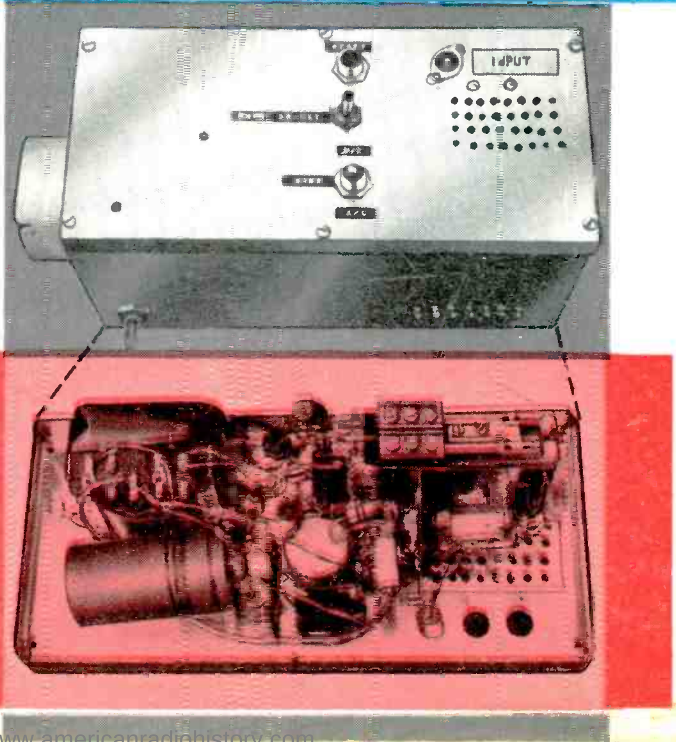
PRACTICAL WIRELESS

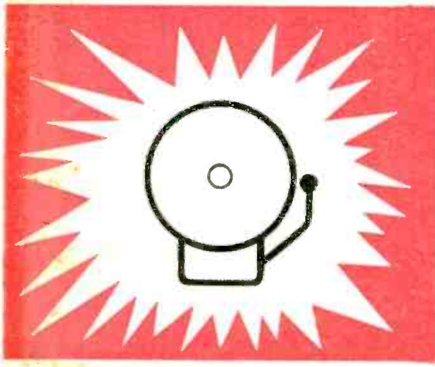
MARCH 1966

2/-

A SIMPLE PROXIMITY DETECTOR

CONSTRUCTIONAL DETAILS INSIDE

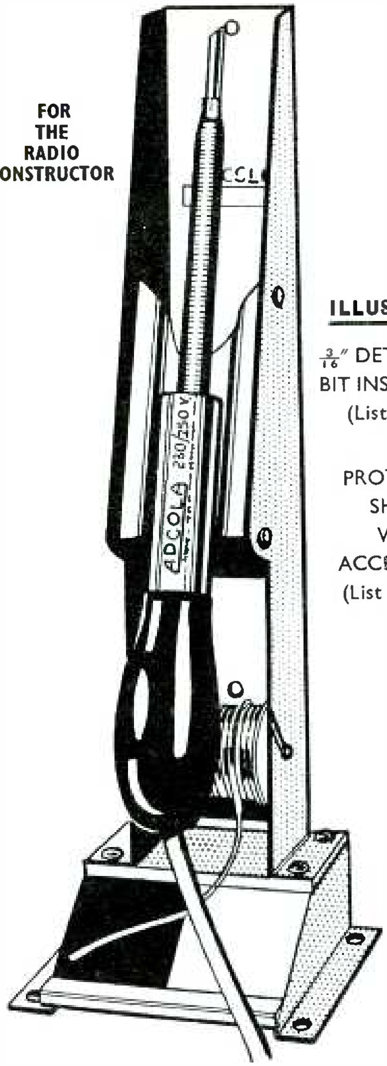




ADCOLA
PRODUCTS LIMITED
(Regd Trade Mark)

SOLDERING EQUIPMENT

FOR THE RADIO CONSTRUCTOR



ILLUSTRATED

$\frac{3}{16}$" DETACHABLE BIT INSTRUMENT (List No. 64)

IN PROTECTIVE SHIELD WITH ACCESSORIES (List No. 700)

FOR CATALOGUES APPLY DIRECT

ADCOLA PRODUCTS LTD.,
ADCOLA HOUSE,
GAUDEN ROAD,
LONDON, S.W.4

Telephones: MACaulay 3101
4272

Telegrams: "SOLJOINT" LONDON SW4

NOMBREX INSTRUMENTATION

TRANSISTORISED SIGNAL GENERATOR

Model 27 £9.16.9

Also available:

★ INDUCTANCE BRIDGE 66	...	£18.6.9
★ POWER SUPPLY UNIT 61	...	£6.14.6
★ C.R. BRIDGE 62	...	£8.11.9
★ AUDIO GENERATOR 63 ...	...	£17.1.9

All Prices include Battery, Post and Packing.
Prompt delivery

S.A.E. for Technical Leaflets

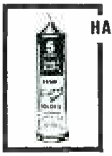
Trade and Export enquiries invited

NOMBREX LTD. Phone: 3515
Estuary House, Camperdown Ter., Exmouth, Devon

ERSIN Multicore SOLDER

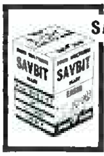
For quick, easy faultless soldering

Ersin Multicore 5-core solder is easy to use and economical. It contains 5 cores of non-corrosive flux, cleaning instantly heavily oxidised surfaces. No extra flux is required. Ersin Multicore Savbit Alloy considerably reduces the wear of copper soldering iron bits.

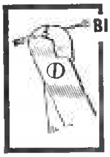


HANDY SOLDER DISPENSER
12 ft. of 18 s.w.g. SAVBIT alloy in a continuous coil, used direct from free-standing dispenser.
2/6 each

LOW TEMPERATURE SOLDER
Size 9 pack contains 24 ft. of 60/40 high tin quality 22 s.w.g.
2/6 each
Size 10 pack 212 ft. 15/- each.



SAVBIT SIZE 1 CARTON
Contains approx. 30 ft. of 18 s.w.g. SAVBIT alloy. Also available in 14 and 16 s.w.g.
5/- each



BIB WIRE STRIPPER AND CUTTER
Strips insulation, cuts wire cleanly. Adjusts to any size.
4/- each

Available from all Electrical and Hardware shops.
If unobtainable write to:

MULTICORE SOLDERS LTD.
Multicore Works, Hemel Hempstead, Herts. Hemel Hempstead 3636
M.4/B

TUBES

SATISFACTION GUARANTEED

	Carr. & Ins. 12/6	6 Months	12 Months
MOST MULLARD. MAZDA. COSSOR. EMITRON. EMISCOPE BRIMAR, FERRANTI TYPES PROCESSED IN OUR OWN FACTORY	12in.	£2. 0.0	£3. 0.0
	15in.	£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

AW48-30 £5.5.0

RECORD DECKS

LATEST GARRARD

All Factory Fresh. All with cartridge.

SRP10 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 -Automatic. £7.19.0.
Model 3,000. Low-mass arm. £10.10.0.
AT60. Bias compensator. £11.19.0.
A70. £19.19.0.
LAB80.—Transcription £25.
401—Transcription. £29.19.0.
Model 50—Automatic. £9.10.0.

B.S.R.

GU7—Single Deck Complete. £4.5.0.
UA14 or **UA16**—Auto Changer. £5.15.0.

BASE SPEAKERS

25 WATT. Very heavy coned 12in. cast chassis. There is nothing to touch it for power handling and quality at the price. Plus 5/- p.p. **£4.19.0**

ANNOUNCEMENT

NEW

BRANCH

NOW OPEN AT
10 TOTTENHAM COURT ROAD
LONDON W.1

STEREO PORTABLE CABINETS

Latest black and silver metal finish. Consisting of centre cabinet size 16¼in. x 13in. x 8in. deep with lift up lid together with two 10 x 6 speaker cabinets which clip on ends of main cabinet size 4½in. x13in. x 8in. making overall size of 25½in. x 14in. x 8in. High quality chrome fittings. Will take almost any autochanger or tape deck. Approx. half price at **£3.19.0**

ARMSTRONG EQUIPMENT. Stocked at all branches.

PRICES SLASHED

DULCI (VHF) FM. TUNERS MODEL FMT5. Self powered 200-250 vac. High sensitivity and automatic gain control for long distance reception. Size 11¾" x 8⅞" x 3¼" high. Weight 7½lbs. In case finished satin chrome & black. Due to fortunate purchase we can offer limited number of these Hi-Fidelity instruments normally £21.13.5 at **15 Gns.**

★ TAPE ★

IDEAL FOR ANY RECORDER. PRICES SLASHED. GUARANTEED APPROX. ½ PRICE. WORLD FAMOUS MAKE BY ENORMOUS PURCHASE.

We offer you fully tensilised polyester/mylar and P.V.C. tapes of quality hi-fi, wide range recording characteristics as top grade tapes. Quality control manufacture. Try one for yourself. They are truly worth a few more coppers than acetate sub-standard, jointed or cheap imports. Try one and prove it for yourself!

Standard Play			Double Play		
3"	150ft.	2/3	3"	300ft.	4/-
4"	300ft.	4/6	4"	600ft.	8/-
5"	600ft	7/6	5"	1200ft.	15/-
5¾"	900ft.	10/6	5¾"	1800ft.	19/6
7"	1200ft.	13/6	7"	2400ft.	27/-
Long Play			**Triple Play**		
3"	225ft.	2/9	4"	900ft.	13/-
4"	450ft.	5/6	5"	1800ft.	25/-
5"	900ft.	10/6	5¾"	2400ft.	34/-
5¾"	1200ft.	13/-	7"	3600ft.	44/-
7"	1800ft.	18/3	**Quadruple Play**		
			3"	600ft.	8/-

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

HITACHI PORTABLE TAPE RECORDER

Fabulous quality and reproduction of music 6 transistor, 1⅞in. and 3¾in. speeds. Output 500mW into high quality speaker. Ingenious single control knob. Fast forward and rewind. Battery level and record level meter. Fast load. Precision capstan drive with dynamic earpiece monitor recording. Radio recording leads. Outside speaker facilities. The most outstanding portable in the country. Size 8 13/16 x 3⅜ x 6⅞in. Genuine normal price of 35 gns. Unrepeatable. 12 months guarantee. All spares available. With tape, tape reel, mike, etc. **19 Gns.**

HITACHI 4 TRACK MODEL TRA-505. This superior 48 guinea recording machine is on very special limited offer. Two channel recording. Plays stereo tapes, 1⅞in. and 3¾in. speed. One track can be listened to on an earphone whilst recording on the second track, and thereafter both tracks played simultaneously through the loudspeaker. Ideal for languages, singing to music etc. Excellent reproduction through Hi-Flux Eliptical speaker. A.C. erase. Dimensions 11" x 11 x 5¼". Weight 12 lbs. Dynamic mike. Sound level meter. Footage indicator. Two mixed inputs. **29 Gns.**

HITACHI AM FM Radios

Wonderfully styled, guaranteed top make 10 transistor with full long and medium waves. Size 9⅝ x 6 3/16 x 12 1/16in. Magnificent reproduction. A pleasure to look at. "An aristocrat in its class." 12 months guarantee against faulty manufacture. Genuine retail price £28.7.6 Unrepeatable. **17 Gns.**

ROBOPHONE ORDERS
Your C.O.D. order for any items exceeding £1 can be telephoned to BRIGHTON 680722 at any time day and night for seven days per week.

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 6d. 2-11 1/-. Free over 12.**

0Z4	4/6	6K8GT	8/3	14S7	14/6	EBC41	6/3	EZ41	5/9	R19	9/6
1A7GT	9/6	6K25	8/6	19AQ5	7/9	EBC81	5/9	EZ80	5/9	SP41	2/3
1C5GT	7/6	6L1	9/6	20D1	8/9	EBF80	7/6	EZ81	6/-	SP61	2/-
1H5GT	3/9	6L6	7/6	20F2	9/6	EBF89	7/9	FC4	8/-	T41	6/9
1N5GT	8/9	6L6G	6/6	20L1	16/-	EBL21	9/9	GZ32	7/6	TDD4	7/-
1S4	7/6	6L18	7/9	20P1	9/6	EBL31	19/6	HVR2	9/-	U14	7/6
2D21	5/6	6L19	12/6	20P3	11/-	EC52	4/9	KT33C	3/9	U18	7/6
3A4	4/-	6LD20	7/9	20P4	17/-	ECC32	4/-	KT36	14/-	U22	6/9
3A5	6/-	6P25	8/6	25A6G	8/-	ECC34	9/-	KT44	6/-	U24	12/6
3D6	4/-	6P28	9/9	25L6GT	7/9	ECC40	6/9	KT45	8/6	U25	8/3
3Q4	5/-	6Q7G	4/-	25Z4G	7/-	ECC81	4/9	KT61	8/6	U26	7/-
5R4GY	8/-	6Q7GT	8/-	30F5	6/-	ECC82	4/9	KT73	5/9	U35	12/6
5U4G	4/-	6SA7	5/9	30FL1	9/6	ECC83	5/9	KT66	12/-	U50	4/6
5Y3G	4/6	6SG7	4/9	30L15	8/9	ECC84	7/6	KT76	8/6	U107	12/6
5Y3GT	4/-	6SK7	5/-	30P4	9/6	ECC85	6/-	KT88	17/6	U191	9/-
5Z4	9/-	6SL7GT	5/6	30P12	7/-	ECC88	9/6	KTW61	5/9	U281	8/6
5Z4G	7/-	6SN7GT	4/6	30PL1	9/3	ECF80	6/-	KTW63	5/-	U282	15/-
5Z4GT	9/6	6SQ7	5/9	35C5	8/6	ECF82	8/3	KTZ63	7/-	U301	12/6
6/30L2	9/-	6U4GT	8/-	35L6GT	8/-	ECH21	11/6	MU14	7/-	U329	8/6
6A8G	7/9	6V6G	4/6	35W4	6/-	ECH35	7/6	N37	10/6	U801	19/-
6A7G	7/6	6VGT	6/-	35Z4GT	5/6	ECH42	8/6	N78	13/-	UABC80	7/-
6AK5	4/3	6X4	4/6	50L6GT	8/6	ECH81	7/-	N108	13/-	UAF42	7/9
6AQ7	5/-	6X5G	5/-	80	5/-	ECH83	6/3	PC86	10/-	UB41	6/6
6AT6	5/-	6X5GT	5/6	185BT	19/6	ECL80	6/6	PC97	7/6	UBC41	7/6
6AU6	7/-	7B6	9/-	185BTA	19/6	ECL82	8/-	PCC84	6/6	UBC81	6/-
6AV6	6/-	7B7	5/6	807(A)	5/-	ECL83	10/6	PCC85	6/6	UBF80	7/9
6BA6	5/6	7C5	7/3	807E	4/9	ECL86	10/3	PCC88	11/9	UBF89	7/6
6BE6	5/6	7C6	7/6	813	49/-	EF36	3/-	PCC89	8/6	UBL21	9/6
6BG6G	15/-	7H7	5/-	866A	12/6	EF39	4/6	PCC189	13/6	UCC85	7/3
6BH6	5/-	7S7	15/-	954	3/6	EF40	11/-	PCF80	6/9	UCF80	8/6
6BJ6	5/-	7Y4	4/6	955	2/3	EF41	8/-	PCF82	6/-	UCH21	9/3
6BR7	8/6	10C1	9/-	956	2/-	EF54	3/3	PCF84	12/-	UCH42	7/3
6BW6	6/9	10C2	14/6	9001	3/6	EF80	3/6	PCF86	7/6	UCH81	7/9
6BW7	5/-	10F1	4/9	9002	4/9	EF85	6/-	PCL82	7/9	UCL82	8/-
6C4	2/3	10LD11	14/6	9003	5/6	EF86	7/6	PCL83	9/-	UCL83	10/-
6C5	5/6	10P18	8/6	ATP4	2/6	EF89	6/9	PCL84	7/3	UF41	6/6
6C6	5/6	10P14	9/6	AZ31	6/-	EF91	8/-	PCL85	7/6	UF42	4/9
6C9	11/-	12AH7	7/-	B36	4/6	EF92	8/-	PCL86	10/6	UF80	6/3
6CD6G	17/-	12AH8	9/-	CBL31	19/-	EF183	9/9	PEN25	8/9	UF85	7/6
6D6	3/-	12AT6	6/6	CL33	9/-	EF184	9/6	PEN45	8/6	UF89	5/9
6F1	4/9	12AT7	4/9	CY31	7/6	EL32	3/9	PEN46	4/6	UL41	7/6
6F6G	3/6	12AU6	9/-	DAF91	4/6	EL33	6/6	PL33	8/6	UL44	14/-
6F13	4/3	12AU7	4/9	DAF96	7/3	EL34	11/6	PL36	9/6	UL46	8/3
6F14	9/6	12AV6	6/3	DF91	3/-	EL35	6/-	PL38	17/6	UL84	7/-
6F15	9/6	12AX7	6/-	DF92	3/-	EL38	12/6	PL81	7/9	UR1C	7/6
6F23	6/6	12BA6	7/-	DF96	7/3	EL41	8/-	PL82	6/6	UM80	9/6
6J5G	3/-	12BE6	6/6	DK91	5/6	EL42	7/9	PL83	6/6	UU6	8/9
6J5GT	4/3	12BH7	8/9	DK92	7/-	EL84	6/6	PL84	7/6	UU8	11/-
6J6	2/6	12E1	17/6	DK96	7/3	EM34	8/6	PY31	8/-	UY21	9/6
6J7G	4/9	12J7GT	8/-	DL92	5/-	EM80	7/9	PY32	10/-	UY41	6/-
6J7G7	7/6	12K7GT	4/-	DL94	6/6	EM81	6/9	PY80	6/6	UY85	5/-
6K6GT	6/-	12K8	9/9	DL96	7/3	EM84	8/9	PY81	5/9	VR105	5/-
6K7	5/9	12K8GT	9/6	EABC80	6/	EM85	8/6	PY82	5/9	VR150	7/9
6K7G	1/-	12Q7GT	5/-	EAF42	8/3	EY51	7/6	PY83	5/9	X66	7/9
6K7GT	4/6	12SA7	6/3	EB41	5/-	EY86	7/3	PY88	9/-	Z66	8/6
6K8	8/6	12SK7	2/9	EB91	2/-	EY88	8/6	PY800	6/3		
6K8G	5/-	12SQ7	7/6	EBC33	4/9	EZ40	6/6	PZ30	9/6		

CONNECTING WIRE

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

CO-AX, low loss, 6d. yd., 25 yards 11/6; 50 yds. 22/-; 100 yds. 42/6. Co-ax Plugs, 1/3. Wall outlet boxes 3/6

MAINS TRANSFORMERS

Excellent Quality Guaranteed Upright mounting 250-0-250v. 60mA. 6.3v., 3A(80mA 12/6) Ditto semi-shrouded. **9/6**

SPECIAL C.R.T. OFFER
Due to huge Bulk Special Purchase we are offering CRM141 and MW 36-24 Tubes at the unrepeatable price of 39/-. P.P. 12/6. The above are guaranteed for 6 months.

✶ BULK BARGAINS ★

12 POTS. Popular values. 5K. to 2 Meg. Unused, mixed pre-set, long sp., switch, etc. **4/6**

CONDENSERS. 25 mixed Electrolytics Many popular sizes. List value £5. Our price **10/-**

100 RESISTORS 6/6
Excellent. Sizes ½–3 watt.

100 CONDENSERS 9/6
Miniature Ceramic and Silver Mica Condensers, 3pF to 5,000pF. LIST VALUE OVER £5.

25 TAG STRIPS 4/-
2, 4, 6, 8-way etc. Unused.

100 HI STABS 9/6
1% to 5% 100 Ω to 5 mΩ.

TRANSISTORS

GUARANTEED TOP QUALITY

Huge reduction, Red Spot standard LF type now only **1/6**
White Spot R.F. **2/-**

Mullard Matched Output Kits OC81D and 2-OC81 **12/6**
R.F. Kits OC44, OC45 (2) 3 transistors. **12/6**

AF114	8/-	OC44	5/6
AF115	7/6	OC45	5/6
AF116	7/6	OC72	5/6
AF117	7/-	OC81	5/6
AF127	9/6	OC81D	5/6
OC26	12/6	OC82	6/-
OC36	14/-	OC170	8/6
		OC171	8/6

GERMANIUM DIODES

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

SILICON RECTIFIERS

Guaranteed performance. Top Makes. Tested 250v. working.
100mA (3 for 9/6) **3/9** 250mA (3 for 19/6) **7/6**

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

Post: 2lbs. 2/-, 4lbs. 2/6, 7lbs., 3/6, 15lbs., 4/-, etc. (C.O.D. extra). ALL VALVES LESS 5% AND POST FREE IN DOZENS.

TECHNICAL TRADING CO.

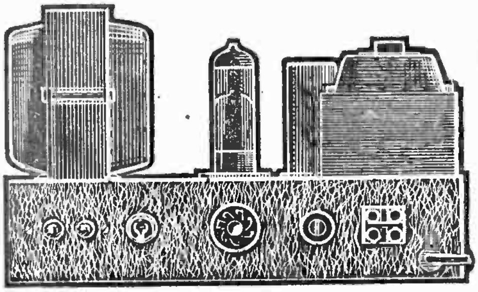
Retail only, Hi-Fi Demonstrations, 72 East Street, Southampton. Tel. 25851
350/352 Fratton Road, Portsmouth. Tel. 22034
ALL MAIL ORDER AND RETAIL SHOP
DEVONIAN COURT, PARK CRESCENT PLACE, BRIGHTON Tel. 67999

STERN-CLYNE ELECTRONIC CENTRES

HI-FI AND TAPE EQUIPMENT ● RADIO ● KITS ● ELECTRONIC COMPONENTS

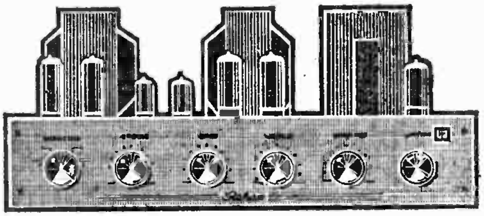
*Designs by MULLARD- Interpreted by STERN

Justly famous—superb Hi-Fi designs from the Mullard Applications Research Laboratory, meticulously executed by Stern and Veritone. Buy them as hand-built and tested units, or in Stern-Clyne's famous Homebuild Kit form. Either way provides performance per £ unequalled anywhere. If you are working to a budget, kits offer a real saving plus real building satisfaction. Each is absolutely complete and backed by comprehensive, easy-to-follow building instructions.



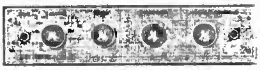
FIVE-TEN AMPLIFIER

One of the most famous amplifiers ever made—thousands are in service as the nucleus of high quality installations throughout the world. Check the phenomenal performance, unmatched by any other amplifier obtainable in this price range: Freq. response 5 c/s. to 30 kc/s. flat ± 1 db. Distortion 0.1% at full 10 watts output. Noise -65 db. below 10 watts. Input signal 40 mV. for 10 watts. Out. Imp. 3 or 15 ohms. Valves EZ81. EF86, ECC83, 2 x EL84. Size overall: 10 x 7 x 6½in. high. Incorporates mains outlet for gram and aux. supply of 250 v. at 45 mA. and 6.3 v. at 2½ amps. for pre-amp. tuner, etc. To full Mullard specification. **Assembled and tested £13.10.0 Kit £10.** *Carr. 6/6.* **FIVE-TEN AMPLIFIER AND TWO-VALVE PRE-AMP. Assembled and tested £21.10.0. Kit 15 gns.** *Add 8/6 carriage.* **FIVE-TEN AMPLIFIER AND THREE-VALVE PRE-AMPLIFIER. Assembled and tested £25.10.0. Kit £19.10.0.** *Add 8/6 carriage.*



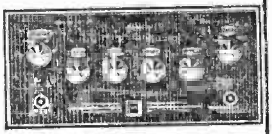
TEN PLUS TEN STEREO AMPLIFIER

Basically two Five-Ten amplifiers with design variations that exploit the exceptional qualities of the Mullard ECL86 Triode/Pentode. Add Stern engineering to a very exacting specification and the result is Stereo performance of the highest quality at astonishingly low cost. Freq. response 5 c/s. to 60 kc/s. flat ± 3 db. Sens. 23 mV. for full 10 watts output each channel. Noise -65 db. below 10 watts. Cross talk -60db. Distortion 0.2% at 10 watts. Out. Imp. 3.75, 8 and 15 ohms from sectionalized secs. of special Ultra Linear output trans. Valves 2 x EF86, 4 x ECL86, GZ34. Size 14 x 6½ x 6½in. high. Aux. output for pre-amp. 300 v. at 6 mA. and 6.3 v. at 1½ amps. Illustration shows amplifier fitted with Passive Control Unit (see right). **Assembled and tested £20.0.0. Kit £16.0.0.** *Add 8/6 carriage.*



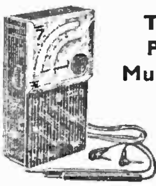
TWO-VALVE PRE-AMPLIFIER

Specially designed for use with the Mullard series of 3, 10 and 20 watt amplifiers but entirely suitable for all Hi-Fi power units not requiring input of more than 250 mV for full output. Features include inputs for crystal and variable reluctance pick-ups with RIAA equalization, plus radio, sensitive microphone, and tape replay direct or from pre-amp. Controls include 6-position selector, volume and wide range bass and treble boost. Valves 2 x EF86, size 9½ x 4½ x 2¾ in. high. Panel 10½ x 2¾ in. Requires 300 v. at 3 mA. and 6.3 v. at 0.6 amps. **Assembled and tested £9.10.0. Kit £6.6.0.** *Add 6/- carriage.*



THREE-VALVE PRE-AMPLIFIER

Specially recommended for use with the 5-10 amplifier, but also suitable for use with all Mullard series mono amplifiers and any high quality unit requiring an input of up to 250 mV. for full output. Features include: wide range Bass and Treble controls, high and low pass filters, auxiliary input and record output sockets, switched inputs for crystal or magnetic pick-ups, radio, tape playback and auxiliary. Power required 250 v. at 6 mA. and 6.3 v. at 1 amp. Valves 2 x EF86 and ECC83. Size 11 x 4½ x 4in. high. Panel 12 x 4¾in. **Assembled and tested £13.13.0. Kit £10.10.0.** *Add 5/- carriage.*



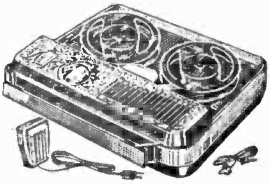
TEST 7 Pocket Multimeter

39/6

Carriage 2/-

A really versatile instrument that makes a handy, pocket size tool. Measures AC or DC voltage in three ranges of 0-15-150-1000 v. Resistance 0-100,000 ohms, and Current 0-150 mA. D.C. Size only: 3¾ x 2½ x 1¼in., with ingenious dial design, providing a clear, easily read scale. Complete with battery and test leads.

NEW PORTABLE TAPE RECORDER

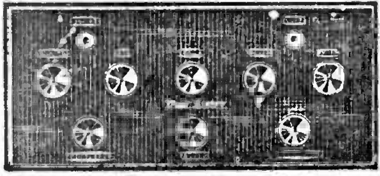


Exceptionally low-priced, but actually a robustly made reliable instrument which can be used anywhere for note taking, idea recording, dictation, etc. Mechanism solidly built onto rigid steel chassis and housed in tough grey plastic case with carrying strap and clear plastic tape deck cover. Fitted with single multi-selector function switch and volume control. Hand microphone has Stop/Start thumbswitch for remote control of record and playback transcription. Complete with tape and spare spool, mike and miniature earpiece. Size only: 8 x 7½ x 2½in. high. £6.19.6. *Carriage* 4/6.

VANDAL PROOF CAR AERIAL Automatically locks below wing when pushed down—withdraws only with special key. 5-draw telescope aerial extends to 4ft. Retracts into concealed plastic tube. Fits any wing contour. With fitted lead, standard plug, 2 keys, keyring, fitting instructions. 39/6. P. & P. 2/6.

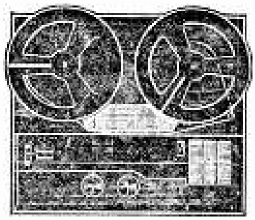
PASSIVE CONTROL UNIT

Specially designed, self-contained unit for use with the Ten plus Ten, either for direct attachment to chassis or for remote fitting. Incorporates switched inputs for crystal or ceramic pick-up, radio and tape replay together with Vol., Bass, Treble and Balance controls on an attractively styled and finished front panel. Sens. 230 mV. for 10 watts. Imp. 500 K. Size 14 x 2 x 2in. Panel 15¾ x 2¾in. For dynamic or low output pick-ups, use Dual Channel pre-amplifier described below. **Passive Control Unit assembled and tested and complete with Ten plus Ten Amplifier £24.0.0. Kit £20.0.0.** *Add 10/- carriage.*

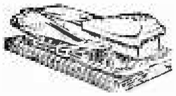


DUAL CHANNEL PRE-AMPLIFIER

Actually twin Two-Valve Pre-amplifiers which together provide an extremely versatile and sensitive input arrangement for the Ten plus Ten amplifier in place of the Passive Control Unit. Features include, dual inputs for mono and stereo Magnetic, Variable Reluctance, Crystal and Ceramic pick-ups, dual inputs for direct and pre-amplified tape playback and radio; separate continuously variable Bass, Treble, and Volume and Balance controls. Switching permits Mono or Stereo operation, equalization conforms to RIAA on disc replay. Power input 250/350 v. at 6 mA. and 6.3 v. at 1 amp. Size 11 x 5 x 4in. high. Panel 12 x 4¾. **Assembled and tested and supplied complete with Ten plus Ten Amplifier £34.0.0 Kit £27.0.0.** *Add 10/6 carriage.* **Dual channel pre-amplifier only. Assembled and tested £15.0.0. Kit £12.10.0** *Add 5/- carriage.*



DUVIDAL TAPE SPLICER

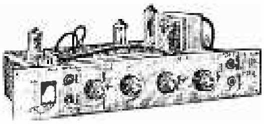


14/6

Carr. 1/6

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

HF/TR3 TAPE AMPLIFIER



Easily the best complete tape amplifier available to the home builder. Supplied already matched for the Magnavox 363 tapedeck.

Features include: switched equalization for all speeds (CCIR standards at 7½ i.p.s.) Treble boost incorporated during Record; Bass boost during playback, speakers output matched for 3, 7.5, and 15 ohms, additional outputs for extension speaker, phone monitoring on Record and Hi-Fi playback through existing systems, Inputs for Mic. Pick-up, and VHF Radio. Valves: EF86, ECC83, EL84, EM81, EZ81. Size overall: 11 x 6 x 6in. (Panel 13⅞ x 3in.). Power pack on separate chassis size 7½ x 3 x 4¾in. **Amp. & power pack Kit of parts £13.13s. Assembled and tested £19.** *Add 7/6 carriage.*

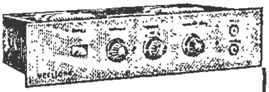
MAGNAVOX 363 TAPE TRANSPORTER(Left)

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.*

TAPE HEAD DEMAGNETIZER

A must for serious tape users! Tape heads become permanently magnetized with constant use; effect is cumulative and leads to background noise that prevents the achievement of perfect recordings. Highly effective, mains operated device is simply applied to recording head and carries magnetic condition through series of hysteresis loops of diminishing amplitude, leaving head substantially free of magnetism. Cleans any tape head in seconds. **29/6** *P. & P.* 2/-.

TAPE PRE-AMP TYPE 'C'



Specially developed by Mullard Laboratories for use with high quality replay systems, and supplied specifically matched for use with the Magnavox 363 tapedeck Features include: ferroxcube pot core inductors for treble equalization, push pull oscillator incorporating ferroxcube transformer, adjustable output for matching to existing high-quality amplifier systems, inputs for Mic., Pick-up, Radio, etc. Valves: 3 x EF86, EC82 and EM81. Totally enclosed in case size 11¼ x 6¼ x 3⅞in. high. (Panel 11¾ x 3½ in.) Power supply of 300 vdc at 25 mA. and 6.3 v. at 1.5 A. is on separate sub-chassis size 6¼ x 4½ x 4⅜in. high to facilitate remote location from tape heads. **Pre-amp and power pack Kit of parts £14. Assembled and tested £19.10s.** *Add 7/6 carriage.*

EXCLUSIVE OFFER OF TOP QUALITY RECORDING TAPE

New American branded tape by world renowned manufacturers and equal in quality to the best obtainable anywhere. Guaranteed splice free, red oxide coated, with full frequency response and uniform output. Resistant to moisture, heat, cold and abrasion. Available in a wide range of Acetate and polyester qualities, each distinctively boxed and cellophane wrapped in colour coded cartons showing recording times at 7½, 3¾ and 1⅞ i.p.s. Compare the prices!

Range available:

Acetate

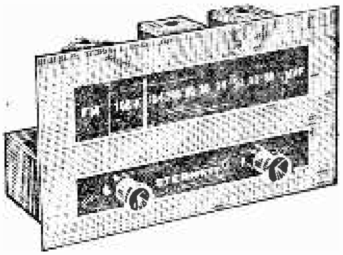
5in. 600ft. Standard **8/6**
5in. 900ft. Long Play **10/-**
5¾in. 1,200ft. Long Play **12/6**

Both types post and packing 1/- per reel. Four or more reels post free.

Polyester

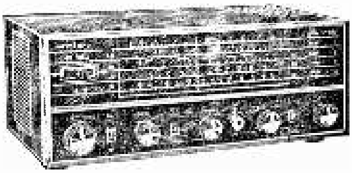
3¼in. 600ft. Double Play **11/6**
7in. 1,200ft. Standard **12/6**
5in. 1,200ft. Double Play **15/-**
7in. 1,800ft. Long Play **20/-**
5¾in. 1,800ft. Double Play **22/6**
7in. 2,400ft. Double Play **25/-**

NEW! STERNKIT FM1 V.H.F. 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. Valves are 4 x EF91 plus 2 diodes. Input sens. 100mV for 40dB. Dist. less than 1% at full deviation. Power reqd. 200v. at 20mA and 6.3v. at 1.8A. Panel black and silver-grey, size 8 x 5in. Chassis: cadmium plated, overall depth 4½in. **FM1 Kit of parts with Instruction Handbook, £7.9.6.** *Carriage* 4/-. **FM1 Assembled and tested, £10.9.6,** *Carriage* 4/-. **Optional Power Pack Type D. Kit of parts. £2.15.0,** *Carriage* 3/6. **Power Pack Type D, Assembled and tested, £3.10.0,** *Carriage* 3/6. Handbook only, **3/-** post free. Descriptive leaflet on request.

VERITONE NEW, ADVANCED COMPACT COMMUNICATIONS RECEIVER



20 Gns.

Carriage and Insurance 15/-

New, highly developed, extremely compact design. Veritone SR.150 has portable radio proportions and a DX performance comparable with many highly expensive, professional receivers. Frequency coverage is continuous from 540 Kc/s to 30 Mc/s in 4 bands, plus bandspread on Ham frequencies of 3.5, 7, 14, and 28 Mc/s. Features include: extra large, clearly marked dial, "S" meter, variable pitch BFO, noise limiter, built-in loudspeaker and extending rod antenna to receive all but most distant stations. Extras include phone output jack, standby switch, etc. Size only: 13¼ x 5 x 8in. deep. **Valves 12BE6, 12AV6,** 12BA6 and 50C5 plus silicon rect. Invaluable for DXer's, marine band listeners, etc. Housed in handsomely finished metal case. For 200/250 volts AC or DC *Supplied with 128-page "Wireless World Guide to Broadcasting Stations."*

THE TESTMASTER 500

£8.17.6 *Post and Packing 2/6.*

Measures a wide range of voltage, current resistance and audio power with a sensitivity of 30,000 ohms/volt on D.C. and 15,000 ohms/volt on A.C. High grade components throughout with 1 per cent tolerance resistors ensure a long, accurate-reading life. Ruggedly constructed, 33 microamp movement is fitted with positive, clearly marked dial. Shunts and multipliers are built round a specially designed low-resistance switch and printed circuit board, and range selection is made through a novel three pronged, rapid selection index knob. Size overall: 6¼ x 4½ x 2¼in. deep. Supplied complete with leads and test prods, batteries and full instructions. **Ranges—D.C. Volts:** 0-0.25-1-2.5-10-25-100-250-500-1,000 at 30,000 ohms/volt. **A.C. Volts:** 0-2.5-10-25-100-250-500-1,000 at 15,000 ohms/volt. **D.C. Current:** 0-05-5-50-500 mA. and 0-12 amps. **Resistance:** 0-60K-6M-60M (350, 35K, 350K at midscale. **Decibels:** —20 to +56dB (0dB=1mW., 600 ohms). **Audio Out:** Capacitor in series with A.C. volt ranges. **Short Test:** Internal buzzer.

STERN-CLYNE ELECTRONIC CENTRES... most exciting shops in Britain!

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 St.	**MUNicipal 3250**
BRISTOL: 26 Merchant Street, Bristol 1.	**Tel. 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.	**Tel. 45889**

HIRE PURCHASE? CERTAINLY!

Easy payment terms available on all kits and assembled equipment value £10 or more Let us have your enquiry.

DESPATCH-TODAY?-PHONE-R.C.S.!

DE-LUXE RECORD PLAYER KITS

Autochange 2-tone Cabinets 17 x 15 x 8½in. High flux loudspeaker. 3 watt famous make amplifier ready built. Quality output. Volume and Bass controls. All items fit together perfectly. Special instructions enable assembly in 30 minutes only 5 wires to join. 12 months' guarantee.

AUTOCHANGE KITS. Absolutely complete.
B.S.R. Monarch .... £10.19.6 P.P. 7/6
Garrard "1000" .... £11.19.6 P.P. 7/6
Garrard AT50 £12.10.0. AT60 £14.15.0 P.P. 7/6

OR SEPARATELY
Cabinet with board 14 x 13in. £3.9.6. P. P. 5/6
3 watt amplifier with speaker £3.12.6 P.P. 3/6

AUTOCHANGERS with LP/78 xtal pick ups.
B.S.R.UA25 or UA14 Mono .. £5.19.6 P.P. 3/6
Garrard "1000" Mono .... £6.10.0 P.P. 3/6
Garrard AT50 £8.10.0: AT60 £10.10.0 P.P. 5/6

SINGLE PLAYERS with LP 78 xtal pick ups.
B.S.R. Junior £3.7.6; B.S.R. GU7 £4.17.6. P.P. 2/6

GARRARD TRANSCRIPTIONS SP25 £11; A70 £21; LAB80, £25; 401, £30. P.P. 5/6 each.

Q MAX CHASSIS CUTTER

Complete die punch Allen screw and key

½in.	14/6	1 1/16in.	18/-	1¾in.	22/6
⅝in.	14/6	1⅛in.	18/-	2in.	34/3
¾in.	15/6	1¼in.	18/6	2 3/32in.	37/9
⅞in.	15/9	1⅜in.	20/-	2⅛in.	44/3
1in.	18/-	1½in.	20/6	1in. sq.	31/6

CRYSTAL MIKE INSERTS

1½in. dia. x ⅜in., 6/6; **BM3** 1 x ⅜in., 7/6; **ACOS MIC**, insert 1⅜in. dia. x ¼in. 8/6
TANNOY CARBON MIKE complete. 5/6

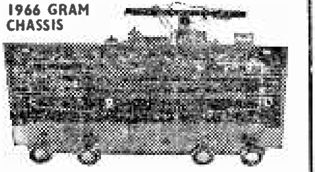
Coils Wearite "P", 4/-; **Osmor** "Q" from 4/-. **Rep. DRR2** L. & M. with reaction, 4/6. **Ferrite Aerials Valve.** M. 8/9; M.L., 12/6. **Ferrite Aerials.** L. & M. for transistor/circuits. **OSMOR, 10/-. WEYRAD, 12/6.** **Ferrite Rod** 8 x ⅜in., 6 x ⅜in., 6 x 5/16in., 3/- ea. **H.F. Choke, 2/9.** **Osmor QC1, 6/9.** **Test Prods, 4/6 pr. Set Trim Tools, 3/-.** **Neon Mains Tester Screwdriver, 5/-.** **Multicore Solder, 6d. yd. Dispenser, 2/6.** **VALVE HOLDERS.** Int. Oct. 6d. Mazda Oct. 6d. B7G, B8A, B8G B9A, 9d.; B7G, B9A Cans, 1/-. Ceramic I.O. EF50, BG7 B9A, 1/-, Valve plugs 2/3.

MOVING COIL MULTIMETER TK 20a 0-1000v. A.C/D.C. ohms. 0 to 100k, etc., 47/6.
MOVING COIL MULTIMETER EP10K 0-1000v. A.C./D.C. ohms 0 to 3 meg. etc. 70/6.
MOVING COIL MULTIMETER EP20K 0-2500v. D.C. 0-1000v. A.C. 20,000 ohms per volt. 0 to 6 meg. 50 Microamps. 99/6
MOVING COIL MULTIMETER EP30K 0-1200 D.C./A.C. volts. 30,000 ohms/v. (D C) 0-10meg. 23 microamps. Full scale. Decibels —10 to +23dB. 132/6

I.F. TRANSFORMERS 7/6 pair

465 K/s Slug Tuning Miniature Can, 3 x 1⅜in. dia. High Q and good band width. Data supplied.

1966 GRAM CHASSIS



Three Wavebands. Long, Med., Short. Five Valves ECH81. EF89, EBC81, EL84, EZ80. 12-months guarantee. A.C. 200/250v. Ferrite Aerial, 5 watts, 3 ohm. 13½in. x 7in. high x 5in. deep. Dial size 13 x 4in. horizontal working. Aligned, calibrated. Chassis isolated from mains.

BRAND NEW £9.19.6 Carr. 5/6

Matched speakers 10 x 6in., 22/6; 13 x 8in., 45/-

VHF-FM RADIOGRAM CHASSIS £16.10.0
With Long and Med. Wavebands, 15in. x 7in. x 9in.

NEW ELECTROLYTICS FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350v	2/-	100/25v	2/-	8/600v	9/-
2/350v	2/3	250/25v	2/6	16/600v	12/-
4/350v	2/3	500/15v	2/6	16+16/500v	7/6
8/450v	2/3	2000/50v	11/6	32+32+32/350v	6/-
16/450v	3/-	8+8/450v	3/6	32+32/450v	6/-
32/450v	3/9	8+16/450v	3/9	50+50/350v	7/-
25/25v	1/9	16+16/450v	4/3	64+120/350v	11/6
50/50v	2/-	32+32/350v	4/6	100+200/275v	12/6

PAPER TUBULARS

350v. 0.1 9d.; 0.51/9; 1 mFd, 3/-; 2 mFd, 150v. 3/-
500v. 0.001 to 0.05 9d.; 0.1 1/-; 0.25 1/6, 0.5 2/6.
1,000v. 0.001, 0.0022 0.0033, 0.0047. 0.01, 0.022, 1/6; 0.047, 01, 2/-. 0.22, 0.47, 3/-.
2,000v. 0.005, 0.01 0.02, 2/6; 0.05. 3/6.
Sub-Min. 0.001, 0.005, 0.01. 0.02, 0.04. 0.05, 0.1 1/-
Sub-Min. Electrolytics 1. 2, 4, 5, 8, 16, 25, 30, 50, 100, 500, 1,000 mFd, 15v. 2/6, 1.000 mFd, 50v. 7/6

SILVER MICA (tolerance 1pF), 2.2 to 47pF, 1/-, ditto 1% 50 to 800 pF, 1/-; 1.000 to 2,000 pF, 1/9. **CERAMICS** 500v., 1pF to 0.01 mFd. 9d. each. **TWIN GANGS.** "O-O" 208 pF + 176 pF, 10/6; "O" 365 pF min., 10/-; 500 pF standard with trimmers 9/6; midget with trimmers. 9/-; 500 pF slow motion, standard. 9/-; small 3-gang 500pF. 19/9. Single "O" 365 pF, 7/6. **SHORT WAVE.** Single 10 pF 25 pF 50 pF, 75 pF, 100 pF, 150 pF, 5/6 each. Can be ganged together. Couplers 9d. each. **TUNING AND REACTION.** 100 pF, 300 pF, 500 pF. 3/6 each. solid dielectric **TRIMMERS** Compression ceramic, 30, 50, 70 pF. 9d.; 100 pF 150 pF. 1/3 250 pF, 1/6; 600 pF, 750 pF, 1/9. **HEADPHONES.** 2,000 ohms, 12/6; 4,000 ohms. 15/-. **EL34 Transformer De Luxe, Push-Pull 30w., 90/-.** **EL34 (510) Ultra Lnear Push-Pull, 10w. 49/6.** **10w. Multi-ratio Push-Pull. 18/6. EL84 3-3), 25/-.** **Standard Pentode, 5/6. ELL80** o.p.t. 12w., 25/-.

TRANSISTOR MAINS ELIMINATOR PP1-6v. PP9-9v. 29/6

DOUBLES 42/6. PP1+PP1, PP9+PP9. PP1 (4½+4½) Size as Batteries. Also min. 9v. 19/6

WEYRAD P50 COILS

Ferrite aerial 12/6: Osc. P50/1AC, 5/6; 1st and 2nd I.F. P50/2CC, 5/7 each; 3rd I.F. P50/3CC, 6/-: Driver Trans-LFDT4, 9/6. Printed Circuit 9/6: 35 ohm Speakers. 5in. 17/6: 6x4in. 21/-. Book 2/-. 3 ohm OPT 10/6

NEW MULLARD TRANSISTORS

Holders 1/3; OA81. 3/-; OC71, 6/-; OC72. 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; ORP12, 12/6.
SILICON RECTIFIERS. OA210 500mA, 200v., 5/6; BY100 550 mA 400v., 10/-.

MAINS TRANSFORMERS *Postage 2/- each*
STANDARD 250-0-250; 80mA, 6.3v., 3.5a., tapped 4v., 4a. Rectifier 6.3v., 1. 5v. 2a., or 4v. 2a, 25/-; ditto 350-0-350 29/6
MINIATURE 200v., 20mA, 6.3v., 1a. 10/6
MIDGET 220v., 45mA., 6.3v., 2a. 15/6
SMALL 300-0-300 70mA., 6.3v., 4a. 19/6
E.M.I. 280-0-280, 100mA, 6.3v, 3.5a, 6.3v, 1½a 17/-
HEATER TRANS. 6.3v., 1½a., 7/6; 6.3v. 4a. 10/6
Ditto, tapped 1.4, 2 3, 4. 5. 6.3v., 1½a. 8/6
GENERAL PURPOSE LOW VOLTAGE 2 amp. 3 4, 5, 6, 8, 9, 10, 12, 15 18, 24 30v. 25/-
1 amp. version, taps and C taps up to 60 v. 29/6
AUTO TRANSFORMERS. 230-110v., 60w. 18/-
0-115, 200, 230, 240v. 150w. 25/-; 500w. 82/6
MULLARD "510" Mains Transformer 33/6
TRANSISTOR 9v., 80mA. 1½ x 1½ x 1in. 7/6

BEST BRITISH P.V.C. RECORDING TAPES (Spare Spools 2/6 ea.)

LP 5in.	900ft.	11/6	DP 5in.	1200ft.	18/6
LP 5¾in.	1200ft.	14/6	DP 5¾in.	1800ft.	24/6
LP 7in.	1800ft.	19/6	DP 7in.	2400ft.	29/6

Volume Controls

Linear or Log Tracks. Long spindles, Midget 5 K ohms to 2 Meg. L.S. 3/-. D.P. 5/-

Stereo L/S 10/6; DP. 14/6
1m log+1m A/log. 7/6

80 ohm CABLE COAX

semi-air spaced ¼in. 40 yds. 17/6 60 yds. 25/- **6d. yd.**

Ideal 625 lines U.H.F. Low loss 5dB 100ft. 500 Mc/s **1/6yd.**

TELESCOPIC CHROME AERIALS, 12 to 33in., 6/6 **TRIPLEXERS** Bands I, II, III, 12/6. **COAX PLUGS** 1/- **LEAD SOCKETS**, 2/-; **PANEL SOCKETS**, 1/-. **OUTLET BOXES** (Surface o. flush). 4/- each. **BALANCED TWIN FEEDERS.** 6d. yd. 80 or 300 ohm **TWIN SCREENED.** 1/6 per yard, 80 ohms only.

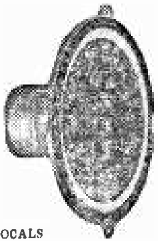
THE "INSTANT" BULK TAPE ERASER AND RECORD HEAD DEMAGNETIZER 200/250v. A.C. 35/-

RETURN OF POST DESPATCH

P.P. Charge 1/6 Full List 1/- C.O.D. 2/6 extra

BAKER LOUDSPEAKERS

HANDMADE BY CRAFTSMEN



HIGH FIDELITY MODELS

12in., 15w., **STALWART** 3 or 15 ohms. 45-13,000 c.p.s., 12,000 lines. Bass res. 45 c.p.s. £5.5.

12in., 15w. **DE LUXE** Foam Cone Surround. 25-16,000 c.p.s., 14,000 lines. Bass res. 35 c.p.s. Remarkable value. £9.

12in., 20w., **SUPERB** Aluminium Drive, Foam Cone Surround 20-17,000 c.p.s., Bass res. 22 c.p.s. Unbeatable value. £15

GROUP MODELS FOR VOCALS BASS. LEAD and RHYTHM GUITARS
Frequency response 30-10.000 c.p.s.
Voice Coils 15 ohms. Heavy Duty outputs.
"GROUP 25" 12in. dia., 25w., 12,000 lines 5 gns.
"GROUP 35" 12in. dia., 35w., 14.000 lines 8½ gns.
"GROUP 50" 15in. dia., 50w. 17.000 lines 18 gns.

LOUDSPEAKERS P.M. 3 OHM FAMOUS MAKES; 2½in., 3in., 4in., 5in., 7 x 4in., 15/6 each. 8in. 17/6. 6½in., 16/6; 10in., 30/-; 12in., 30/-; (15 ohms, 35/-); 10 x 6in., 22/6; 8 x 3in., 21/-; 8 x 5in., 21/-. **EMI** 13 x 8in. ceramic, double cone, 3 or 15Ω 45/-.

WAVE-CHANGE SWITCHES. 2 p. 2-way or 2 p. 6-way; 3 p. 4-way or 1 p. 12-way; 4 p. 2-way or 4 p. 3-way, 3/6 each; 8 p. 4-way. 2 wafer, 6/6.

WAVE-CHANGE "MAKITS" available, 1 p. 12-way, 2 p. 6-way, 3 p. 4-way 4 p. 3-way 6 p. 2-way. Kit Price: 1 wafer 8/6; 2-wafer 12/6; 3 wafer 16/-. Extra wafers 3/6 each, extra long shafts 2/- extra.

TOGGLE SWITCHES s.p. 2/-, d.p. 3/6; d.p.d.t. 4/-.

★ RADIO BOOKS ★ (P.P. 9d.)

Valves, Diodes, Transistor equivs.	10/6
Transistor Audio Amplifier Manual	6/-
Shortwave Transistor Receiver ..	5/-
Beginners' Modern Transistor Sets	7/6
Sub-miniature Transistor Receivers	5/-
Boys' Book of Crystal Sets	2/6
"W.W." Radio Valve Data	7/6
High Fidelity Speaker Enclosure	5/-
TV Fault Finding	6/-
Mullard Amplifier Manual	8/6
Valve Guide, Books 1, 2, 3, 4 or 5	5/- ea.
Practical Radio Inside Out.. ..	4/6
Transistor Communication Sets ..	6/-
Transistor Controlled Models ..	7/6
International Radio Stations ..	2/6

JACK SOCKETS. Standard 2/6, closed circuit 4/6. Grundig type 3-pin 1/3; Standard Lead Type 6/-. Phono Plugs 1/-. Socket 1/-. Banana Plugs 1/-. **JACK LUGS.** Screened 3/-. Grundig 3-pin. 3/6. **BULGIN NON-REV. PLUGS and SOCKETS.** P74, 2-pin 4/3; P73 3-pin 4/6; P194 6-pin 6/6; P466 12/6. **RESISTORS.** Preferred values. 10 ohms to 10 meg. ¼ w., ½ w., 1 w., 20% 4d.; 1½ w., 8d.; 2 w., 1/-. **HIGH STABILITY** ½ w., 1% 2/-. All Values. 10 ohms to 10 meg. Ditto 5% 10 ohms to 22 meg., 9d.

5 watt	0.5 to 8.2 ohm 3 W	1/6
10 watt	**WIRE-WOUND RESISTORS**	1/9
15 watt	10 ohms—6,800 ohms	2/-

10 K., 15 K., 25 K., 10 w. 3/-

MAINS DROPPERS Midget. With sliders. 0.3a 1 K., 0.2a. 1.2 K., 0.15a., 1.5 K., 0.1a., 2 K., 6/- each. Line Cord 100 ohms ft., 3-way. 1/- ft. **Wirewound Ext. Speaker Controls** 10Ω 3/-; 25Ω 6/6. **WIRE-WOUND POTS 3 WATT.** Miniature TV Types. All values 10 ohms to 25 K., 3/- each, 30 K., 4/-. (Carbon 30 K to 2 meg., 3/-). All with knob. **WIRE-WOUND POTS 4 WATTS.** Long ¼in. Spindle. Value 50 ohms to 50 K., 6/6; 100 K., 7/6. **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 x 12in., 6/-.

ARDENTE TRANSISTOR TRANSFORMERS

D3035 7.3 CT.1 Push-Pull to 3 ohms output 11/-
D3034 1.5:1 C.T. Push-Pull Driver 11/-
D3058 11.5:1 Output 3 ohms, 11/-; D1001, 12/-
D239 4.5:1 Driver, 11/6; D240 8.5:1 Driver. 11/6
TRANSISTOR POTS 5 K Switched VC1545 5/3
SUB-MIN EARPIECE Xtal or Magnetic 7/6
SUB-MIN JACK AND PLUG 2.5 or 3.5mm. 3/6 pr.

TV REMOTE CONTROL for Philips 19TG111A, 121A, 125A, 142A, 23TG111A, 113A, 121A, 131A, Cossor CT1910A, 21A, CT231CA, 21A, 81A, Stella ST1033A, 39A, 43A, 53A. Plug in with 11ft. 7-way cable, 3 DP switches, dual pot., volume and brightness. OA81 diode, etc. etc. List 3 gns. New boxed. OUR PRICE 12/6, post free.

Blank Aluminium Chassis, 18 s.w.g., 4 sides, riveted corners, lattice fixing holes, 2½in. sides, 7 x 4in., 5/6; 9 x 7in., 6/6; 11 x 7in., 7/6; 13 x 9in., 9/6; 14 x 11in., 12/6; 15 x 14in., 15/-; 11 x 3in., 6/6.
Panels 18 s.w.g. 12 x 12in., 5/6; 14 x 3in., 4/6; 12 x 8in., 3/6; 10 x 7in. 2/9; 6 x 6in., 2/-; 6 x 4in., 1/6.

RADIO COMPONENT SPECIALISTS

337 WHITEHORSE ROAD
WEST CROYDON Telephone THO 1665

Written guarantee with every purchase *(Export: Send remittance and postage, no C.O.D.)* Buses 133, 68 pass door. S.R. Stn. Selhurst

INCREASE YOUR KNOWLEDGE

ICS

RADIO • TELEVISION • ELECTRONIC ENGINEERING

MEMBER OF THE ASSOCIATION
OF BRITISH CORRESPONDENCE COLLEGES

CHOOSE THE RIGHT COURSE FROM:

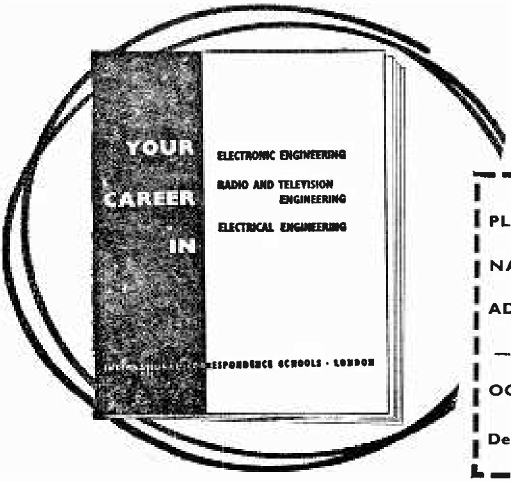
RADIO AND TELEVISION ENGINEERING, INDUSTRIAL TELEVISION, RADIO AND TELEVISION SERVICING, ELECTRONICS, COMPUTERS AND PROGRAMMING ELECTRONIC TECHNICIANS, SERVOMECHANISMS, TELEMETRY, COLOUR TV, INSTRUMENTATION, AND PRINCIPLES OF AUTOMATION.

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 RD, London SW11
3.66

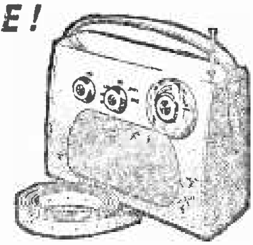
Why NOT BUILD ONE OF OUR PORTABLE TRANSISTOR RADIOS...

BACKED BY OUR SUPER AFTER SALES SERVICE

All components used in our receivers may be purchased separately if desired. Parts price lists and easy build plans available separately at prices stated. Overseas post 10/-.

FIRST FOR QUALITY, PERFORMANCE & PRICE!

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 4" 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)

MELODY SIX

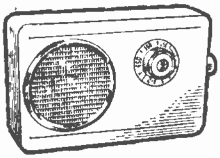
"... amazed at volume and performance ... has really come up to my expectations."
S.G. Stockton-on-Tees.

● **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 B.B.C. Home and Light, 208 and many Continental stations. Handsome leather-look pocket size case, only 6¾ x 3¼ x 1½in. approx. with gilt speaker grille and supplied with hand and shoulder straps.

Parts Price List and easy build plans 2/- (FREE with kit) Total cost of all parts now only **£3.9.6** P. & P. 3/6

New TRANSONA FIVE



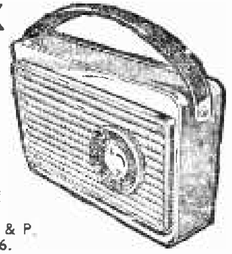
"Home, Light. A.F.N. Lux. all at good volume."
G.P. Durham.

● **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)*

TRANSONA SIX



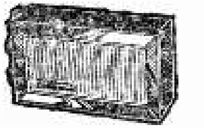
● **8 stages—6 transistors and 2 diodes**

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)

POCKET FIVE



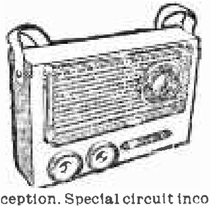
● **7 stages—5 transistors and 2 diodes**

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 case with red speaker grille. Size 5¼ x 1¼ x 3½in. (Uses 1289 battery available anywhere).

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

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

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 R.F. Stages, push-pull output. 3in. speaker (will drive large speaker). Size 7¼ x 5¼ 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)*

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. Tuneable 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 7¼ x 5¼ x 1½in. Carrying strap 1/6 extra.

★ EXTRA BAND FOR EASIER TUNING OF LUX, ETC.

Parts Price List and easy build plans 2/- (FREE with kit) Total cost of all parts now only **£3.19.6** P. & P 3/6

RADIO EXCHANGE CO

61, HIGH STREET, BEDFORD
Telephone: Bedford 52367

Callers side entrance Barratts Shoe Shop open 9-5 p.m. Sats 10-12.30 p.m.

R.S.C.
(MANCHESTER) 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 2/9 extra under £2. 4/6 extra under £5. Trade Supplied. S.A.E. with all enquiries please.

Personal shoppers welcome at any branches below. Open all day Saturday.

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

BRISTOL 14 Lower Castle Street (Half-day Wednesday) Tel.: 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

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

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

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

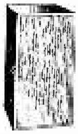
ARMSTRONG, TRUVOX, LEAK, QUAD, ROGERS, LINEAR, W.B., FANE, WHARFEDALE, GOODMANS, GARRARD, GOLDRING, GRAMPIAN, LUSTRAPHONE, SHURE, RESLO, TANDBERG, FERROGRAPH Products stocked. Usual credit terms available.

INTRODUCING A NEW RANGE OF HIGH FIDELITY LOUDSPEAKER UNITS

AUDIOTRINE 'PETITE' MINIATURE

Size only 10½ x 5¼ x 7¼in. Rating 8 watts. Frequency range 45-20,000 c.p.s. Cabinet beautifully finished in Teak (light) or Walnut (medium). Fitted specially designed Heavy cast 5in. speaker with large pole pieces, extra long voice coil and rubber surround. Impedance 3 ohms or 15 ohms.

Or Deposit 27/- and 9 monthly payments of 17/10 (Total £9.7.6). **8 Gns.** Carr. 7/6



The AUDIOTRINE MINI-TEN

Size only 11¼in. High, 6in. Wide, 7½in. Deep. Rating 10 watts. Impedance 15 ohms. De luxe Teak or Walnut finished cabinet acoustically lined Heavy cast 5in. Bass speaker with extra high flux density ceramic magnet and rubber surround giving low fundamental resonance. Choke/Capacity Cross-over and Tweeter. Really astounding performance. Frequency range 45-20,000 c.p.s.

Or Deposit £2 and 9 monthly payments 27/9 (Total £14.9.0) **12½ Gns.** Carr. 8/6

The GLOUCESTER

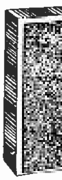
Handsome "slimline" cabinet, acoustically lined. Size 24in. High, 20in. Wide, 6¼in. deep. Finished light teak or medium walnut. 12in. high flux 12,000 line speaker. Cross-over unit and Tweeter. Rating 10 watts. Smooth response 40-20,000 c.p.s. Impedance 15 ohms.

Or Deposit 36/- and 9 monthly payments 24/8 (Total £12.18.0). **11 Gns.** Carr. 15/-

The DORCHESTER

Attractive cabinet in luxurious Teak or Walnut finish. Acoustically lined. Size 24in. High, 15in. Wide, 6¼in. deep. Incorporating specially designed 10in. Heavy cast speaker with massive 2in. pole pieces and dial cone with rubber surround. Frequency response 20-20,000 c.p.s. Rating 15 watts. Impedance 15 ohms.

Or Deposit 48/- and 9 monthly payments 33/- (Total £17.7.3). **15 Gns.** Carr. 15/-



The BRONTE

Handsome cabinet of modern styling. Acoustically lined and finished Teak or Walnut. Size 22in. High, 15in. Wide, 6¼in. Deep. 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 26/10 (Total £14.0.6). **12 Gns.** Carr. 15/-

The STANWAY

Attractive contemporary styled cabinet finished Teak (light) or Walnut (medium). Acoustically lined. Size 24in. High, 20in. Wide, 6¼in. Deep. Fitted 12in. high flux Bass speaker with rubber surround giving extremely low fundamental resonance and high sensitivity. The smooth frequency response 20-20,000 c.p.s. is achieved by addition of high flux tweeter and choke/capacity cross-over system. Rating 20 watts. Impedance 15 ohms.

Or Deposit 3 gns. and 12 monthly payments 32/6 (Total £22.13.0). **19½ Gns.** Carr. 17/6

FANE HEAVY DUTY HI-FI SPEAKERS
12" 20 watt. Type 122/10. Post 5/6. Only 5 Gns.

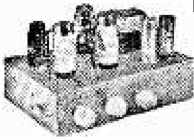
TWEETERS R.A. 3 ohm **25/9** 15 ohm **25/9**

SCOOP PURCHASE OF HIGH QUALITY RECORD CHANGERS Carr. 5/6

Brand new Garrard 3000 LM. Very latest model. Normal Retail price approx. £12.15.0. Heavy Turntable, Sonotone Low Mass Stereo/Mono cartridge. Fully guaranteed. **10 Gns.**

AUDIOTRINE HF100D 10in.

15 Watt HI-FI Loudspeakers
Heavy cast construction. Dual cone. Smooth frequency response 20-20,000 c.p.s. Speech coil 3 or 15 ohm. Exceptional value at **£5.15.0** Carr. 5/9



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. H.T. of 300v. 25mA and L.T. of 6.3v. 1.5a. available for supply of Radio Tuner or Tape Deck pre-amp. For A.C. mains 200-250v. Speaker output 3 ohms. Kit is complete in every detail with fully punched Hammer finished chassis, point-to-point wiring diagrams and instructions. Exceptional value **£4.15.0** **or assembled ready for use 25/- extra, plus 3/6 carr., deposit 22/6 and 5 monthly payments of 22/6 (total £6.15.0) for assembled unit.**

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

FULLY TRANSISTORISED 200/250v. A.C. Mains Operation.
OUTPUT 10 WATTS R.M.S. into 15 ohms.
OUTPUT 15 WATTS R.M.S. 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: 20-20,000 c.p.s.
TREBLE CONTROL: +15dB to —14dB at 10 Kc/s.
BASS CONTROL: +12dB to —15dB at 50 c/s.
HARMONIC DISTORTION at 10 Watts R.M.S. 1,000 c.p.s. 0.35%. **HUM LEVEL:** —75dB.
NEGATIVE FEEDBACK: 52dB.

Complete Kit of parts with full constructional details and point to point wiring diagrams. If preferred printed circuit can be supplied with parts soldered in and tested for 21/- extra. **9½ GNS.** Carr. 10/-

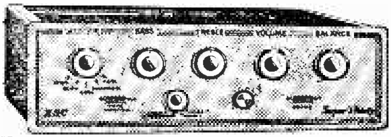
Attractive Walnut or Teak finished cover **6 Gns.** or Deposit **19/-** and 9 monthly payments **13/2**. Total **£6.17.6.** Or unit factory built and tested, complete with Cover and with our usual 12 months guarantee. **19½ GNS.** Carr. 12/6

Or Deposit **£3.2.0** and 9 monthly payments **43/3**. Total **£22.11.3.**

ALL COMPONENTS ETC. ARE OF A HIGH STANDARD AND SUPPLIED BY LEADING BRITISH MANUFACTURERS.

Send S.A.E for leaflet.

WE PROUDLY INTRODUCE TWO COMPLETELY NEW UNITS WITH TECHNICAL SPECIFICATIONS COMPARING MORE THAN FAVOURABLY WITH SIMILAR AMPLIFIERS AT 2-3 TIMES THE COST.



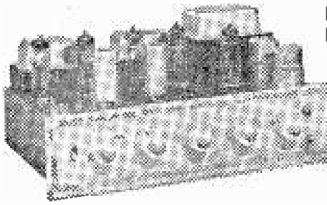
IMPORTANT NOTE. Rated output figures are given in R.M.S. and not speech and music or I.H.F.M., otherwise we could obviously quote much higher outputs.

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. 12" Wide, 3" High and 8" Deep.
Attractive Facia Plate and Matching Knobs. Neon Panel Indicator.
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 REGARDLESS OF THE COST. 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. If required printed circuits can be supplied with appropriate components assembled, soldered and tested for 2 Gns. extra. **18 GNS.** Carr. 12/6

Terms: Deposit **6 gns.** & 9 mthly payments **36/6** Total **£22.14.6.** Attractive Walnut or Teak finished cover **6 gns.** or Deposit **19/-** & 9 mthly payments **13/2** Total **£6.17.6.** Or unit completely assembled ready for use fitted cover as above. Or Deposit **£4.12.0** & 12 mthly p'ments **48/-**. Total **£33.8.0** **29 GNS.** Carr. 15/-

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



Based on a current Mullard design and employing valves ECC83, ECC83, ECL86, ECL86, ECL86, ECL86, EZ81. Send S.A.E. for leaflet.

FREQUENCY RESPONSE ±2dB. 30-20,000 c.p.s.
HUM LEVEL 65dB down.
SENSITIVITY: 5 millivolts maximum.
HARMONIC DISTORTION (each channel) 0.2%.

PROVIDING 10/14 WATT ULTRA LINEAR PUSH-PULL OUTPUT ON EACH CHANNEL

SUITABLE for "MIKE", GRAM, RADIO or TAPE.

- ★ Four-position tone compensation and Input Selector switch.
- ★ Will amplify direct from Tape Heads.
- ★ Stereo/Mono switch so that peak monaural output of 28 watts can be obtained.
- ★ Separate Bass "Lift" and "Cut" and treble "Lift" and "Cut" controls.
- ★ Neon panel indicator.
- ★ Handsome Perspex Frontplate.

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. **13 Gns.** Carr. 12/6. or Factory assembled, tested and supplied with our usual 12 months guarantee for **18 GNS.** Carr. 12/6 or DEPOSIT 57/- and 9 monthly payments of 39/10 (Total £20.15.6).

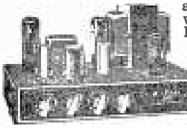
AUDIOTRINE HI-FI TAPE RECORDER KIT

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 negative feedback equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a Handsome Portable Carrying Cabinet of latest styling and finished dark grey leathercloth. Size 14½ x 17 x 8½in. high and circuit. Total cost if purchased individually approximately £35. Performance equal to units in the £50-£60 class. S.A.E. for leaflets. **TERMS: Deposit 4 gns.** and 12 monthly payments of 42/-. (Total 28 gns.). 4 Track Model 3 gns. extra.

25½ Gns. Carr. 18/6

R.S.C. A10 30 WATT ULTRA LINEAR HIGH FIDELITY AMPLIFIER



A highly sensitive Push-Pull high output unit with self-contained Pre-amp./Tone Control Stages. Performance figures compare equally with most expensive amplifiers available. Hum level —70dB. Frequency response ±3dB 30-20,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All first grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Minimum input required for full output 12 millivolts so that **any kind of Microphone or Pick-up is suitable.** The unit is designed for **Clubs, Schools, Theatres, Dance Halls** or **Outdoor Functions,** etc. For use with Electronic **Organ, Guitar, String Bass,** etc. Gram, Radio or Tape. **Output Socket provides** 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. Output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point to point wiring diagrams and instructions. **12 Gns.** Carr. 10/- 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 33/3 (Total £17.7.3).**

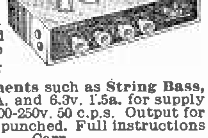
INTEREST CHARGES REFUNDED

on H.P. and CREDIT SALE Accounts settled in 6 months.

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 Collaro Tape Deck and Hi-Fi amplifier, suitable almost any Tape Deck. S.A.E. for leaflet. **9½ Gns.**

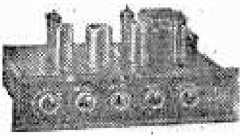
HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

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 "Lift" and "Cut". Frequency response ±3dB 30-20,000 c/s. Six negative feedback loops. Hum level —60dB. SENSITIVITY 23 millivolts. Suitable for Crystal or Ceramic P.U.s, all types "mikes" Comparable with the very best designs. For **Musical Instruments** such as **String Bass, Electronic Guitars,** etc. **Output Socket** provides 300v. 30mA, and 6.3v. 1.5a. for supply **of a Radio Tuner.** Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit complete to last nut. Chassis fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/-
(Or factory built 51/6 extra).
Metal covers with 2 carrying handles can be supplied for £1. **TERMS ON ASSEMBLED UNITS: Deposit 33/3** and 9 monthly payments of **24/1** (**Total £12.10.0**). Send S.A.E. for illustrated leaflet detailing Cabinets, Speakers, Mikes, etc.

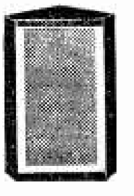
R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER



A complete set of parts for the construction of a stereo amplifier 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 Control give equal variation of "lift" and "cut". 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. Full constructional details and price list 2/6. **8 Gns.** Carr. 10/-

Or supplied factory assembled with 12 months' guarantee for £11.7.6. Terms: Deposit 2 gns. and 9 monthly payments of 24/2 (Total £12.19.6).

AUDIOTRINE CORNER CONSOLE CABINETS



Strongly made. Beautiful polished walnut veneered finish. Pleasing design. **JUNIOR MODEL.** For up to 8in. speaker. Approx. 20 x 11 x 8in. Carr. 5/6 **49/9**
STANDARD MODEL. To take up to 10in. speaker. Size 27 x 18 x 18in. **5 Gns.** Carr. 7/6.
SENIOR MODEL To take up to 12in. speaker and with Tweeter cut-out. Size approx. 30 x 30 x 15in. (Recommended for use with Audiotrine speaker system.) Terms available. Carr. 8/6. **8 Gns.**

AUDIOTRINE HI-FI LOUDSPEAKER ENCLOSURES

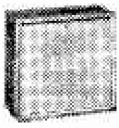
All types of pleasing modern "slimline" design acoustically lined in alternative finishes of light teak or medium walnut.

SE8 Designed for optimum performance with any Hi-Fi 8in. speaker. Size 22in. high, 15in. wide. 6in. deep. **£5.15.0** Or Deposit 18/- and 9 monthly payments 12/3 (Total £6.8.3). Carr. 7/6

SE10 For 10in. High Fidelity Speaker with provision for tweeter. Especially recommended for use with Audiotrine HF100D speaker. Size 24in. high. 15in. wide, 6½in. deep. **£6.19.9** Or deposit 21/- and 9 monthly payments 15/- (Total £7.16.0) Carr. 10/-.

SE12 For outstanding performance with any 12in. Hi-Fi speaker but especially suitable for types with low fundamental resonance. A tweeter cut-out is provided. Size 24 x 20 x 6½in. approx. Or Deposit 27/- and 9 monthly payments 17/10 (Total £9.7.6) Carr. 10/-. ONLY **8 Gns**

12in. HIGH QUALITY LOUDSPEAKERS

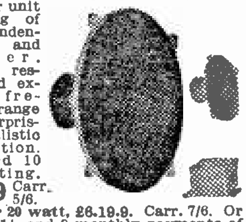


In walnut veneered cabinet.
10 WATT MODEL. Gauss 12,000 lines. Speech coil 3 or 15 ohms. Carr. 5/6 **£4.19.6**
Terms: Deposit 15/- and 9 monthly payments of 10/10 (Total £5.12.6)
20 WATT MODEL. 15 ohm. Size 18 x 18 x 10in. Terms: Deposit 24/6 and 9 monthly payments of 17/- (Total £8.17.6). Carr. 8/6. **£7.19.6**
30 WATT MODEL. 15 ohms. Carr. 10/- or Deposit 35/- and 9 monthly payments of 22/- (Total £11.18.0). **10 Gns.**
Any of above in extra heavy Rexine covered Cabinets, £1 extra.

W.B. "STENTORIAN" HIGH FIDELITY P.M. SPEAKERS HF1012. 10 watts rating. Where a really good quality speaker at a low price is required we highly recommend this unit with an amazing performance. Please state whether 3 or 15 ohms required. **£4.19.9**

R.S.C. JUNIOR BASS REFLEX CABINET. Designed for above speaker but suitable for any good quality 8in. or 10in. speaker. Acoustically lined and ported. Medium Walnut veneer finish. Size 18 x 12 x 10in. Strongly made. Handsome appearance. Superb reproduction. Carr. 5/-. **£4.7.6**

AUDIOTRINE HI-FI SPEAKER SYSTEMS Consisting of matched 12in. 12,000 line, 15 ohm high quality speaker; cross-over unit (consisting of choke, condenser, etc.) and Tweeter. Smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating. **£4.19.9** Carr. 5/6.



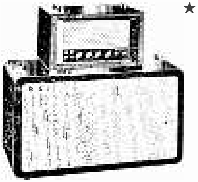
Or Senior 20 watt, £6.19.9. Carr. 7/6. Or Deposit 21/- and 9 monthly payments of 15/- (Total £7.16.0).

R.S.C. BABY ALARM or INTERCOMM KIT. Parts with diagrams, etc. In two polished walnut finished cabinets of pleasing design. High sensitivity. For 200-250v. A.C. mains. Fully isolated. Controllable at both units. A unit of this class would normally cost £20-£30. Only 89/6, carr. 5/-, Ready for use. 6 gns.

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".

★ Separate cabinets fully covered in contrasting tones of Rexine/Vynair with gold trimming for speakers and amplifiers.

★ Separate Bass and Treble Controls.

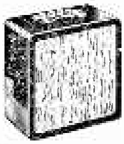
Send S.A.E for leaflet. Or call at one of our many branches and compare the Bass-Regent with units at more than three times the cost.

49 GNS. Carr. 25/- Or deposit **£7.16.0** and 12 monthly payments of **81/6** (Total **54 gns.**).

R.S.C. B20 MULTI-PURPOSE AMP. 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. Carr. 17/6 **29½ Gns.**
Or deposit **£4.14.6** and 12 monthly payments of **49/-** (Total **32¼ gns.**).

R.S.C. 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 approx. 18in. x 18in. x 8in. ONLY **19½ Gns.** Or Deposit **3 gns.** and 12 monthly payments of **32/6** (Total **£22.13.0**) Carr. 12/6
S.A.E. for leaflet.

JASON FMTI. VHF/FM Radio Tuner design. All parts inc. valves, tuning dial, escutcheon, etc. **£6.19.6**

TANNOY RE-ENTRANT LOUDSPEAKERS. For outdoor or factory use, 8 ohms, 8 watts. **27/6** Carr 4/6

TRANSISTORISED SOUND MIXER

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

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

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

MIDGET Clamped Type 2¼ x 2¼ x 2½in.	
250v. 60mA, 6.3v. 2a	13/9
250-0-250v. 60mA. 6.3v. 2a..	14/9
TOP SHROUDED DROP THROUGH	
250-0-250v. 70mA, 6.3v. 2a, 0-5-6.3v. 2a	17/9
350-0-350v. 80mA, 6.3v. 2a, 0-5-6.3v. 2a	21/9
250-0-250v. 100mA, 6.3v. 2a, 6.3v. 1a ..	21/9
250-0-250v. 100mA, 6.3v. 3.5a, C.T. ..	19/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	28/9
300-0-300v, 130mA, 6.3v. 4a, 6.3v. 1a, for Mullard 510 Amplifier	35/9
300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	28/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	28/9
350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a	37/9
FULLY SHROUDED UPRIGHT	
250-0-250v. 60mA, 6.3v. 2a, 0-5-6.3v. 2a Midget type 2½ x 3 x 3in.	18/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	29/9
300-0-300v. 100mA, 6.3v. 4a, 5.v 3a ..	29/9
300-0-300v. 130mA, 6.3v. 4a, C.T. 6.3v. 1a, for Mullard Amplifier	36/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	29/9
350-0-350v. 150mA, 6.3v. 4a. 0-5-6.3v. 3a	38/9
425-0-425v. 200mA. 6.3v. 4a, C.T. 5v. 3a	57/9
425-0-425v. 200mA (6.3v. 4a Twice), 5v. 3a	59/9
450-0-450v. 250mA, 6.3v. 4a, C.T. 5v. 3a	69/9

FILAMENT TRANSFORMERS
200-250v. 50 c/s primaries 6.3v. 1.5a, **6/6**; 6.3v. 2a, **7/6**; 12v. 1a, **7/11**; 6/3v. 3a, **8/11**; 6.3v. 6a, **17/6**; 12v. 1.5a twice, **17/6**.

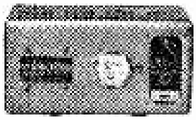
OUTPUT TRANSFORMERS	
Standard Pentode 5,000Ω to 3Ω ..	6/6
Standard Pentode 7,000Ω to 3Ω ..	6/6
Push-Pull 8 watts, EL84, or 6V6 to 3Ω or matched to 15Ω	9/9
Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5-8 to 15Ω	19/9
Following types for 3 and 15Ω speakers:	
Push-Pull 10-12 watts, 6V6 or EL84 ..	18/9
Push-Pull 15-18 watts, 6L6, KT66 ..	22/9
Push-Pull Mullard 510 Ultra Linear ..	29/9
Push-Pull 20 watts, sectionally wound 6L, KT66, EL34 etc.	49/9
SMOOTHING CHOKES	
60mA, 10H 400Ω **4/11.** 100mA, 10H, 220Ω	8/9
80mA, 10H 350Ω **5/9.** 150mA, 10H, 250Ω	11/9

CHARGER TRANSFORMERS
All with 200-240-250 v. 50 /cs Primaries: 0-9-15v. 1½a, **12/9**; 0-9-15v. 2a, **14/9**; 0-9-15v. 3a, **16/9**; 0-9-15v. 5a, **19/9**; 0-9-15v. 6a, **23/9**; 0-9-15v. 8a. **28/9.**

AUTO (Step up/Step down) TRANS. 0-110/120-230/250v. 50-80 watts, **13/9**; 150 watts **27/9**; 250 watts, **49/9**; 500 watts, **99/9.**

R.S.C. BATTERY CHARGING EQUIPMENT Guaranteed 12 months

All for A.C. Mains 200-250 v. 50 c/s



Assembled 4 amps 6/12v. Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12v. charging. Louvred steel case with stoved grey hammer finish. Fused and ready for use with mains and output leads and clips. **59/9** Or Deposit **12/-** and 5 monthly payments **12/-** Total **£3.12.0.** Carr. 4/6

Heavy Duty Charger Kit
6/12v. 6 amps., variable output. Consists of Main Transformer 0-200-230-250v.; FW (Bridge) Selenium Rectifier; Ammeter, Variable Charge Rate Selector Panels, Plugs, Fuses, Fuseholder and circuit. Carr. 5/6
PRICE 59/9

BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge. Metal Rectifier, well ventilated steel case. Fuses. Fuse-holders. Grommets, panels, Heavy Duty Clips, circuit. Carr. 3/6

6v. or 12v. 1 amp........	22/9
As above with ammeter	28/9
6v. or 12v. 2 amps......	25/9
6v. or 12v 2 amps, inclusive of ammeter........	35/9
6v. or 12v. 4 amps with Ammeter and variable charge rate selector....	52/9

CHARGER AMMETERS
0-1.5a., 0-4a., 0-7a., **8/9** each.

EX GOVT. SELENIUM RECTIFIERS 12v 15 AMP (BRIDGE) F.W. ONLY 19/9

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 39/9. Carr. 3/9

R.S.C. 4 WATT GRAM. AMPLIFIER KIT. Complete set of parts to build a good quality compact unit suitable for use with any record playing unit. Mains isolated chassis, separate Bass and Treble controls. Output for 2-3 ohm speaker. For 200-250v. A.C. **59/9**

HI-FI 12 WATT AMPLIFIERS

BRAND NEW Carr. 7/6
EX-GUITAR AMPLIFIERS **£7.19.9**

Manufacturers' discontinued Model. Push pull output. Latest high efficiency valves. Dual separately controlled Inputs for 'Mike' and gram. Separate Bass and Treble Controls. High Sensitivity. Output for 3 or 15 ohms speaker. Guaranteed tested and in perfect working order

TRANSISTOR SALE

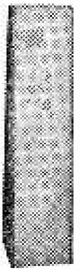
Mullard OC71 **2/11** OC45 **3/11**, OC44 **3/11**, OC72 **2/11**, OC81 **2/11**. OC171 **8/9**; AF117 **6/9**. Ediswan XA101 **3/9**, XA112 **3/9**, XC101A **3/9.** Postage 6d. for up to 3 transistors.

INTEREST CHARGES REFUNDED ON H.P. ACCOUNTS SETTLED IN 6 MONTHS

R.S.C. (MANCHESTER) LTD

Addresses Page 927

R.S.C. COLUMN SPEAKERS



Covered in two-tone Rexine/Vynair. Ideal for vocalists and Public Address. Normally supplied for 15 ohm matching but can be supplied for 100v. line for 35/- extra.

Type C58, 15-20 watts. Fitted five 8in. high flux speakers. Overall size approx. 42 x 10 x 5in. **12½ Gns.** Carr. 10/- Or deposit £2 and 9 monthly payments of **27/9** (**Total £14.9.9**).

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 of **3 gns.** and 9 mthly pymts of **43/2** (**Total 21¼ gns.**).

30 WATT HI-FI AMPLIFIER

For LEAD, RHYTHM, BASS GUITAR and for VOCAL or INSTRUMENTAL GROUPS

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 fascia plate. For 200-250v. A.C. mains. Output for 3 or 15 ohm speakers.
Carr. 12/6 Send S.A.E. for leaflet.
17 Gns. or Deposit **£3** and 9 monthly payments of **37/- (Total £19.13.0).**

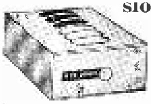
SELENIUM RECTIFIERS F.W.(BRIDGED)

6/12v. 1a, **3/11**; 6/12v. 3a, **9/9**; 6/12v. 6a, **15/3**; 6/12v. 2a, **6/11**; 6/12v. 4a, **12/3**; 6/12v. 10a, **26/9**

COMPLETE POWER PACK KIT

Consisting of Mains Trans., Metal Rectifier, Electrolytics, smoothing choke, chassis and circuit. 200/250v. A.C. mains. Output 250v. 60 mA, 6.3v. 2a. **19/11**

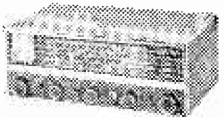
R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI.



An all-dry battery eliminator. Size 5¼ x 4¼x2in. approx. Completely replaces batteries supply 1.4v. and 90v. where A.C. mains 200/250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram **39/9** or ready for use **49/9.**

COMMUNICATION RECEIVERS

RX 60 DE LUXE 4 BAND



220/240v. 50/60 c.p.s. A.C. mains operation. Frequencies covered 1600 Kc/s to 30 Mc/s continuous. Incorporates 5in. speaker. Slide rule tuning dial 'S' meter. Internal ferrite aerial 58in. 10 section for short waves. Fitted sockets for optional outdoor aerial. Headphones, external speaker socket. Other features are electrical bandspread tuning. Noise limiter, A.V.C., B.F.O., stand-by switch. Size approx. 12¼ x 5¼ x 8¾in. Handsome crackle finished metal cabinet. Brand new with full instructions manual. Usual guarantee. **19 Gns.** Or Deposit **£5** and 9 monthly pymts **37/8** (Total **£21.19.0**). Carr. 10/-

18in. 60 WATT EXTRA HEAVY DUTY LOUDSPEAKERS

Famous make. Normal price over £25. Very limited number to clear with full guarantee. Terms available. Carr. 15/- **17 Gns.**

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. **4 Gns.**

BENTLEY ACOUSTIC CORPORATION LTD.

Suppliers to H.M. Government. 38 CHALCOT ROAD, LONDON, N.W.1 Telephone: PRIMROSE 9090

NEAREST UNDERGROUND: CHALK FARM. ALL GOODS LISTED BELOW ACTUALLY IN STOCK, ALL GOODS ARE NEW, BEST QUALITY BRANDS ONLY, AND SUBJECT TO MAKERS' FULL GUARANTEE, PLEASE NOTE THAT WE DO NOT SELL ITEMS FROM USED EQUIPMENT NOR MANUFACTURERS' SECONDS & REJECTS, WHICH ARE OFTEN DESCRIBED AS "NEW AND TESTED" BUT HAVE A SHORT AND UNRELIABLE LIFE.

OA2	5/9
OB2	6/-
OZ4GT	4/3
1A3	2/6
1A4	12/6
1A5	5/-
1A7GT	7/6
1C1	4/-
1C2	8/-
1C3	6/6
1C5	5/-
1C6	10/6
1D5	6/6
1D6	9/6
1FD1	6/-
1FD9	3/3
1G6	6/-
1H5GT	7/6
1L4	2/3
1LA4	17/6
1LA6	16/10
1LD5	4/-
1LN5	4/6
1N5GT	8/6
1P1	6/6
1P10	4/9
1P11	5/-
1R5	4/-
1S4	5/-
1S5	3/3
1T2	29/-
1T4	2/3
1U4	5/6
1U5	5/3
2A7	12/6
2C26	2/9
2D13C	7/-
2D21	5/-
2X2	3/-
3A4	3/9
3A5	6/9
3B7	5/-
3D6	3/9
3Q4	5/3
3Q5GT	6/9
3S4	4/9
3V4	5/-
4D1	3/9
5R4GY	8/6
5T4	7/-
5U4G	4/9
5V4G	8/-
5Y3GT	4/9
5Z3	6/6
5Z4	7/6
6/30L2	8/9
6A6G	3/9
6A8G	5/9
6AC7	3/-
6AG5	2/6
6AG7	5/9
6AJ5	8/6
6AK5	4/9
6AK6	6/-
6AK8	5/9
6AL5	2/3
6AM4	16/6
6AM5	2/6
6AM6	3/-
6AQ5	5/9
6AB6	20/-
6AT6	3/6
6AU6	5/9
6AV6	5/6
6B5G	12/6
6B8G	2/6
6BA6	4/6
6BE6	4/3
6BH6	5/3
6BJ6	5/6
6BQ5	4/6
6BQ7A	7/6
6BR7	8/3
6BR8	8/-
6BS7	25/-
6BW6	7/6
6BW7	5/-
6BX6	4/3
6C4	2/3
6C5	4/-
6C6	3/-
6C8	3/-
6C9	10/9
6C10	8/-
6C12	5/9
6CD6G	18/-
6CD7	9/6
6CH6	6/6
6CW4	24/-
6D1	1/6
6D3	9/6
6D6	3/-
6E5	9/6
6F1	9/6
6F6G	3/9
6F6GT	7/6
6F7	5/-
6F8	5/-
6F12	3/-
6F13	3/9
6F14	23/3
6F15	6/9
6F16	6/6
6F17	12/6
6F18	13/5
6F23	9/3
6F24	10/6
6F32	3/-
6F33	3/6
6G6	2/6
6H6	1/6
6J5G	3/9
6J5GT	4/3
6J6	3/-
6J7G	4/6
6J7GT	7/-
6K6GT	5/6
6K7G	1/3
6K7GT	4/9
6K8G	3/3
6K8GTM	8/6
6K25	24/-
6L1	10/-
6L5G	12/6
6L6GT	7/3
6L7GTM	5/6
6L18	10/-
6L19	19/-
6LD3	6/6
6LD13	6/3
6LD20	6/6
6N7GT	7/-
6P1	9/3
6P25	6/6
6P26	9/-
6P28	11/6
6Q7G	4/3
6Q7GT	7/9
6R7G	5/3
6R7GT	11/-
6SA7	7/-
6SC7	4/9
6SG7	7/9
6SG7GT	4/9
6SH7	3/-
6SJ7GT	4/6
6SK7GT	4/6
6SL7GT	4/9
6SN7GT	4/6
6SQ7	5/-
6ST7	12/6
6SS7	2/-
6U4GT	8/6
6U5G	5/-
6U7G	7/-
6V6G	8/6
6V6GT	5/6
6X4	3/9
6X5	5/3
6Y7G	12/6
6Z5G	15/-
7A7	12/6
7AN7	5/6
7B6	12/6
7B7	9/6
7C5	8/-
7C6	6/9
7C7	5/-
7D3	15/-
7D5	14/6
7F7	7/-
7H7	5/9
7R7	12/6
7V7	5/-
7Y4	5/-
8D2	2/6
9BW6	9/6
9D2	3/-
9D7	7/6
10C1	9/9
10C2	12/-
10D1	7/-
10D2	11/8
10F1	10/-
10F9	9/9
10F18	9/9
10LD3	6/3
10LD11	9/6
10P13	12/-
10P14	11/6
11D3	17/6
11D5	17/6
11E3	17/-
12A6	2/3
12A8GT	16/6
12AC6	8/6
12AD6	9/6
12AE6	8/-
12AH7	5/-
12AH8	10/9
12AT6	4/6
12AT7	3/6
12AU6	5/9
12AU7	4/6
12AV6	5/9
12AX7	4/6
12AY7	9/9
12BA6	5/3
12BE6	4/9
12BH7	6/-
12E1	16/9
12H6GT	1/6
12J5GT	2/6
12J7GT	7/3
12K5	10/-
12K7GT	3/6
12K8GT	8/6
12Q7GT	3/6
12SA7GT	6/9
12SC7	4/-
12SG7	3/-
12SH7	3/-
12SJ7	5/-
12SK7	3/-
12SQ7	8/-
12SR7	5/-
12U5G	7/-
12Y4	2/-
13D1	5/-
13D3	9/-
14H7	9/6
14S7	34/11
18	12/6
19	10/6
19AQ5	7/3
19BG6G	20/5
19H1	6/-
20D1	10/-
20D2	21/-
20F2	11/6
20L1	14/-
20P1	12/6
20P3	12/-
20P4	13/-
20P5	11/6
25A6G	7/6
25L6	4/9
25U4GT	14/7
25Y5	7/9
25Y5G	7/9
25Z4G	6/6
25Z5	7/3
25Z6GT	8/-
28D7	6/9
30C1	/6
30C15	10/-
30C17	11/9
30C18	9/3
30F5	7/3
30FL1	9/3
30FL14	11/-
30L1	5/6
30L15	10/3
30L17	11/6
30P4	12/-
30P12	7/6
30P16	5/3
30P19	12/-
30PL1	9/6
30PL13	10/6
30PL14	11/3
30PL15	9/6
35/51	12/6
35A5	20/9
35L6GT	6/-
35W4	4/6
35Z3	16/2
35Z4GT	4/6
35Z5GT	5/9
40SUA	6/6
41MTL	8/-
41STH	10/-
42	5/-
43	10/-
45	17/6
45Z6GT	15/-
50A5	21/10
50B5	6/6
50C5	6/6
50CD6G	40/9
50L6GT	6/-
52KU	14/6
53KU	14/6
72	6/6
77	5/-
78	4/9
80	5/3
83V	8/-
85A2	6/6
90AG	67/6
90AV	67/6
90CG	42/-
90CV	42/-
90C1	16/-
150B2	16/6
150C2	5/9
161	15/-
185BT	34/11
215SG	6/6
220B	10/6
301	20/-
302	15/-
303	15/-
305	1./6
306	13/-
807	11/9
956	2/-
1203A	7/-
1622	12/6
2101	12/6
4033	15/-
4687	71/-
5763	7/6
6067	10/-
7193	1/6
7475	2/9
9002	4/6
9006	2/6
A1834	20/-
ACO44	9/-
AC2HL	10/6
AC2PEN	11/6
AC2PEN/DD	12/6
AC5PEN/DD	23/3
AC6PEN	4/9
AC/PEN (5)	17/6
AC/PEN (7)	17/-
AC/SG	22/6
AC/SG/VM	12/-
AC/TH1	10/-
AC/TP	18/-
AC/VP1	12/-
AC/VP2	12/-
ATP4	2/3
AZ1	8/6
AZ31	9/6
AZ41	6/6
B36	4/9
B349	10/3
B719	5/9
BL63	10/6
C1	12/6
CK506	6/6
CL4	19/6
CL33	11/6
CV6	2/6
CV63	10/6
CV271	12/6
CV428	19/-
CY1	16/4
CY1C	./6
CY31	5/9
D1	1/3
D15	13/6
D42	10/6
D63	5/-
D77	2/3
DAC32	7/6
DAF91	3/3
DAF96	6/-
DCC90	6/9
DD4	12/6
DD41	10/6
DDT4	7/6
DET25	7/6
DF33	8/6
DF66	15/-
DF72	30/-
DF91	2/3
DF96	6/-
DF97	10/-
DH30	15/6
DH63	4/3
DH76	3/6
DH77	3/6
DH81	23/3
DH101	25/-
DH107	16/11
DH719	5/9
DK32	7/6
DK40	15/6
DK91	4/-
DK92	8/-
DK96	6/6
DL33	6/9
DL35	5/-
DL63	5/3
DL72	15/-
DL75	30/-
DL92	4/9
DL94	5/-
DL96	6/6
DL810	10/6
DM70	5/-
DM71	9/9
DW4/350	8/6
DW4/500	8/6
DY86	6/6
DY87	7/6
E80F	24/-
E83F	24/-
E88CC	13/6
E180F	19/6
E1148	1/9
EA50	1/6
EA76	6/9
EABC80	5/9
EAC91	3/3
EAF42	7/9
EB34	1/-
EB41	4/9
EB91	2/3
EBC3	20/6
EBC33	6/-
EBC41	6/6
EBC81	6/3
EBC90	3/6
EBC91	5/6
EBF80	5/9
EBF83	7/3
EBF89	5/9
EBL21	10/3
EC52	4/3
EC53	12/6
EC54	6/-
EC70	4/9
EC90	2/3
EC91	4/-
EC92	6/6
ECC31	7/3
ECC32	4/6
ECC33	29/1
ECC34	21/7
ECC35	4/9
ECC40	7/-
ECC81	3/6
ECC82	4/6
ECC83	4/6
ECC84	5/6
ECC85	5/9
ECC88	8/9
ECC189	11/6
ECC804	8/9
ECC807	15/-
ECF80	7/3
ECF82	6/3
ECF86	10/-
ECF804	24/-
ECH3	23/3
ECH21	10/-
ECH33	22/8
ECH35	6/-
ECH42	8/-
ECH81	5/9
ECH83	6/6
ECH84	9/6
ECL80	5/9
ECL82	6/6
ECL83	10/-
ECL86	8/-
EF6	20/6
EF9	20/6
EF22	6/6
EF36	3/6
EF37A	7/-
EF39	5/-
EF40	8/9
EF41	6/6
EF42	3/9
EF50	2/6
EF54	3/-
EF73	5/-
EF80	4/3
EF83	9/9
EF85	4/6
EF86	6/6
EF89	4/3
EF91	3/-
EF92	2/6
EF97	10/-
EF98	9/9
EF183	7/3
EF184	6/6
EH90	9/6
EK32	5/9
EL32	3/6
EL33	6/6
EL34	9/9
EL35	10/-
EL36	8/9
EL37	12/3
EL41	7/-
EL42	7/9
EL81	8/3
EL83	6/9
EL84	4/6
EL85	7/6
EL86	7/3
EL91	2/6
EL95	5/-
EL360	27/-
EL820	16/4
EL822	22/6
ELL80	13/6
EM4	17/9
EM34	11/6
EM35	12/-
EM71	15/6
EM80	6/3
EM81	7/-
EM84	6/-
EM85	8/9
EM87	7/6
EN31	10/-
EN91	5/6
EY51	5/6
EY81	7/3
EY83	9/3
EY84	9/6
EY86	5/C
EY88	8/9
EY91	3/-
EZ35	5/3
EZ40	5/6
EZ41	6/3
EZ80	3/9
EZ81	4/3
EZ90	3/9
FC2	14/6
FC4	8/9
FC13	14/6
FC13C	17/-
FW4/500	6/6
FW4/800	8/6
GT1C	9/9
GU50	55/-
GZ30	7/
GZ32	8/-
GZ33	14/6
GZ34	10/-
GZ37	14/6
H30	5/-
HABC80	9/3
HL2	7/6
HL13C	4/-
HL23	12/6
HL23DD	5/-
HL41	3/9
HL41DD	12/6
HL42DD	12/6
HL133DD	9/6
HN309	25/-
HVR2	8/9
HVR2A	8/9
1W3	5/6
1W4/350	5/6
1W4/500	6/-
KBC32	20/5
KF35	12/6
KL35	11/6
KLL32	21/7
KT2	5/-
KT8	15/-
KT32	4/9
KT33C	6/-
KT36	29/-
KT41	6/6
KT44	5/-
KT61	6/9
KT63	3/9
KT66	12/3
KT74	12/6
KT88	28/-
KTW61	4/9
KTW62	5/6
KTW63	5/6
KTZ41	5/6
L63	3/9
LN152	5/9
LN309	9/6
LN319	9/6
LP2	9/6
LZ319	6/6
LZ329	6/6
MHD4	7/6
MHLD6	12/6
ML6	5/9
MS4B	20/5
MSP4	12/-
MU12/14	4/6
MX40	8/9
N37	10/6
N78	26/-
N108	26/2
N339	25/-
P41	3/6
P61	2/6
PABC80	6/9
PC86	9/9
PC88	9/-
PC95	6/9
PC97	6/9
PCC84	5/6
PCC85	6/9
PCC88	10/6
PCC89	11/6
PCC189	9/6
PCF80	6/6
PCF82	6/-
PCF84	8/6
PCF86	8/3
PCF801	9/9
PCF802	10/-
PCF805	9/3
PCF806	12/9
PCL82	6/6
PCL83	9/6
PCL84	7/6
PCL85	8/6
PCL86	8/9
PCL88	12/6
PEN40DD	34/-
PEN45	7/-
PEN45DD	12/-
PEN46	4/-
PEN383	10/3
PEN453DD	10/6
PENA4	7/-
PEN/DD 4020	17/6
PFL200	14/6
PL33	9/-
PL36	9/-
PL38	16/-
PL81	6/9
PL82	5/3
PL83	6/-
PL84	6/3
PL500	14/-
PM84	9/3
PT15	10/-
PX4	9/-
PY31	6/9
PY32	8/9
PY33	8/9
PY80	4/9
PY81	5/-
PY82	4/9
PY83	5/6
PY88	7/3
PY800	5/9
PY801	7/6
PZ30	9/6
QP21	5/-
QP22B	12/6
QQVO3/10	35/-
QS7520	10/6
QS150/15	9/6
R10	15/-
R12	5/6
R16	29/-
R17	17/6
R18	9/6
R19	6/9
R52	7/6
RG1/240A	65/-
RK34	7/6
S130	22/6
SP4B	19/6
SP13C	12/6
SP41	2/-
SP42	12/6
SP61	2/-
SU25	27/2
T41	9/-
TDD2	12/6
TDD4	7/6
TH4B	10/-
TH21C	10/6
TH30C	14/6
TH41	15/6
TH233	6/9
TP22	5/-
TP25	5/-
TP2620	7/6
TY86F	11/8
UABC80	5/6
UAF42	7/-
UB41	10/6
UBC41	6/3
UBC81	6/3
UBF80	5/6
UBF89	6/3
UBL21	10/9
UC92	6/3
UCC84	8/-
UCC85	6/6
UCF80	8/3
UCH21	8/-
UCH42	8/-
UCH81	6/6
UCL82	7/3
OCL83	9/-
UF41	6/9
UF42	4/9
UF80	7/3
UF85	6/9
UF86	9/-
UF89	5/6
UL41	7/-
UL46	8/6
UL84	5/6
UM4	17/6
UM34	17/6
UM80	8/3
UR1C	6/6
UU5	7/-
UU6	11/-
UU7	11/-
UU8	14/-
UU9	5/6
UU12	4/3
UY1N	10/3
UY21	9/-
UY41	5/-
UY85	4/9
U10	9/-
U12/14	7/6
U16	15/-
U17	5/-
U18/20	6/6
U19	48/6
U22	5/9
U25	8/6
U26	7/6
U31	6/6
U33	13/6
U35	16/6
U37	29/-
U45	15/6
U47	8/6
U50	4/9
U52	4/9
U76	4/6
U78	3/9
U101	19/6
U107	17/6
U191	9/6
U251	9/-
U281	8/9
U282	12/3
U301	11/-
U329	9/-
U339	9/6
U403	9/9
U404	6/-
U801	15/-
U4020	6/6
VMP4G	11/9
VMS4B	12/-
VP2	8/6
VP2B	9/6
VP4	14/6
VP4A	14/6
VP4B	12/-
VP13C	7/-
VP23	2/6
VP41	5/-
VP133	9/9
VR75	21/-
VR105	5/6
VR150	4/9
VT61A	7/-
VT501	3/-
VU111	5/-
VU120	10/-
VU120A	10/-
VU133	7/-
W21	5/-
W42	12/-
W61M	24/6
W63	10/6
W76	3/6
W77	2/6
W81M	5/9
W101	26/2
W107	10/6
W729	17/6
X14	7/9
X18	8/-
X24	16/6
X41	10/-
X61	6/-
X63	5/9
X64	5/6
X65	5/6
X66	7/3
X76M	8/6
X78	26/2
X79	27/-
X81M	29/1
X101	23/6
X109	26/-
X118	9/9
X119	C/6
X142	8/-
Y63	5/-
Y65	5/-
Z63	4/6
Z66	7/3
Z77	3/-
Z729	6/6
Z749	9/3
Z759	36/-
Transistors and diodes	
AA120	4/6
AA129	4/6
AC107	14/6
AC113	8/-
AC114	8/-
AC127	9/6
AD140	25/-
AF102	27/6
AF114	11/-
AF115	10/6
AF116	10/-
AF117	5/6
AF118	20/-
AF124	11/-
AF125	10/6
AF126	10/-
AF127	9/6
AF186	27/6
AFZ12	26/6
BYZ13	11/6
GD3	6/6
GD6	5/6
GD14	10/-
GET103	7/-
GET104	10/-
GET106	17/6
GET111	12/-
GET11.	6/9
GET114	6/6
GET116	17/-
GET873	9/3
GET874	9/6
GEX13	3/6
GEX35	3/-
GEX36	10/-
GEX45	6/6
GEX64	11/6
GEX66	15/-
MAT100	7/9
MAT101	8/6
MAT120	7/9
MAT121	8/6
OA5	6/-
OA10	6/6
OA70	3/-
OA73	3/-
OA79	3/-
OA81	3/-
OA85	3/-
OA86	4/-
OA90	3/-
OA91	3/-
OA95	3/6
OA200	5/-
OA211	13/6
OAZ200	12/6
OAZ203	9/6
OAZ204	9/6
OAZ210	7/6
OC16W	35/-
OC19	25/-
OC22	23/-
OC23	57/-
OC25	12/-
OC26	9/-
OC28	23/-
OC29	16/6
OC35	9/6
OC36	21/6
OC41	8/-
OC42	8/6
OC43	12/6
OC44	4/9
OC44PM	8/3
OC45	3/6
OC45M	8/-
OC65	22/6
OC66	25/-
OC70	6/6
OC71	3/6
OC72	8/-
OC73	16/-
OC74	8/-
OC75	8/-
OC76	8/6
OC77	12/-
OC78	8/-
OC81	4/-
OC81D	4/-
OC81M	8/-
OC82	10/-
OC83	6/-
OC84	8/-
OC139	12/-
OC140	19/-
OC170	8/6
OC171	9/-
OC200	10/6
OC201	29/-
OC203	14/-
OC204	10/6
OC206	10/6
OCP71	27/6
ORP12	12/6
TS2	12/6
TS3	15/-
V10/15A	12/-
XA103	15/-

WE REQUIRE FOR PROMPT CASH SETTLEMENT ALL TYPES OF VALVES, LOOSE OR BOXED, BUT MUST BE NEW

METAL RECTIFIERS. DRM1B 13/-. DRM2B and DRM3B 15/6. LW7 21/-. LW15 26/-. RMO 7/11. RM1 5/3. RM2 6/3. RM3 7/9. RM4 12/9. RM5 17/6. 14A86 17/6 14A97 19/6. 14A100 23/-. 14A163 35/6. 14B130 31/-. 14B261 11/6. FC101 16/9. 16RC.1.16.1 8/-. 16RD.2.2.8.1 11/-. 16RE.2.1.8.1 8/6. 18RA.1.1.8.1 4/-. 18RA.1.2.8.1 11/-. FC31 21/-. FC116 0/-. FC124 12/6. SB3 10/6. C2D 9/-. C2H 5/9. C2V 9/-. C3D 11/-. C3B 14/8. C3V 11/-. R3/2D 4/3. Q3/4 3/7. **ELECTROLYTICS.** Can types: 32 x 32/450v. 6/-. 50 x 50/350v. 6/-. 64 x 120/350v. 9/-. 60 x 250/275v. 9/6. 100 x 400/275v 12/6. 100/275v. 3/-. 200/275v. 4/-. 100 x 200/275v. 8/6. Tubular types: 8/450v. 1/9. 16/450v. 2/9. 32/450v. 3/9. 8 x 8/450v. 3/-. 16 x 16/450v. 4/-. 32 x 32/350v. 4/-. 8 x 16/450v. 3/9. 32/350v. 3/- **Midget silicon rectifiers. Types BY100.** Output 250 volts ½ amp. No larger than a shirt button. 6/6 each. Series limiting resistance 1/6.

EXPRESS POSTAL SERVICE! ALL ORDERS DESPATCHED SAME DAY AS RECEIVED

Terms of business—Cash with order only. Post/Packing 6d. per item. Orders over £5 post free. No C.O.D. All orders cleared day of receipt. Any parcel insured against damage in transit for 6d. extra. We are open for personal shoppers 9.00—5 p.m. Sats. 9.00—1 p.m. Complete list of modern and obsolete valves, resistors, condensers, transformers, potentiometers, microphones, etc. with terms of business 6d. Please enquire for any item not listed with S.A.E.

SURBITON PARK RADIO

MARTIN AUDIOKITS & RECORDAKITS

F.M. TUNER UNITS Nos. 15, 16 and 17..............Cash **£12.17.6**
Or Dep. 51/6 *and* 12 *m. pymts. of* 18/10..............(*H.P. Price* £13.17.6)
TRANSISTORISED AMPLIFIER with 5 position input selector. pre-amp and controls, 10 watt amplifier and Power Pack
For 3 Ohm Speaker......Cash **£14.5.0**
Or Dep. 57/- *and* 12 *m. pymts.* 20/10.................(*H.P. Price* £15.7.0)
For 15 Ohm Speaker ......Cash **£15.8.0**
Or Dep. 62/- *and* 12 *m. pymts.* 22/6.................(*H.P. Price* £16.12.0)
All above include Front Panels, Knobs and Instructions.
TWO TRACK RECORDAKIT AMP. (Valve) **FOR STUDIO DECK**, 6 valves, controls, self powered.............Cash **£11.11.0**
Or Dep. 47/- *and* 8 *m. pymts.* 25/6.................(*H.P. Price* £12.11.0)
FOUR TRACK AMP. as above.......................Cash **£12.12.0**
Or Dep. 52/- *and* 8 *m. pymts.* 27/6.................(*H.P. Price* £13.12.0)
Case for either of above tape amplifiers and Studio deck £5.5.0
TAPE PRE-AMP for Studio Deck, self powered.
Two Track....Cash **£8.8.0**
Or Dep. 34/- *and* 6 *m. pymts.* 25/8.....................(*H.P. Price* £9.9.0)
TAPE PRE-AMP as above..........Four Track... Cash **£9.9.0**
Or Dep. 39/- *and* 6 *m. pymts.* 28/4.....................(*H.P. Price* £10.9.0)
All the above amplifiers are for the STUDIO deck which is no longer available. The Martin Recordakits will be modified for the new Magnavox deck in due course. Details will be forwarded to enquirers when to hand.
We are leading stockists for all Martin Constructional Kits.

AMPLIFIERS·TUNERS Selection

ARMSTRONG 221 10-10 watts Stereo, Mag PU and Filter
Cash **£33.15.0**
Or Dep. 135/- *and* 8 *m. pymts.* 49/6.................(*H.P. Price* £36.9.0)
ARMSTRONG 222 10-10 watts Stereo Amplifier......Cash **£27.10.0**
Or Dep. 110/- *and* 12 *m. pymts.* 40/4...............(*H.P. Price* £29.14.0)
ARMSTRONG 224 F.M. Tuner Powered...........Cash **£22.10.0**
Or Dep. 90/- *and* 12 *m. pymts.* 33/-.................(*H.P. Price* £24.6.0)
ARMSTRONG 223 AM/FM TUNER Powered......Cash **£28.15.0**
Or Dep. 115/- *and* 12 *m. pymts.* 42/2................(*H.P. Price* £31.1.0)
ARMSTRONG 127 MONO 5W with AM/FM..........Cash **£26.10.0**
Or Dep. 106/- *and* 12 *m. pymts.* 38/10...............(*H.P. Price* £28.12.0

SURBITON PARK RADIO LTD.

ARMSTRONG 127 STEREO as above Stereo amp....Cash **£37.10.0**
Or Dep. 150/- *and* 12 *m. pymts.* 55/-................(*H.P. Price* £40.10.0)
ARMSTRONG 227 MONO 10W amp. with **AM/FM**....Cash **£36.15.0**
Or Dep. 147/- *and* 12 *m. pymts.* 58/10...............(*H.P. Price* £39.13.0)
ARMSTRONG 227 STEREO as above with Stereo Amp.
Cash **£52.15.0**
Or Dep. 211/- *and* 12 *m. pymts.* 77/4................(*H.P. Price* £56.19.0)
ARMSTRONG 226 STEREO as above, but Mag. P.U. Filter.
Cash **£61.0.0**
Or Dep. 260/- *and* 12 *m. pymts.* 88/-................(*H.P. Price* £65.16.0)
Teak Cases for all Armstrong Units.......................**£3.10.0**
ROGERS CADET Mk. 3 10-10 watt Stereo Amp. Mag. P.U.
Cash **£29.10.0**
Or Dep. 118/- *and* 12 *m. pymts.* 43/3................(*H.P. Price* £31.17.0)
CASE MODEL ROGERS CADET Mk. 3............**£3.0.0 extra**
LEAK STEREO 30 TRANSISTOR AMPLIFIER..Cash **£49.10.0**
Or Dep. 198/- *and* 1 *m. pymts.* 72/7................(*H.P. Price* £53.9.1)

LOUDSPEAKERS Selection

FANE 122/10 Heavy Duty 12in. 20 watt................Cash **£5.17.6**
WHARFEDALE SUPER 8/RS/DD.................Cash **£7.0.0**
WHARFEDALE SUPER 10/RS/DD.............Cash **£11.13.4**
Or Dep. 47/6 *and* 8 *m. pymts.* 25/9..................(*H.P. Price* £12.13.6)
GOODMANS MAXIM..............................Cash **£17.10.6**
Or Dep. 70/6 *and* 12 *m. pymts.* 25/8.................(*H.P. Price* £18.18.9)

MOTORS·PICK-UPS Selection

GARRARD SRP10 Mono...........................Cash **£5.10.0**
GARRARD Model 1000 Mono......................Cash **£7.10.0**
GARRARD Model 2000 Mono Large Table........Cash **£8.10.0**
Or Dep. 34/- *and* 6 *m. pymts.* 26/-...................(*H.P. Price* £9.10.0)
GARRARD Model 3000 Stereo Lightweight arm....Cash **£11.11.0**
Or Dep. 47/- *and* 8 *m. pymts.* 25/6.................(*H.P. Price* £12.11.0)
GARRARD S.P.25 Less cart.: Single player........Cash **£12.10.0**
Or Dep. 50/- *and* 8 *m. pymts.* 27/6.................(*H.P. Price* £13.10.0)
GARRARD AT60 Less cart.: Heavy table..........Cash **£13.0.0**
Or Dep. 52/- *and* 12 *m. pymts.* 19/-.................(*H.P. Price* £14.0.0)
GARRARD LAB80 Push button oper., less cart....Cash **£27.10.0**
Or Dep. 110/- *and* 12 *m. pymts.* 40/4...............(*H.P. Price* £29.14.0)
GARRARD 401 Transcription Table. No arm......Cash **£32.10.0**
Or Dep. 130/- *and* 12 *m. pymts.* 47/8...............(*H.P. Price* £35.2.0)
GOLDRING G66 Mono Single Player.............Cash **£11.11.0**
Or Dep. 47/- *and* 8 *m. pymts.* 25/6.................(*H.P. Price* £12.11.0)
GOLDRING GL68 Less cart. Pickup lift............Cash **£19.10.6**
Or Dep. 78/6 *and* 12 *m. pymts.* 28/7................(*H.P. Price* £21.1.6)
GOLDRING GL70 Less cart. PU lift. Heavy table....Cash **£29.18.6**
Or Dep. 120/6 *and* 12 *m. pymts.* 43/9................(*H.P. Price* £32.5.6)

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.)

WEYRAD

TRANSISTOR RECEIVER COILS

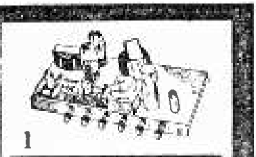
Special versions of the P50 Series are now available for the AF.117 or OC.170 Transistors. Details of the simple modifications to our standard receiver are given in the latest edition of the Constructors Booklet which is priced at 2/-.

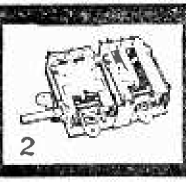
The new components and their original equivalents are listed below:

	For OC45	For AF117	Price
Oscillator Coil	P50/1AC	P50/1AC	5/4
1st I.F. Transformer	P50/2CC	P51/1	5/7
2nd I.F. Transformer	P50/2CC	P51/2	5/7
3rd I.F. Transformer	P50/3CC	P50/3V	6/-
Rod Aerial		RA2W	12/6
Driver Transformer		LFDT4/1	9/6
Output Transformer		OPT1	10/6
Printed Circuit		PCA1	9/6

WEYRAD (ELECTRONICS) LIMITED

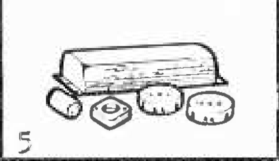
School Street, WEYMOUTH, Dorset


1

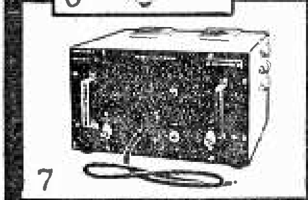

2

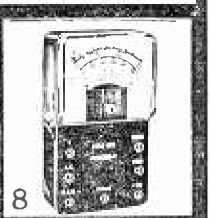

3

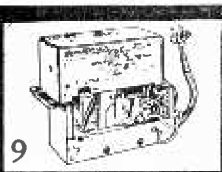

4

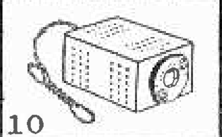

5


6


7


8

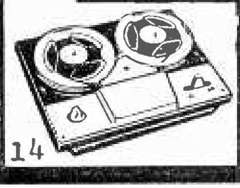

9

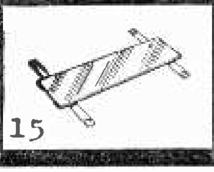

10


11


12


13


14


15

1. **6 VALVE 15 WATT PUSH-PULL AMPLIFIER,** 15 x 7 x 1¾in. A.C. Mains 200-250 volts. 4 inputs with controls for same and bass and treble lift controls. Tapped for 3 and 15 ohm speakers. Extra H.T. and L.T. for F.M. Tuner supplies etc., built and tested. **7 gns.** P. & P. 13/6.

2. **CYLDON AM FM PERMEABILITY TUNERS FOR ALL TRANSISTOR OPERATION.** Size 2½ x 2¼in. approx. By famous manufacturer. A.M. I.F. 470 Kc/s. F.M.-I.F. 10.7 Mc/s. A.M. coverage from 1620 Kc/s-525 Kc/s. F.M. coverage 108 Mc/s-88Mc/s. Circuit diagrams 2/6. FREE with Tuner, 1st, 2nd and 3rd A.M. I.F.'s, 1st, 2nd, 3rd and 4th F.M. I.F.'s V.H.F. Osc. choke, A.M. I.F. trap. All the above are the R.F. end of an A.M./F.M. receiver car radio etc. The above items **£2.10.0.**

3. **AMPLIFIER KIT.** 3 to 4 watt Amplifier Kit. Comprising chassis 8¾ x 2¼ x 1in. Double wound mains transformer, output transformer, volume and tone controls, resistors, condensers etc. Valves 6V6. ECC81 and metal rectifier. Circuit 1/6. free with kit, **29/6** plus **4/6** P.&P.

4. **8-WATT 5-VALVE PUSH-PULL AMPLIFIER & METAL RECTIFIER** Size: 9 x 6 x 1¼in. 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 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. 8/-.

5. **40W FLUORESCENT LIGHT KIT** incorporating GEC Choke size 8¼ x 1¾ x 1⅝in. 2 bi-pin holders, starter and starter holder, **11/6.** P. & P. 4/6. Similar to above: **80W Fluorescent Light Kit** incorporating GEC choke size 11¾ x 1¾ x 1⅝in. 2 bi-pin holders, starter and starter holder. **17/6.** P. & P. 5/6.

6. **OSCILLOSCOPE for D.C. and A.C. APPLICATIONS.** Push-pull X amplifier; Fly-back 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 200-250v., **£18.18.0.** P. & P. 10/-. **FULL 12 MONTHS' GUARANTEE INCLUDING VALVES and TUBE.**

7. **FIXED FREQUENCY SIGNAL GENERATOR.** Crystal controls in metal case, size 10 x 6 x 6in. Incorporating two FC13 valves, mains transformer, metal rectifier, choke, indicator, lamp, crystal and numerous components. Modulated and unmodulated output socket. Originally used for I.T.V. frequencies. Brand new, **39/6**, plus 7 P. & P. A.C. mains 200-250 volts.
SILICON RECTIFIERS. 250v. P.I.V.. 750mA. Six for **7/6** post paid.

8. **POCKET MULTI-METER.** Size 3⅞ x 2⅛ x 1⅜in. Meter size 2⅛ x 1⅜in. 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.

9. **CHANNEL TUNER I.F. 16-19 Mc/s.** Continuously tunable from 174-216 Mc/s. Valves required—PCF80 and PCC84 (in series). Cover BBC and ITA ranges. Also Police, Fire and Taxis, etc. Brand new by famous maker **10/-**, P. & P. 3/-.

10. **POWER SUPPLY KIT** in metal case, size 3¾ x 2½ x 2in. incorporating mains transformer, rectifier and condensers. 230/250 A.C. mains Output; 9v., 10mA. **10/6** plus 3/- P. & P.

11. **B.S.R. 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: 12½ x 10⅝in. Space required above baseboard 4¾in., below baseboard 2¾in. Fitted with full Fi turnover crystal head. **£5.19.6.** P. & P. 7/6.

12. **FIRST QUALITY PVC TAPE**

5¾in. Std. 850ft. ..	**9/-**	5in. L.P. 850ft.	**10/6**
7in. Std. 1200ft. ..	**11/6**	3in. T.P. 600ft.	**10/6**
3in. L.P. 240ft. ..	**4/-**	5in. T.P. 1800ft.	**25/6**
5¾in. L.P. 1200ft. ..	**11/6**	5¾in. T.P. 2400ft.	**32/6**
7in. L.P. 1800ft. ..	**18/6**	7in. T.P. 3600ft.	**42/6**

P. & P. on each 1/6. 4 or more Post Free.

13. **MAYFAIR 5-TRANSISTOR TAPE RECORDER**
Capstan-driven, battery operated, 7½ and 3¾ i.p.s. Precision made. Push-button controls. High quality 2¾in. speaker. Push-pull circuit. Output: 400 mw. Frequency response: 200-7,000 kc/s. Fast rewind. Up to 1 hour twin track playing time. Automatic erasing for re-recording. Dimensions: 8in. x 11in. x 3⅞in. Weighs only 7lbs. **£11.11.0** plus 7/6 P. & P.

14. **BSR TAPE DECK**
AC 200/250v, tape speed 3¾ twin track, **£5.5.0** P. & P. 7/6.

15. **GEC FLAT HEATER ELEMENT 500 w.**
Can be used for wash boilers, washing machines, etc. Five or six elements can be used in parallel to give 2500/3000 watts. Size 5½ x 1⅛, copper enclosed. 2/6 each, P. & P. 1/-. 4 or more Post Paid.

RADIO & TV COMPONENTS (ACTON) LTD.

21b High Street, Acton, London, W.3.

All enquiries Stamped Addressed Envelope.
Goods not despatched outside U.K.
Shop hours 9 a.m.—6 p.m. Early closing Wednesday

New! from R.&T.V.

MUSETTE PORTABLE RADIO

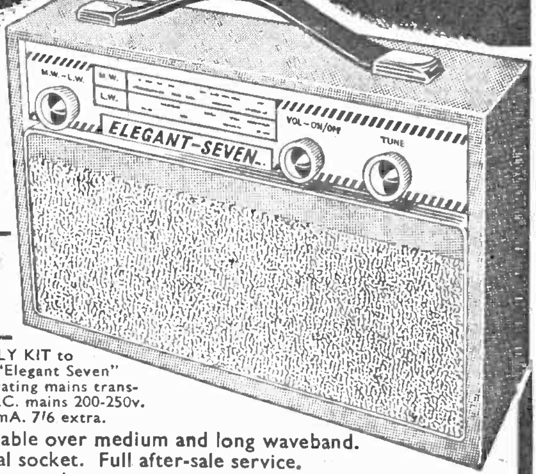
PRICE

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 mounted 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.

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 mounted 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 & 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.

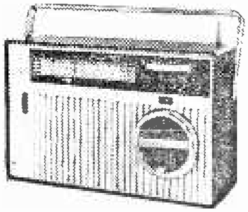
RADIO & TV COMPONENTS (ACTON) LTD **21C High St., Acton, London W3**
Open 9 a.m.—6 p.m. including Sats. Early closing Wed. Goods not despatched outside U.K. Terms C.W.O.

LASKY'S RADIO

Offer the Finest Value and HOME CONSTRUCTORS

We consider our construction parcels to be the finest value on the home constructor 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" RANGE



GENERAL SPECIFICATION

7 transistor plus 2 diode superhet, 6 waveband portable receiver. Operating from four 1.5 v. torch batteries. The SKYROVER and SKYROVER DE LUXE cover the full Medium Waveband and Short Waveband 31-94 M and also 4 separate switched band-spread 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.

A simple additional circuit provides coverage of the 1100/1950M. band (including 1500 M. Light programme). All components and detailed construction data.
Only 10/- extra Post Free
This conversion is suitable for both models that have already been constructed.

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

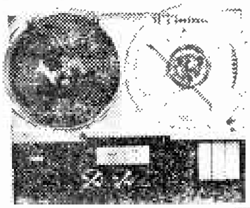
NEW—The SKYROVER Mk 111

Now supplied with redesigned cabinet, edgewise controls, black and chrome plastic cabinet
Size 10 x 6½ x 3¾in. with carrying handle.
Can now be built for **£8.19.6** Post 5/-
H.P. Terms: 27/- dep. and 11 months at 15/9. Total H.P. Price £10.0.3.

NEW—The SKYROVER DE LUXE

Tone Control Circuit is incorporated with separate Control. 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 **£10.19.6**
Post 5/-
H.P. Terms: 33/- dep. and 11 mths. at 19/2. Total H.P.P. £12.3.10

The Very Latest MAGNAVOX-COLLARO 363 TAPE DECKS



3 speed model—1⅞, 3¾, 7½ i.p.s., available with either ½ track or ¼ track heads. Features include: pause control; digital counter; fast forward and rewind; new 4 pole fully screened induction motor; interlocking keys. Size of top plate 13½ x 11 x 5¼in. deep below unit plate. For 200/250v. A.C. mains, 50 c.p.s. operation. New, unused and fully guaranteed.

LASKY'S PRICE with ½ track heads **£10.10.0**
LASKY'S PRICE with ¼ track heads **£13.9.6**
Carriage and packing 7/6 extra

SPECIAL for OVERSEAS CUSTOMERS—the new Magnavox-Collaro 363 Deck for 110/125v., 50 or 60 c.p.s. mains now available, prices as above. Post to any part of the World, 35/-.

SPECIAL PURCHASE OFFER

7 TRANSISTOR RADIO CHASSIS

Superhet chassis, fully built—by famous British manufacturer—on printed circuit. Uses 7 Newmarket transistors giving 500 m/w push-pull output—3 I.F. stages; ferrite rod aerial. Covers full, long and medium wavebands—200/550M and 1200/2000M and switched band spread on 208M (Luxembourg). 4½in. speaker, fitted; volume control on/off switch, tuning dial and position for car aerial socket. Uses any 9V battery. Overall dimensions—7in. x 4½in. x 2in. Absolutely complete except for cabinets.

LASKY'S PRICE 69/6 Post 5/-. Recommended battery PP6, 2/9 or PP7, 3/3 extra.

TRANSISTORS new and guaranteed

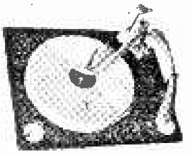
GET 81, GET 85, GET 86, **2/6**; 873A, 874P, **3/6**; OC45, OC71, OC81D, **4/6**; OC44, OC70, OC76, OC81 (match pair **10/6**), **5/6**; AF117, OC75, OC200, **6/6**; OC42, OC43, OC73, OC82D, **7/6**; OC201, OC204, **15/-**; OC205, OC206, **19/6**; OC28 **24/6**.

TRANSFILTERS BY BRUSH CRYSTAL CO

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

7/6 EACH
Post 6d.

B.S.R. AUTOCHANGERS—BRAND NEW 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.

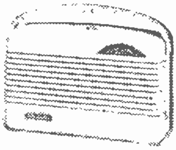
INTERNATIONAL TAPE

Famous American Brand—Fully Guaranteed

3in.	Message tape, 150ft.	3	6
3in.	Message tape, 225ft.	4	11
3in.	Message tape, 300ft.	7	6
3¼in.	Triple play, 600ft., Mylar base	15	0
4in.	Triple play, 900ft., Mylar base	17	6
5in.	Double play, 1,200ft., Mylar base	15	0
5in.	Long play, 900ft., Acetate base	10	0
5in.	Standard play, 600ft., PVC base	8	6
5in.	Triple play, 1,800ft., Mylar base	35	0
5¾in.	Double play, 1,800ft., Mylar base	22	6
5¾in.	Long play, 1,200ft. Acetate base	12	6
5¾in.	Standard play, 850ft., PVC base	11	6
5¾in.	Long play, 1,200ft., Mylar base	15	0
5¾in.	Triple play, 2,400ft., Mylar base	45	0
7in.	Standard play, 1,200ft., Acetate base	10	0
7in.	Standard play, 1,200ft., Mylar base	12	6
7in.	Long play, 1,800ft., Mylar base	19	6
7in.	Double play, 2,400ft., Mylar base	25	0
7in.	Long play, 1,800ft., Acetate base	15	0
7in.	Triple play, 3,600ft., Mylar base	58	6

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

The "REALISTIC" Seven



★ 7-Transistor Superhet. ★ 350 milliwatt output into 4in. high flux speaker. ★ All components mounted on a single printed circuit board. ★ Full medium and long wave cover. ★ Plastic cabinet with carrying handle, size 7 x 10 x 3½in., Blue/Grey or all Grey. ★ Socket for car aerial. ★ I.F. frequency 470 Kc/s. ★ Ferrite rod internal aerial. Operates from PP9 or similar battery. ★ Full data supplied. All coils and I.F.'s etc. fully wound ready for immediate assembly. An outstanding receiver.

Can be built for **£5.19.6**
Post 4/6.
PP9 Batt. 3/9. Data and Instructions separately 2/6. Refunded if you purchase the parcel. All parts sold separately.

REALISTIC Seven DE LUXE

With the same specifications as standard model—PLUS a superior wood cabinet in contemporary styling with full vision circular dial.

ONLY **£1** EXTRA

GOODMANS OF ENGLAND CROSSOVER UNITS

XO/750 HALF SECTION CROSSOVER. For use with bass and treble speakers. 15Ω imp. to crossover at 750 c.p.s. Rated at 25 watts (British). In wood case 6½ x 4½ x 4in. New and unused.

LASKY'S PRICE 29/- Post 2/6.

STEREOPHONIC FILTER. This is a frequency divider/mixer for use with a Stereo amplifier Its function is to combine the bass frequencies up to 300 c.p.s. into a single bass speaker for both channels and to divide the frequencies above 300 c.p.s. into two separate mid/top range speakers. It can also be used as a 300 c.p.s. crossover for a mono system. 15Ω imp. Rated at 25 watts (British). In wood case 10 x 4½ x 3in. New and unused.

LASKY'S PRICE 19/6 Post 2/6.

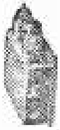
SINCLAIR MINIATURES

We stock the complete range of Sinclair Super-miniature Kits.

THE MICRO-6 pocket radio	59/6
THE SLIMLINE pocket radio	49/6
THE MICRO-FM tuner receiver	£5.19.6
THE X-20 Amplifier	£7.19.6
Ready built and tested	£9.19.6
THE X-10 Amplifier	£5.19.6
Ready built and tested	£6.19.6

See our Practical Wireless November '65 advertisement for details.

U.H.F. TUNERS



Only a few available. Complete with PC86 and PC88 valves. We regret no circuit or data is available. Knobs included.

LASKY'S PRICE 69/6
Post 2/6.

GORLER UT 340 FM/VHF TUNING HEART

Permeability tunes—covering 87 to 108 Mc/s. For use with one ECC85 valve. In metal case, size 3 x 2½ x 1¼in. Circuit supplied.

LASKY'S PRICE 19/11
ECC85 valve 9/- extra. Post 2/-.

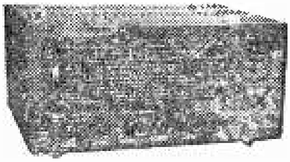
LASKY'S FOR D.I.Y. CONSTRUCTION BARGAINS

Service in Great Britain to both & HI-FI ENTHUSIASTS

TAPE RECORDERS · RECORD PLAYERS · AMPLIFIERS ETC.
COMPLETE MONO/STEREO SYSTEMS TO YOUR SPEC.

LASKY'S RADIO

NEW COMMUNICATION RECEIVERS MODEL KT 320 KIT



Supplied in sub-assemblies for easy building. Covers range from 540 Kc/s to 30 Mc's. Ham Band is provided with a scale for direct reading and can also be band spread. 9 valves. Facilities: A.N.L., A.V.C. and M.V.C. Q-Multiplier also serves as B.F.O. H.F. stage and two I.F. stages ensure high sensitivity and selectivity (all coils and I.F.'s are supplied pre-aligned). 2 Aerial Sockets. Stand-by position for use with a transmitter. S meter fitted. 200-250v. A.C. mains. Steel cabinet, grey crackle finish. Size 15 x 8 x 10in. Dial 12 x 4in. All parts new and fully guaranteed. Complete with full construction data and operating manual.

LASKY'S PRICE 25 GNS. POST FREE

Also available ready built and tested 29 gns.
H.P. Terms available.

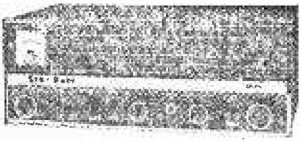
MODEL HE30

Still a few available—as advertised June '65

LASKY'S PRICE 33 GNS.

H.P. Terms available.

MODEL HE40



Covers medium wave band and 1.6-4.4 Mc/s., 4.5-11.0 Mc/s., 11.0-30.0 Mc/s. in separate switched band spread ranges. Controls include B.F.O. Sensitivity. A.N.L. Receiver—Stand-by switch. Tone Switch, S-Meter. For 200-250 v. A.C./D.C. Internal loop and telescopic antennae fitted. Valve line-up: 12BE6, 12BA6, 12AV6, 50C5, and metal rectifier. Size 13½ x 8¼ x 5¼in. Instruction manual included. No Kits available.

LASKY'S PRICE 18½ GNS. POST 10/-

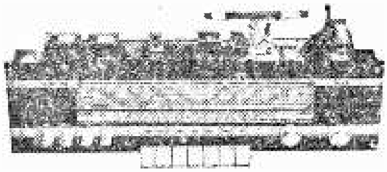
H.P. Terms £4.0.0 dep. and 11 months at £1.11.0. Total H.P.P, £21.1.0.

MODEL HE80

14-valve super sensitive communication receiver. Freq. range 540 Kc/s—30 Mc/s. and 144-146 Mc/s. Dual conversion on 2 metres, with extra R.F. stage. Single R.F. stage, two I.F. stages on all other bands. B.F.O. and Q-multiplier circuits. Improved A.N.L. and voltage regulated powerpack. "S" meter band spread on amateur bands, large illuminated dial with logging scale. All controls fitted. Output for speaker and phones. Valve line-up: 4 x 6AQ8, 3 x 6BA6, 2 x 6BE6, 1 x 6BL8, 6AL5, 6AQ5, 6CA4 and OA2. Steel case 17 x 7¼ x 10in. For 200/250v. A.C. mains. Brand new with full instruction manual. No Kits available.

LASKY'S PRICE 59 GNS. POST FREE

H.P. Terms £12.19.0 dep. and 11 monthly payments of £4.18.0. Total H.P.P. £66.17.0.

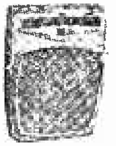


THE LATEST "KUBA" IMPORTED AM/FM STEREO RADIOGRAM CHASSIS

Long, medium and short waveband coverage plus VHF/FM. Piano key wave-change. Separate flywheel tuning on AM and FM Bass, treble and balance controls. Magic-eye tuning indicator. Ferrite rod aerial. The very latest printed circuitry. Provision for multiplex adaptor. 5 valves—line up: ECC85, ECH801, ECC83, ELL80, EAF801. Full vision tuning scale, size 21 x 6in. Overall dimensions: 21 x 6½ x 8in. Made to the very highest standards.

LASKY'S PRICE 29½ GNS. **Carriage & Insurance 12/6 extra.**

TRANSISTOR POCKET RADIOS



IDEAL GIFTS - All supplied complete with personal earpiece, battery and carrying case. Fully guaranteed—ready to use. **POST FREE.**

BOY'S 2 TRANSISTOR In attractive plastic case. Size only 4in. x 2¼in. x 1in. Fitted 2¼in. speaker. Socket for personal earpiece. Uses PP3 battery. Tunable over full medium waveband.

LASKY'S PRICE 35/-

BOY'S 4 TRANSISTOR MODEL **LASKY'S PRICE 45/-**

6 TRANSISTOR MODEL

Fully built in plastic case, 4in. x 2¼in. x 1in. with 2¼in. speaker. Uses single PP3 type battery. Tunable over full medium waveband. **LASKY'S PRICE 59/6**

2 Waveband (Long and Medium) Model. Size 5 x 3½ x 1½in. Cream/black plastic case. Including earpiece and carrying case. **LASKY'S PRICE 89/6**

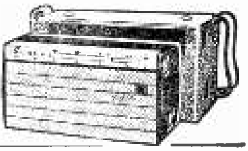
THE "TRANSWAVE" DE LUXE TWO WAVEBAND RADIO

8 Sony transistors give super sensitive reception over the full Med. and Long wavebands. Internal ferrite and detachable chrome telescopic aerials. 2¼" p.m. speaker. Smart black plastic cabinet with metal trim—size 6¾ x 3½ x 1¾in. Uses 3 pen light batteries. Complete with leather case and shoulder strap, earpiece and batteries. Post 2/6.

LASKY'S PRICE 95/-

3 WONDERFUL SETS FROM THE U.S.S.R.

THE "SELGA" 7 TRANSISTOR RADIO



High sensitivity circuit gives excellent reception over full Med. waveband and powerful volume. P.M. speaker. Uses PP3 type battery. Black and ivory plastic cabinet size 7 x 4 x 2in. Socket for external aerial. Complete with solid hide case and shoulder strap, earpiece and battery.

LASKY'S PRICE £5.9.6 Post 2/6

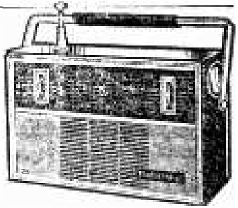
THE "SOKOL" 7 TRANSISTOR TWO BAND RADIO

Super quality receiver covering the full Med. and Long wavebands with exclusive rechargeable battery which can be recharged from any 110/250v. A.C. mains supply. Also operates on PP3 type dry battery. P.M. speaker. Ivory and black plastic cabinet 6 x 3¼ x 1¼in. Socket for external aerial. Complete with real leather case, rechargeable battery and charger, dry battery and earpiece.

LASKY'S PRICE £6.9.6 Post 2/6

THE "CONVAIR"

10 TRANSISTOR PORTABLE RECEIVER



Extremely well designed and made receiver covering the Long, Med. and Short wavebands. The Short waveband has switched band spread on 13m., 16m., 19m., 25m., 31m., 41m. bands. Internal ferrite rod and telescopic aerials. Sockets for external aerial and earth and gram. pick-up. Strong cream and black plastic cabinet with carrying handle—size 10 x 7½ x 3¼in. Uses six U2 type batteries (supplied).

LASKY'S PRICE £12.19.6 Post 5/-

SPECIAL OFFER: GARRARD AT5 AUTOCHANGERS

4 speed mains model—brand new and fully guaranteed
LASKY'S PRICE With mono crystal cartridge **£5.19.6** With stereo cartridge **£6.9.6** Post 5/-

207 EDGWARE RD, LONDON, W.2 Tel: PAD 3271
33 TOTTENHAM CT. RD., LONDON, W.1 Tel: MUS 2605
Both 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 St., Tower Hamlets, London, E.1. Tel: STE 4821/2

LASKY'S FOR SPEEDY MAIL ORDER SERVICE

LEARN ELECTRONICS *—AS YOU BUILD*

over **40** **CIRCUITS** **EXPERIMENTS** **TEST GEAR**

including . . .

● CATHODE RAY OSCILLOSCOPE

- ● Valve Experiments
- ● Transistor Experiments
- ● Electro-magnetic Experiments
- ● Basic Amplifier
- ● Basic Oscillator
- ● Basic Rectifier
- ● Signal Tracer
- ● Simple Counter
- ● Time Delay Circuit
- ● Square Wave Generator
- ● Morse Code Oscillator
- ● Simple Transmitter
- ● Electronic Switch
- ● Photo-electric Circuit
- ● Basic Computer Circuit
- ● Basic Radio Receiver
- ● A.C. Experiments
- ● D.C. Experiments

The full equipment supplied comprises valves transistors photo-tube modern type chassis board printed circuit board full range resistors capacitors and inductors transformers potentiometers switches transistors valves all hardware wiring and every detail required for all practical work *plus* CATHODE RAY OSCILLOSCOPE for demonstrating results of all experiments carried out. All practical work fully described in comprehensive PRACTICAL MANUALS. Tutor service and advice if needed.

This complete practical course will teach you all the basic principles of electronics by carrying out experiments and building operational apparatus. You will learn how to recognise and handle all types of modern components; their symbols and how to read a completed circuit or schematic diagram. The course then shows how all the basic electronic circuits are constructed and used, and HOW THEY ACTUALLY WORK BY USING THE OSCILLOSCOPE PROVIDED. *An application is given in all the main fields of electronics, i.e. Radio; control circuits; computors and automation; photoelectrics; counters, etc., and rules and procedure for fault finding and servicing of all types of electronic equipment.*

- ● NO PREVIOUS KNOWLEDGE NEEDED
- ● SENT IN ATTRACTIVE BOX
- ● NO MATHS USED OR NEEDED
- ● COMPLETE ADVICE SERVICE
- ● REASONABLE FEE—NO EXTRAS REQUIRED
- ● EVERYTHING REMAINS YOUR OWN PROPERTY

A completely NEW up-to-date home study experimental course by

BRITISH NATIONAL RADIO SCHOOL —

Britain's Leading Electronic Training Organisation.

POST NOW FOR FREE BROCHURE

To BRITISH NATIONAL RADIO SCHOOL READING BERKSHIRE. Please send free Brochure without obligation to

NAME ....

ADDRESS ....

....

Block Capitals Please

OR WRITE IF YOU PREFER NOT TO CUT COUPON PW 3.66

PRACTICAL WIRELESS

MARCH 1966
VOL 41 NO 709

MOUNTAIN OF MAIL

THE size of our post bag seems to increase month by month. Whether in fact this is more apparent than real we have not had the nerve to check upon. We do know, however, that each week we have to clear a mountain of mail.

Mind you, we are not really complaining. It might often appear that we are becoming engulfed in an avalanche of letters, but we undertake the task of clearing them in a spirit of (relatively) cheerful acceptance. For without such response, we would not be able to keep in such close contact with the opinions, aspirations, thoughts, wishes and (we must admit) occasional grouses, of readers. And a hobby magazine without a lively participating readership is dead.

As might be anticipated by connoisseurs of this page, all this is leading up to a few things that have been niggling away in the dark recesses of our minds. The obvious kick-off is to regret that it is impossible always to provide a quick reply. Our policy for users of the Query Service, for instance, is to channel specialised enquiries to members of a panel of experts who operate outside our normal editorial staff. In this way, the best possible advice is obtained, but delays are sometimes inevitable.

It must also be remembered that sometimes a seemingly simple enquiry (which may take only a single line of writing) could require a considerable time in checking references, or in obtaining information when it is not on file.

So, in the interests of everyone, please keep letters concise and clear. Always quote our Reference number on follow-up letters. Do not write for blueprints we do not list. If you want technical advice, always enclose a query coupon and SAE. In fact—if in doubt—read the notes printed each month on the inside back cover page!

Meantime, keep the letters coming and we will do our very best for you!

CONTENTS

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: 29s. per year to any part of the world. **THE APRIL ISSUE WILL BE PUBLISHED ON MARCH 3rd.**

R.A.E. Success

I HAVE recently sat and passed the R.A.E., after following the course in PRACTICAL WIRELESS. I am now practising Morse, to bring my present 6—7 words per minute up to the required 12.

I should like to add that I found John Colley's remarks in "The Morse Bogey" very encouraging.

L. R. Tennant.

East Cowes,
Isle of Wight.

A Challenge

A FEW years ago a quite ordinary commercial 6-valve set costing about £15 had three wavebands, and pushed out two or three watts through an 8in. speaker, which was very pleasant to listen to. No present-day transistor set can compare with this.

I have constructed many of your own designs and several commercial kits; I have also listened to quite a few fairly expensive commercial sets. NONE of them is capable of reproducing music to my satisfaction and I have gone back to listening to my ancient mains radio (5-valve superhet, circa 1935).

I can imagine that some of your technical staff will disagree with me. In which case I offer P.W. a challenge! This is to publish a design—for readers to construct—of a transistor radio to the following specification:—

Mains operated. Medium and long wave bands. Output at least 3W. To operate a fair-sized speaker of 15Ω. Tone control that really works. Capable of GOOD music reproduction. Output for tape recorder. (If a separate v.h.f./f.m. circuit could be incorporated, so much the better).

As it is impossible to buy a commercial set approaching this specification, I am certain that many of your readers would be only too delighted to construct a quality radio.

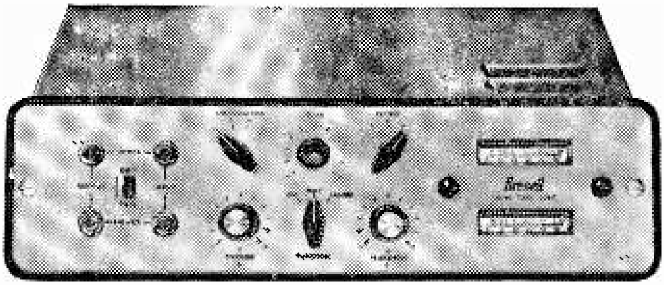
L. Welch.

Hillingdon,
Middlesex.

[*How about it*?—Editor]

NEWS AND..

BRENELL TAPE LINK



The Brenell Hi-Fi Tape Link contains twin recording amplifiers, "Push Pull" Bias/Erase oscillator, twin playback preamplifiers and is designed for use with a three-headed stereophonic tape deck, i.e. separate Erase, Recording and Playback heads of either the half track or quarter track types of the following types:

	Erase	Record	Playback
2/2 TRACK (half track)	*BL210 or UL290*	*UK202*	*UK200*
2/4 TRACK (quarter track) ...	*BL216 or UL296*	*UK207*	*UK205*

Any make of High Fidelity amplifying equipment capable of supplying a signal level from Radio Tuners, Microphones, Gramophone Pickups, etc., of at least 75 millivolts (the output from a Hi-Fi preamp usually ranges from 125 to 500 millivolts).

Mono and Stereo recording facilities are provided and whilst recording is in progress one may listen to the recorded material a fraction of a second after recording has taken place or to the signal being fed to the recording amplifier (comparison of the recorded and original signals may be undertaken). Two edgewise scaled illuminated meters indicate the recording signal level and dual concentric gain controls give individual control of the two recording amplifiers. Variable Bias enables the recordist to obtain optimum results at all tape speeds with all brands of tape. Frequency correction for 4 tape speeds, both for recording and replaying, is incorporated.

To ensure elimination of hum, the amplifiers are completely enclosed in a strong metal case, valves are D.C. heated and the power unit is on a separate chassis in order that it may be mounted where it cannot introduce hum into the system.

Price including power unit—£46.0.0. For further details contact Brenell Engineering Co. Ltd., 231 Liverpool Road, London N.1.

A BOOKLET FROM MULLARD

A booklet entitled "Quick-Heating V.H.F. Tetrodes and Double Tetrodes" is now available from Mullard.

The booklet provides designers with information on the techniques associated with the use of quick-heating v.h.f. tetrodes and double tetrodes. It gives abridged data on each type, a selection of practical circuits and recommended valve line-ups for different types of transmitter.

Requests for copies should be made to the following address: Industrial Markets Division, Mullard Limited, Mullard House, Torrington Place, London, W.C.1.

"PUSH-BUTTON MULTIMETER"

Planet Instrument Co., 25 Dominion Avenue, Leeds, 7, are able to supply most of the non-standard resistors, and low value resistors used in the "Push-Button Multimeter," published in the January, 1966, issue of *Practical Wireless*.

..COMMENT

NEW POWER TRANSISTOR FROM MARCONI

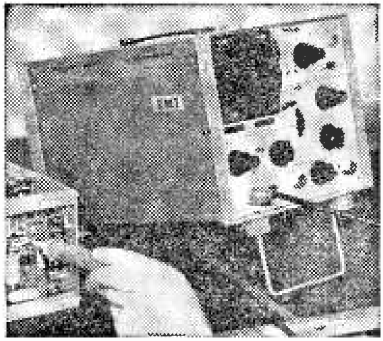
A new transistor, type 203-03, one of the types that has made the Marconi MYRIAD computer possible, has just been placed on the general market by the Microelectronics Division of The Marconi Company.

This new transistor is an n.p.n. silicon planar transistor mounted in a standard (3 lead) TO-5 encapsulation. The combination of high breakdown voltage and current handling capacity with low saturation voltage and fast switching times are believed to be unique.

In a typical circuit, the total time taken to switch ON is 14 nanoseconds, and the total time taken to switch OFF is 90 nanoseconds. The collector-emitter saturation voltage is of the order of 0·3V and maximum collector-base leakage is 0·1μA. Minimum collector-base and collector-emitter breakdown voltages are both 45V with a minimum emitter-base breakdown voltage of 4V.

Ratings (Limiting Values). Storage temperature —65 to +150°C. Maximum power dissipation at 25°C. case temperature, 3·0W. Maximum power dissipation at 25°C. ambient temperature, 0·8W. Maximum power dissipation at 75°C. ambient temperature 0·5W. Maximum emitter-base voltage 4·5V. Maximum collector-emitter voltage 50V. Maximum collector-base voltage 50V. Peak emitter current 1·0A.

TRANSISTOR OSCILLOSCOPE FROM EMI



A new, low price, solid-state measuring oscilloscope with high performance characteristics has been announced by EMI Electronics Ltd.

Known as the Oscilloscope 101, its advanced circuitry provides stable triggering up to 30 Mc/s. The Y-amplifier bandwidth of 15 Mc/s, coupled with a maximum sensitivity of 50mV/cm, ensures that waveforms are faithfully displayed on the new 3in. c.r.t., type MX54. Specification as follows:

Y AMPLIFIER—bandwidth: d.c. to 15 Mc/s (—3dB); sensitivity range: 50mV/cm to 60V/cm; measurement accuracy: better than ± 5%.

SWEEP GENERATOR & X AMPLIFIER—bandwidth: d.c. to 4 Mc/s (—3dB); sensitivity: 300mV/cm to 1·5V/cm; sweep speeds: 40ns/cm to 100 ms/cm; measurement accuracy: better than ± 5%.

TRIGGERING—bandwidth: 5 c/s to 15 Mc/s: sensitivity: 0·2 cm internal, 0·2V external; modes: a.c. (level control operative) automatic (level control inoperative).

VOLTAGE CALIBRATION—produces 7 kc/s square waves of amplitudes from 200mV to 40V accurate to 2%.

CATHODE RAY TUBE—EMI type MX54, 3in. diameter operated at 2·6kV.

POWER SUPPLIES—95 to 130V, 50 to 60 c/s or 190 to 260V, 50 to 60 c/s or 12V d.c. nominal (11 to 14V absolute), positive earthed.

The power consumption is 25W a.c. or 20W d.c.

The height is 9in., width 8·5in. and depth 15in. The weight is approximately 17 lbs. and the case is finished with silk screen printed front and rear panels and plastic faced covers. The price is £170.

The Meaning of Amateur

ON READING the item on "The Meaning of Amateur" in the January, 1966, issue I find myself rather puzzled. To purchase a commercially made Tx and Rx and use same if licensed I am wondering what the operator would be an "amateur" of, not having constructed any equipment himself. I have always had the impression that an amateur was a person who used his initiative and produced an article entirely on his own, not having been professionally trained in the subject. The reference to amateur sportsmen does not apply in any way and I am rather surprised that such a letter was printed. The difference between professional and amateur sportsmen is that the latter are not paid for their activities.

If our Birmingham friend hasn't sufficient interest in radio to enable him to brew his own gear I would suggest he looks to some other hobby where a little energy and initiative is not required.

Long live amateur radio as we know it, with appreciation to P.W. in that field.

J. R. Davidson, G3FG.

Carshalton,
Surrey.

* * *

YOUR correspondent on "The Meaning of Amateur" (page 692, December issue) asks why people buy expensive equipment rather than "roll their own". The simple answer to this is that the trade has cottoned on to this and almost all components are priced against published circuits, so that the home-made job will cost as much as—and sometimes more than—an on-the-shelf product.

If one wants proof of this one has only to take any good circuit and price the components available on the market—then compare the total with the price of a proprietary item. In addition, how many of us can afford the test equipment, etc., to set up a home-made job?

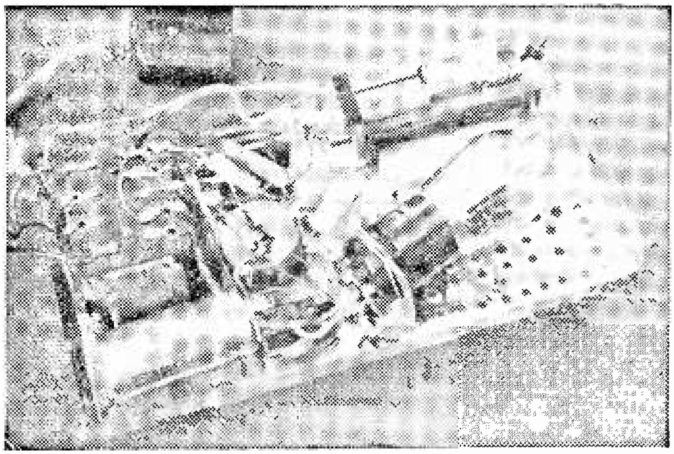
D. A. Snoad.

Haslemere,
Surrey.

more News and Comment **on page 968**

COVER SUBJECT

A SIMPLE PROXIMITY DETECTOR



by H. Wagner

THERE have been several proximity detectors described in technical magazines over the last few years; most of them rely on the change in anode (or collector) current as a result of change in oscillatory state of a simple feedback r.f. oscillator. This type of detector can be made very sensitive; in fact a *true* proximity detector and, as such, can be employed in cases where it is important for an operator not to get too close to a piece of machinery, etc. As a burglar alarm it would seem that great sensitivity is not so much required as reliability of operation the moment the guarded article is touched or tampered with.

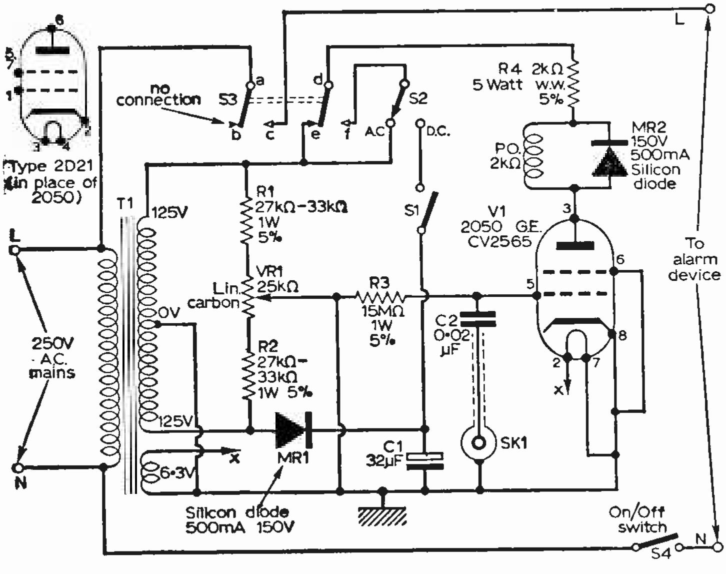


Fig. 1: Circuit diagram of the proximity detector. The relay is a P.O. type, 2-pole, 2-way, 2kΩ. Resistors should be high stability types for optimum circuit reliability. T1 is a Radiospares midget type, 125-0-125V and 6·3V secondaries.

The little gadget described here is less complex than the oscillator type of detector but, once set, will give reliable service.

Modes of Operation

From the circuit diagram in Fig. 1 it can be seen that in one mode of operation the thyratron is operated on a.c.; by throwing a switch the circuit will run on d.c. This choice of operation is deliberate. If one intends to leave the house unattended for only a short time—to pop around the corner—it is better to select a.c. operation. The intruder, having had his warning, is now faced with one of two courses of action: (i) Clear off, muttering invectives, (ii) sit down and think out his next move.

If you're out for a short time you'll foil his second course and you will not have unduly annoyed your neighbours.

If you're off for the week-end, switch to d.c. operation. Once triggered the device will not let up until the police get the Electricity Board to disconnect your supply and then it is the duty of the force to protect your property until your return.

If one of these devices is hooked up to each external door, you might ask, how are you going to explain away the shocking noise you make each time you re-enter your own dwelling? The circuit in Fig. 2 shows how one door is provided with a touch detector having a bi-metal relay in the output circuit. The 30-40 second delay on this is long enough for a sober man to get his key in the lock, open the door and switch off the device before it starts the bell ringing. The remaining detectors in the house are switched off in the normal manner.

Layout Uncritical

There is very little to mention concerning the circuit. Layout of the components has been suggested in Fig. 3 but need not be adhered to so long as the valve is kept away from the other portions of the circuit such as the transformer, silicon diode and the 5% resistors. If the 2050 valve is used it will be found to run much cooler than the miniature 2D21. If the miniature valve is used, plenty of cooling holes should be drilled in the box within which the device is housed. One of the writer's detectors was built in a larger biscuit tin and one in a somewhat smaller one. Both tins were cleaned with spirit and then sprayed with aluminium paint to improve their appearance.

The valve socket is soldered directly into a small piece of biscuit tin and a lip is bent on the under side so that this can be soldered directly to the inside of the lid of the box.

Switch S2 can be a more fancy one-pole, two-way one, but an ordinary two-way type is satisfactory. A jumper wire is soldered as shown in the diagrams. S1 is not absolutely necessary since, once the device is operating correctly, the armature in the relay can be made to throw out by setting the switch S2 over to the a.c. position. S1 was left out in the second model. The type of relay used was not very suitable but with the 2kΩ wire-wound resistor in series and a little fiddling with the contact tensions no more trouble was experienced. A 1μF paper capacitor was tried instead of the silicon diode but this is not recommended. If a 5kΩ relay is available, or even a 4kΩ one, there should be no difficulty at all.

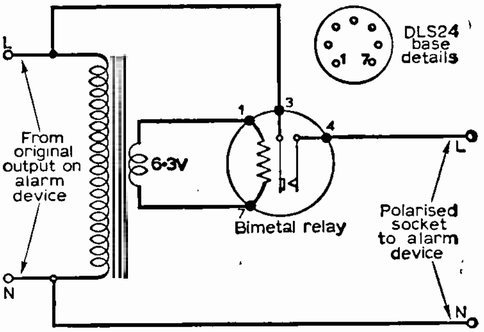


Fig. 2: Connections from unit to provide one door with touch detector.

In the prototype ordinary resistors were used after first using 50kΩ potentiometers to find the correct values in the resistor string across the secondary of the power transformer. Ordinary 20% resistors were useless; 10% were still unstable over a long period; 5% high-stability resistors provided complete reliability.

Mains Voltages

The house voltage in the writer's area is approximately 250V. Where this differs adjustments can be made so that the actual voltage on each side of the centre tap is around 120V. The most important thing is to get the two voltages—a.c. and d.c.—in agreement. The valve data book says the maximum grid resistor should be 10MΩ. With the low voltages and currents used here 15MΩ was found to be better. An interesting thing about the two valves is that whilst the 2D21 seems more sensitive its action does not appear to be so decisive as that of the 2050. It also runs very much hotter.

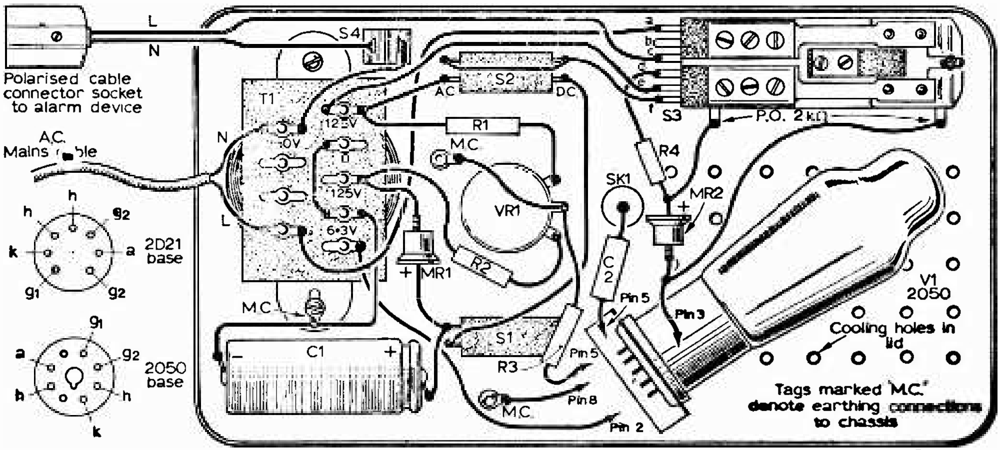


Fig. 3: Layout of components—from the 2050 unit shown in the heading photograph.

Testing the Unit

After the unit has been built it should be tested for positive action of the relay. Allow the set to warm up for about four or five minutes and then turn the 25kΩ potentiometer until the relay drops out. On touching the core of the coaxial cable at the end remote from the unit the relay should pull in smartly. If it is found that the relay prefers to operate the other way, i.e. prefers to stay pulled in and drops out smartly when the cable core is touched, the remedy is to change over the leads to the primary of the transformer. If this has to be done do not forget to change the leads over at the other end of the cable connectors to keep the polarities correct.

If preferred the delay unit can be built inside the same box as the alarm device. The way described in this article is quite useful as the delay section can be transferred from one unit to the other without in any way upsetting the rather critical setting of the units.

Once positive action has been obtained the final adjustment should be put off for about four days, during which time the unit should be left on in its assigned position. This will age the valve sufficiently and it is quite extraordinary how the unit will settle down after this initial cooking.

The proximal end of the cable shield will be grounded automatically through the coaxial plug and socket. The other end of the cable—and this should not exceed 4ft in length—has a crocodile clip soldered to the core and the braiding should be trimmed off and taped out of the way.

The mains cable should have a ground wire so that proper grounding of the unit may be effected through the house grounding system.

Exactly how the crocodile clip is connected to the door has to be found out by trial and error. Too close coupling will virtually short out a.c. hum on which this unit depends for its action.

In the writer's case it was found that a nail driven into the wood about ¼in. from the "lock" gave just about the right coupling for one unit, whilst the other unit required the nail to be placed about 4in. away from the lock.

Field Intensity

One point should be mentioned; make this unit is that it depends upon the a.c. field intensity in its vicinity. If this is altered by switching on lights in the same room—the hall—or, shall we say, using any lights carrying current along wires in the vicinity of the alarm unit, then the unit will have had its sensitivity altered.

In other words, final adjustment must be done with lights out and only the usual things working in the house such as the frig. and water heater. Once this is understood, and the unit adjusted under these conditions, one will be agreeably surprised at its reliability.

One point should be mentioned: make sure the d.c. output is about the same at the relay contact as the a.c. Otherwise sensitivity will not be the same and results disappointing.

Two of these units have been operating continuously for many months without any sign of instability.

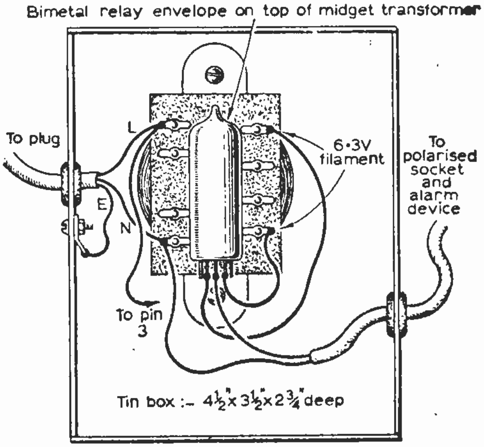


Fig. 4: Physical layout of the unit of Fig. 2.

In our area power failures are far more common than elsewhere and it was very necessary to make sure that the unit did not "play up" after the power had been returned. It was found that what really happened was that the unit lost its sensitivity for about ten minutes after "returning" the power and this whether the mode switch was set at "one shot" or "warning".

The third unit operating in the house is the one described by R. Bebbington in the November, 1963, issue of this magazine. This one gave a few false alarms, to my embarrassment, but settled down quite happily when its sensitivity was suitably reduced. Its only weakness is its power output—in noise. A push-pull class B maximum gain, maximum distortion amplifier(!) using two 6L6s in the output stage raised the noise level to a very nice 30W.

The a.c. hum field units drive a G.E.C. burglar alarm bell of very generous proportions, plus two powerful lights directed on to "the right places". The noise and bright lights are quite awe-inspiring! ■

FOR THE BEGINNER

Aerial Tuning Methods

GORDON J. KING

AN aerial is possessed of distributed inductance and capacitance. This makes it equivalent to a transmission line and thus in many respects it behaves like a tuned circuit. An aerial is said to be tuned when its length equals a half wavelength or a multiple of half wavelengths of the signal and when the aerial is "unearthed". With an "earthed" aerial tuning occurs when its length equals a quarter wavelength or a multiple of quarter wavelengths of the signal. Here, then, we have the fundamental conception behind half- and quarter-wave aerials.

Tuned Aerials

An aerial abstracts signal energy from a passing radio wave. If the aerial is of a length equal to the wavelength of the signal, then a complete wave of electrical current is induced into it, as shown in Fig. 1. Here it will be seen that wave A-B is identical to wave B-C but of opposite sign. Thus, a complete current change can be accommodated in an aerial whose length is half that of the aerial in Fig. 1. This is shown in Fig. 2 and is representative of the half-wave aerial. The aerial is unearthed in this case.

An earthed quarter wave aerial works in a similar manner, but the missing second quarter-wave section is produced by a reflection in the earth of the first quarter-wave section. This is called an "image" aerial. The joint action of a quarter-wave aerial and its image is the same as that of an unearthed half-wave aerial. The image effect is depicted in Fig. 3.

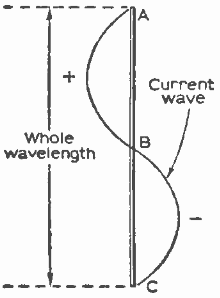


Fig. 1 (left): A current wave of the nature illustrated here is induced into an aerial which is adjusted in length to suit the wavelength of the signal.

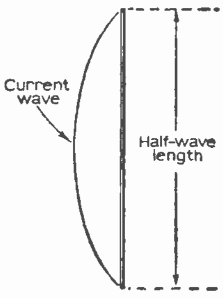


Fig. 2 (right): Since a complete change of current occurs both at A-B and B-C in Fig. 1, an aerial tunes when its length accommodates a half of a whole wave, as this diagram shows.

V.h.f. aerials for radio and television are usually of the half-wave variety, since they are not normally earthed. This means that the overall length of the aerial corresponds to half the wavelength of the v.h.f. signal. In practice, the length of the aerial is not exactly half the wavelength of the signal because the velocity of the radio wave on being induced into the aerial is reduced slightly. This is corrected by arranging for the physical length of the aerial to be about 95 per cent of the signal half wavelength. That is, by making the aerial 5 per cent shorter than the signal half wavelength. Thus, to tune to a wavelength of, say, 10 metres, a half-wave aerial would need to have a physical length of about 9·5 metres.

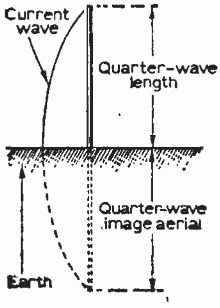
Simple Calculations

Radio waves in free space have a velocity of 186,000 miles per second, equal to 300,000,000 metres per second. The signal wavelength then, is really a measure of the distance that a full radio wave travels in one second. Since we know the wave velocity, therefore, we can easily find the wavelength by dividing 300,000,000 by the signal frequency in cycles per second (c/s). The answer is in metres.

We can ease the calculation at v.h.f. by crossing off six noughts at the top of the equation and working in megacycles per second (Mc/s) at the bottom instead of in c/s. Remember, here we are dealing in whole wavelengths. The length of a tuned unearthed aerial is 95 per cent of half the wavelength value so calculated. Let us try a simple example.

Say the signal frequency is 150Mc/s (in the v.h.f. spectrum). The wavelength of that signal is thus 300/150, or 2 metres. Half is 1 metre, and 95 per cent of this is 0·95 metre, which is the length of a half-wave aerial that would tune 150Mc/s. Easy?

Incidentally if we want to work in feet we should multiply the length in metres by 3·281 or in inches multiply by 39·37. Thus, the 0·95 metre aerial illustrated above is equal to 3·117ft. Using



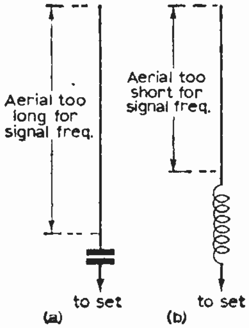


Fig. 3 (left): A quarter-wave aerial which is effectively "earthed" at one end behaves as a half-wave aerial by virtue of the quarter-wave "image" of the real aerial reflected by the ground.

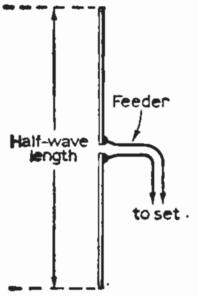
Fig. 4 (right): The inductive element of an aerial which is too long for the signal can be tuned out by series capacitance, as shown at (a), while the capacitive element of an aerial which is too short for the signal can be tuned out by series inductance, as shown at (b).

the above arithmetic, a formula for calculating the length of an aerial in feet direct is length in feet equals 468/frequency in Mc/s. Of course, it follows that a quarter-wave aerial is exactly half the length of a half-wave one.

Just one more thing here and that is since the wavelength of a signal is equal to the wave velocity divided by the frequency, the frequency of a signal is equal to the wave velocity divided by the wavelength. This simply means that by dividing 300 by the wavelength in metres we are given the frequency in Mc/s, or by using 300,000,000 at the top the answer is in c/s.

Tuning Artifices

So far so good but what if one wants to operate an aerial over a range of signal frequencies? The obvious solution is to arrange for the aerial to be adjustable in length so that it can be tuned accurately to any particular signal frequency or wavelength. This is done in fact, where optimum radiation (in the case of a transmitting aerial) or signal pickup is demanded. Often, however, a number of aerials are used which can be switched to the transmitter or receiver to suit the sending or received signal frequency.



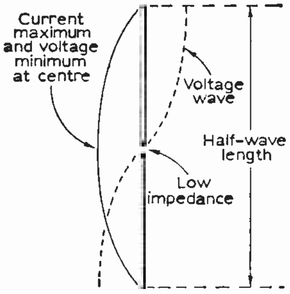


Fig. 5 (left): A half-wave aerial is generally split in the centre to take the feeder, as shown here.

Fig. 6 (right): The voltage and current distribution in a tuned half-wave aerial. The impedance at the centre is low and at each end high.

There is another way of handling the problem which is based upon the fact that if an aerial is not exactly the correct length for resonance, it can be resonated by adding series inductance if it is too short or by adding series capacitance if it is too long. The idea is shown in Fig. 4. This tuning idea is derived from the fact that a signal voltage applied to an aerial will encounter a capacitive reactance at frequencies just below resonance and an inductive reactance at frequencies just above resonance. Thus, the series inductance neutralises the capacitive reactance of too short aerials, while the series capacitance neutralises the inductive reactance of too long aerials. When an aerial is correctly tuned its loading point looks like resistance.

An aerial resistance or impedance stems from the fact that, apart from a current component of the abstracted signal, it also has induced into it a voltage component. Thus, the resistance or impedance is given by the voltage at any given point divided by the current at the same point. This means that the resistance or impedance is low when the voltage is low and the current high and high when the voltage is high and the current low.

An unearthed half-wave aerial is often disconnected electrically at its centre, at which point a connection is made to the feeder as shown in Fig. 5. This is known as the half-wave dipole. Dipole because the aerial is then in two sections "di" (two) "pole" (sections). When an aerial is so arranged the impedance at the centre is low because the current is at maximum and the voltage at minimum as shown in Fig. 6.

Impedance

The actual impedance offered by an aerial to a series voltage is influenced by various factors, including frequency ground losses, type of aerial, length and so forth. However, the impedance at the centre of a tuned half-wave dipole is in the order of 75Ω. This point thus represents a good match to 75Ω coaxial feeder or twin feeder. The transference of signal to or from an aerial is governed by the matching, the closer the match the better the transference. A serious mismatch loses signal power because the signals are then reflected up and down the feeder and tend towards cancellation.

The impedance at the end of a tuned aerial is high, in the order of thousands of ohms, because here the voltage is high and the current low. The impedance at the "earthed" end of a quarter-wave "earthed" aerial is also low, comparable to that at the centre of an "unearthed" dipole. Quarter-wave aerials are often used with mobile radio communication systems on cars. Here the metal body of the car represents the earth and it is in this that the aerial image is reflected.

An "earthed" aerial should not be taken to imply that one end is really connected direct to earth. It simply signifies that the missing quarter-wave section is made up either by the earth itself or by the mass of metal (such as the metal body of a car) by virtue of the image effect described earlier. Connection to a so-called earthed quarter-wave aerial is shown in Fig. 6.

Ordinary car radio aerials are not normally tuned in terms of length. Car radios and transistor sets operated in cars tune over the l.w. and m.w. bands. Of course it would be impossible to employ a half- or quarter-wave aerial tuned by length to such long wavelengths. The loss of efficiency by the use of an aerial of considerably shorter length than the signal half or quarter wavelength in such cases is countered by the use of high gain r.f. and frequency changer stages in the sets themselves.

The same really applies to domestic radios which work from short lengths of aerial wire. There is no real tuning in the aerial itself but sometimes "loading coils" are used in the aerial circuit particularly on the l.w. band, to enhance the signal transference from the aerial to the first stage in the set.

Tuning by Inductance

It is possible dramatically to improve the performance of a car radio or transistor set working in a car from a short, outside car-type aerial by loading or tuning the aerial with series inductance and then adjusting the length of the aerial to resonance at the required frequency. This gives the condition depicted in Fig. 4b.

For m.w. applications such a coil can be wound on a length of ferrite rod and then introduced between the bottom of the aerial and the set as shown in Fig. 8. A practical coil of this nature can consist of 120 turns of 20 s.w.g. enamelled covered wire close wound on a 4in. ferrite rod of ⅜in. diameter. When connected in the aerial circuit as shown in Fig. 8 the length of the telescopic aerial should be adjusted with the set tuned to a weak m.w. station at the top of the band (round Radio Luxembourg area) for maximum pick-up.

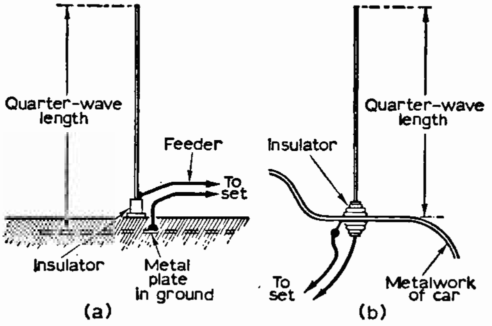
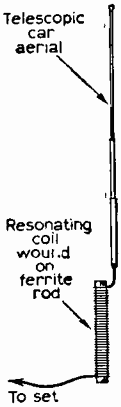


Fig. 7: Connecting a feeder to a quarter-wave "earthed" aerial. At (a) a connection is made to a metal plate in the ground, beneath the aerial, while at (b) the metal body of a car, for instance, is used instead of an earthed plate.



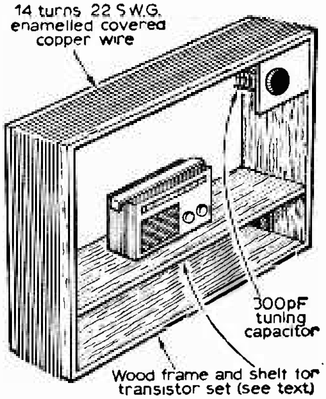


Fig. 8 (left): An inductor connected at the end of a telescopic aerial can be used to improve reception. The system is then tuned by adjusting the length of the telescopic aerial when the set is tuned to the required station. Details of the "resonating coil" are given in the text.

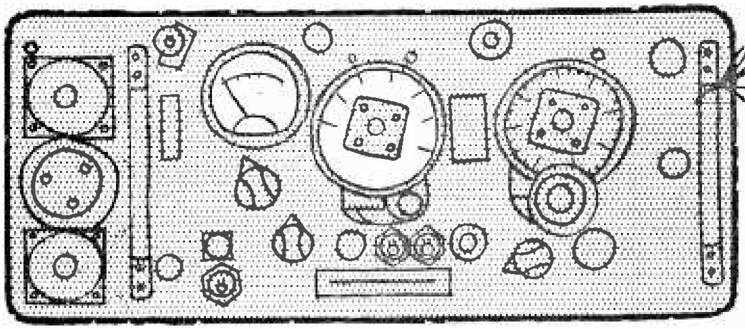
Fig. 9 (right): Greatly improved performance of small transistor portables on distant or weak stations is possible by placing the set in a tuned loop, as shown here. Details are given in the text.

On the s.w. bands a too long aerial can be peaked on any particular station by connecting a variable capacitor of 300pF in series with the aerial at the set end, giving the condition as shown in Fig. 4a. The capacitor should be adjusted for maximum response.

Tuned Loop

Transistor sets feature ferrite rod aerials of high efficiency the coils on which are tuned by the r.f. section of the two-ganged capacitor. There are times, however, when a greater signal pick-up would be desirable, especially at the high-frequency end of the m.w. band. This can often be achieved without the use of an external aerial or amplifier by running the set itself within a tuned loop as shown in Fig. 9. The loop is wound on a wooden frame with a shelf inside upon which the transistor set can be stood. For normal m.w. reception the loop should consist of 14 turns of 22 s.w.g. enamelled covered copper wire the ends of which are connected across the tags of a single section 300pF tuning capacitor. This can be mounted on a small wooden panel in one corner of the frame as shown in the diagram. A suitable overall size for the frame is 18in. x 18in. x 6in., though the width is really governed by the dimensions of the transistor set, for the 14 turns of wire take up very little space.

The set is placed in the loop as shown and both the loop and the set orientated for maximum pick-up. The loop tuning capacitor is then adjusted for maximum boost. ■



No 19 SET MODS

by S. Simpson

Part 1

W.S.19, Mk. 3, now widely available from dealers in Government surplus equipment, was employed by the Army as communications equipment for use in tanks. It is of rugged construction and contains an intercom amplifier, a v.h.f. transceiver, an h.f. transmitter, and a corresponding five-valve superhet receiver. This receiver is the subject of the following modifications; when modified, it becomes a nine-valve (including rectifier) receiver comprising two r.f. stages, mixer, two i.f. stages, detector/avc/first a.f. stage (which can be tapped for head-set operation), output stage and beat-frequency oscillator. The frequency ranges, 2Mc/s to 4·5Mc/s and 4·5Mc/s to 8Mc/s, are unchanged. Power is obtainable from 240V a.c. mains.

This article is not suitable for a novice, unless he is prepared to "write off" the cost of his W.S.19 as "gained experience" if he fails to cope with the job. It is written for the amateur who has built one or two receivers and other equipment using valves, and has overcome the snags which perhaps arose. He must have access to a fine-pointed soldering iron, a comprehensive test meter, a reasonable workbench with adequate light on which the receiver can be left undisturbed (this is not a "one-evening" job) and a power supply giving 6·3V at about 3A, and 200V at about 50mA. An existing *a.c.-operated* receiver can be put to use, as described later.

Components

One or two additional components will be required. These are:—

(1) Mains transformer giving 250/0/250V, 50mA, 6·3V at 3A, 5V at 2A. The transformer should have above-chassis mounting facilities.
(2) Smoothing choke, approximately 10 Henries at 50mA. Under-chassis mounting and of small dimensions as space is limited.
(3) 8 + 16μF, 300V working, electrolytic capacitor. Under-chassis mounting; space is limited.
(4) 5Z4 or 5Z4G rectifier.
(5) Approximately twelve resistors.
(6) Two single-circuit telephone jacks; one socket.
(7) One 3Ω impedance permanent-magnet loudspeaker.

Quantity insulated single-lead flex (nine different colours are very desirable); quantity twin p.v.c. flex; approximately 3ft. coaxial lead.

The Procedure

The procedure adopted by the author was:—

(1) an initial check of the receiver as found;
(2) carry out one of a series of modifications, then check that the receiver is still operational;
(3) continue with the next modification, check, and so on.

The reader will find that he covers some ground more than once; the reason is apparent when one studies the complexity under the W.S.19 chassis. If a lot of the work is attempted at one go, only an experienced amateur will extricate himself from the tangle of snags he will probably set up. "little and often" is a much better policy when dealing with W.S.19.

The Modifications

The series of modifications is carried out in the following order:—

(1) Conversion of valve heaters circuit; initial check.
(2) Removal of send/receive relays and restoration of affected h.t. circuits; check receiver.
(3) Inclusion of headset output; check.
(4) Restoration of a.v.c. } Carried out as one modification prior to checking receiver.
(5) Restoration of b.f.o. note control. }
(6) Inclusion of additional r.f. stage; check.
(7) Inclusion of loudspeaker output stage; check.
(8) Inclusion of band-spreading; check.
(9) Inclusion of mains power supply; no check possible at this stage.
(10) Modification to A SET, B SET, and I/C switch assembly to provide "mains on" and "h.t. on" control, also headset sockets check.
(11) Inclusion of monitoring system; check.

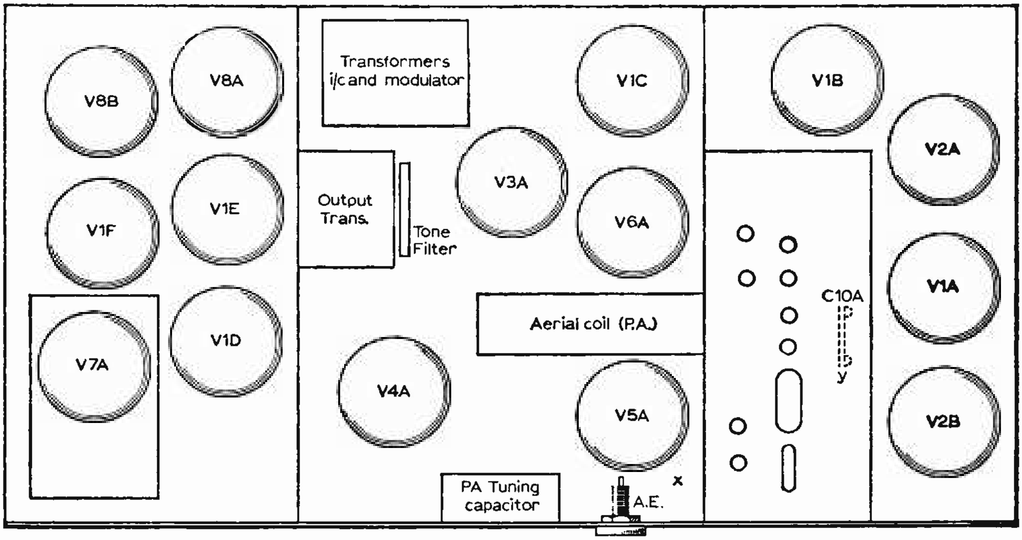


Fig. 1: Topside chassis layout before modification.

Illustrations

The reader should study the illustrations provided in this article in conjunction with the W.S.19 as found. No attempt has been made to produce an accurately-dimensioned drawing of the topside of the chassis, nor to include all of the assembly, but identification of the parts concerned should be quite easy.

The underside view (Fig. 2) shows all valve sockets concerned and their orientation, also the locations of certain terminal strips and existing components mentioned in the modifications. It also shows as shaded rectangles, the positions of additional components. An overall circuit diagram of the modified receiver is not given. The original heater circuit is given in Fig. 3 and compared with the modified version.

Time Involved

One is often asked, "How long will the job take?". The answer can only be based on certain assumptions. Given a fairly intelligent amateur possessing more than basic knowledge and the necessary tools, and working two hours nightly, he should complete the work in approximately ten days. The individual reader must apply this "yardstick" to his own ability.

Making a Start

The work begins by checking the "found" condition of the receiver, and the valves.

(1) Remove the securing screws and remove the chassis from its outer case.

(2) Remove all valve screens, including the cover over the v.h.f. section; note that the cover carries a valve-location plan and check it agrees with Figs. 1 and 2.

(3) Remove all valves; check the following starred valves are present and usable:—

★V2B	6K8	★V3A	6Q7	V8B
★V1A	6K7	V6A		V1E
★V2A	6K8	★V5A	6K7	V1F
★V1B	6K7	V4A		V1D
★V1C	6K7	★V8A	6V6	V7A

(4) Check that the general mechanical condition of the receiver (controls, switches, etc.) is apparently sound.

Initial Check: Heaters

The initial check involves changing the heater circuit from the original (Fig. 3a) to that shown in Fig. 3b; thereafter, an external power supply is used to check that the receiver, as found, is operational.

(1) Study Fig. 3a, then, by a zero ohms check, ascertain which heater pins are, in fact, earthed. Note these on Fig. 2.

(2) Proceed with interconnections shown in Fig. 3b.

(3) At the "A SET, B SET I/C" switch assembly (hereafter "3-switch assembly"), loosen the securing nut at each switch.

(4) Remove four 6BA ch.hd. screws passing through the assembly plate. Undo the switch securing nuts completely, then remove the plate. The DPDT switches and associated wiring are now accessible. (This procedure is necessary because of the very limited wiring to these switches.)

(5) Check A SET is switched off (toggle upward). Check for zero ohms between pin 3 on PL2 (lower plug on left front of panel) and the upper contacts of A SET. (Pin 3 carries LT+).

(6) Switch A SET on and check for zero ohms

between PL2, pin 3 and the appropriate lower contact on A SET. If the switch is erratic replace it and wire as found. (One of these wires is cut away at the next operation: read the step below before wiring).

(7) Having found the appropriate l.t. contact, sever the wire (lead "a" in Fig. 3a). Solder a new lead ("b", Fig. 3b) between the l.t. contact and the "live" pin on V5A. The lead should be capable of carrying 3A without undue loss.

Initial Check: H.T. Supply

Check the h.t. line as follows:—

(1) Check for zero ohms between PL2, pin 6 (h.t. input) and the remaining unchecked contact on the upper side of A SET, with the switch "off".

(2) Check for continuity across the switch to the relevant contact with A SET switched "on".

(3) Check for zero ohms between PL2, pin 6 and tag 9 on TS1 (Fig. 2). Disconnect the meter and refit the 3-switch assembly.

Initial Check: Power Supply

A 6·3V 3A a.c. supply, together with approximately 200V h.t., are required. Sources will, of course, vary, but it is assumed the reader has the knowledge and ability to adapt the power supply in an existing *a.c.-operated* radio, radiogram, etc., to his needs. The chassis of the adapted source should be connected to W.S.19 chassis, the h.t.+ line to PL2, pin 6, one 6·3V line to PL2, pin 3, and the remaining line to W.S.19 chassis. Caution must be taken to guard against crossed earths short-circuiting the 6·3V supply; if the adapted source carries dial lamps, crossed earths will be shown up by failure of the dial lamps to light.

The W.S.19 will withstand 280V, but an attempt should be made to reduce h.t. to approximately 200V by use of a voltage dropper; the W.S.19 end of the dropper will require at least 8μF bypass capacitance to W.S.19 chassis.

Initial Check: Operation

With the adapted power source switched off, proceed as follows:—

(1) Temporarily fit two crocodile clips to the headset-cord connections. Clip one to W.S.19 chassis and the other to one lead of a 0·01μF, 300V capacitor. Connect the free lead of the capacitor to the white lead of the output transformer (Fig. 1).

(2) Fit the starred valves (referred to earlier) to the relevant sockets.

(3) Connect a reasonably efficient aerial to the A set AERIAL plug. An earth is helpful but not essential. Turn up A.F. GAIN and R.F. GAIN.

(4) Connect a voltmeter to read 300V maximum between W.S.19 chassis (negative) and PL2, pin 6.

(5) Don the headset. Switch on A SET. Switch on the adapted power source.

(6) Check that the valves in W.S.19 are alight. Watch for h.t. at the voltmeter; before this rises to a maximum the output of the receiver should be audible. If it is not, check that the M.C.W., C.W., R.T. switch (hereafter

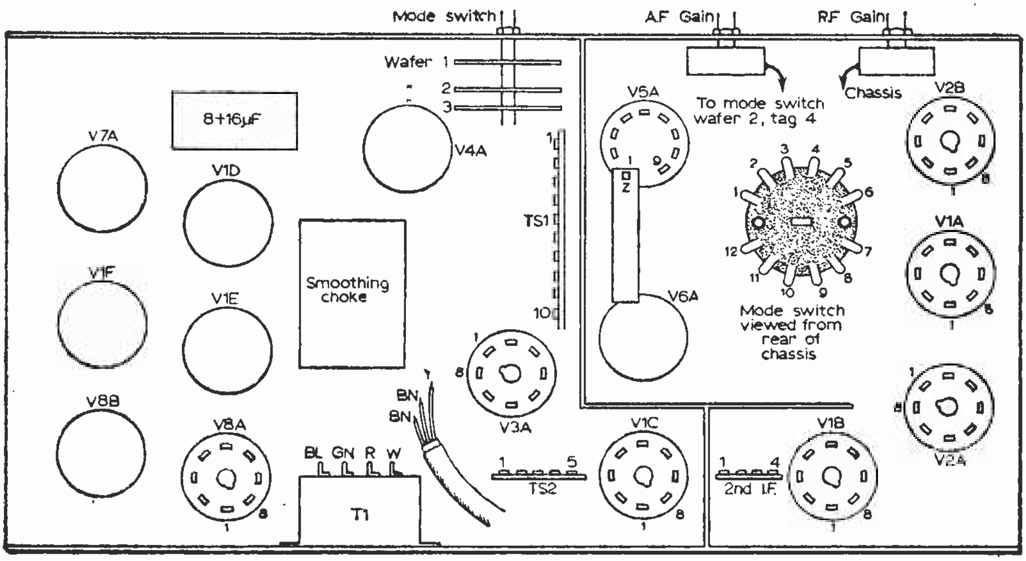
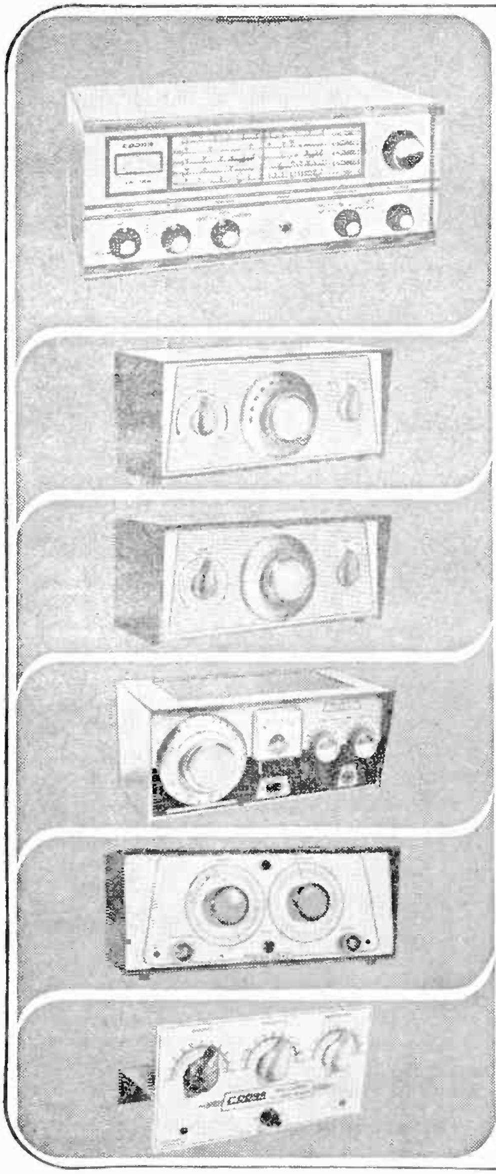


***Fig. 2:** Layout of valve sockets (underside). The additional components are the 8+16uF capacitor, smoothing choke and T1.*

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 lineup. 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. Superb styling, metal cabinet in the new Organasol Satin lustre finish. Size 13" x 5¾" x 7¾". For A.C. 200/250 v. 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 1.5–30Mc/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, 0.3 amp L.T. Size 8¼ 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 8¼ x 5 x 4in. Power requirements 180–250v. H.T. at 5mA 6.3v. 0.3 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 8¼ 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 4/9 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 4/9 each. Instruction Manual only 2/- (credited on order). Electrical Bandspread available. Provision to add 2 transistor amplifier.

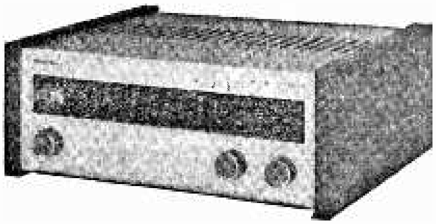
SEND 6d. IN STAMPS FOR ILLUS. LEAFLETS OF THE CODAR RANGE • H.P. TERMS AVAILABLE • WORLD-WIDE MAIL ORDER SERVICE

CODAR RADIO COMPANY

BANK HOUSE, SOUTHWICK SQUARE
SOUTHWICK, SUSSEX. Tel. 3149
G3IRE G3HGQ

Canada: Codar Radio of Canada, Tweed, Ontario.

TUNE TO



Armstrong

A 223 AM-FM Tuner, shown above, or a 224 FM Tuner will enable you to take full advantage of the wonderful source of quality sound FM broadcasts offer. Matching any high fidelity amplifier (including our models 221 and 222) they are self powered and only need the simple addition of an Armstrong Multiplex Decoder for stereo broadcast reception. Tuning is by meter with complete freedom from drift, and the units may be built into your own cabinet or housed in our handsome case of teak and vinyl hide (as shown). For full details and technical specifications of all models, plus lists of over 300 stockists, post coupon or write mentioning 3PW66.

model 223 AM-FM TUNER	£28.15.0
model 224 FM TUNER..........................	£22.10.0
optional case for either model	£3.10.0

ARMSTRONG AUDIO LTD, WARLTERS RD, N.7.
Telephone: NORth 3213.

Name ....

Address ....

....

3PW66

Make Your Ability PAY

UNLIMITED OPPORTUNITES 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 and Water Colour
BUILDING & CIVIL ENG'NG
Architecture, Bricklaying
Building Construction
Builders' Draughtsman
Builders' Quantities
Interior Decoration
Quantity Surveying
Heating and 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 and 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
Electrician's
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..

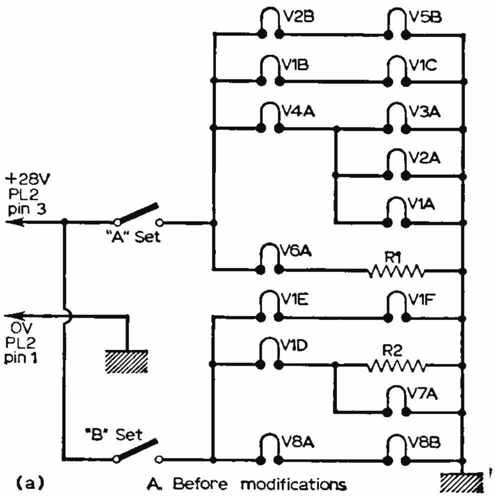
Address..

....

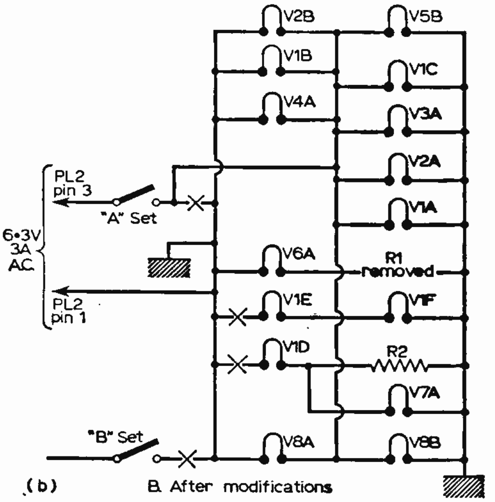
Occupation ....

3.66

INTERNATIONAL CORRESPONDENCE SCHOOLS



(a) A. Before modifications



(b) B. After modifications

Fig. 3: The heater circuitry (a) before modifications (b) after modifications.

"mode" switch) is at R.T. If the headset is still silent, transfer the 0·01μF capacitor lead from "white" to "blue" on the output transformer.

(7) Check A.F. GAIN and R.F. GAIN are operational. Check for noisy valves. Set the mode switch to C.W. and check that the beat-frequency oscillator (b.f.o.) is operational. (Note that maximum R.F. GAIN can swamp the b.f.o.; reduce R.F. GAIN if this trouble is found). Check the b.f.o note-shift control is operational (the change of note in the author's version is very slight).

(8) If all is well, switch off the adapted power source, then A SET. Disconnect the headset from the capacitor and chassis; leave the capacitor in position. Disconnect the power supply leads but do not discard the arrangement as it will be necessary in further checks. Modification can now begin.

Removal of Send/Receive Relays

These are two relays mounted on a common bracket under the chassis. These are removed to provide room for power supply components. Since these relays carry certain h.t. leads to the receiver section, elimination of the relays is followed by restoration of necessary h.t. circuits, and a receiver serviceability check. Proceed as follows.

(1) Cut away all wiring to the relays; soften the locking varnish at the bracket holding screws by wetting with methylated spirit. Remove the screws.

(2) Switch on A SET. Check for zero ohms (approximately) between PL2, pin 6, and TS1, tag 9 (Fig. 2). Switch off A SET.

(3) Connect one ohmmeter lead to pin 6 on V1C (occupied by junction of two resistors). Connect the ohmmeter free lead in turn to each red or orange lead in the group coming from the vicinity of V1C (these leads were cut away from the relays) and check for zero ohms.

(4) Connect the lead so found to TS1, tag 9. Connect the ohmmeter to tag 9 and on high ohms range check for continuity at the screen grids (pin 4) of V1A, V1B and V1C. Restore cut connections, if any, by checking backward from the affected valve.

(5) Restore R.F. GAIN by earthing the central contact to an adjacent tag in the screened compartment of the waveband switch.

(6) Recheck the receiver, at present operational without A.V.C. and B.F.O.

Inclusion of Headset Operation

This modification converts V3A, into an A.F. amplifier to drive an output valve. From its anode, a feed to a headset is provided.

(1) Cut all wiring away from the modulator transformer, intercom transformer, and output transformer. Remove these components; keep the output transformer handy.

(2) Remove all wiring to V4A socket; remove the socket (secured by two 4BA screws into stand-off pillars).

(3) On the mode switch, wafer 2, pin 4 (Fig. 2), locate a screened lead passing to V3A control grid. Extend the connection from pin 4 to include pin 3, also on wafer 2.

(4) At A.F. GAIN control, connect the centre contact to wafer 2, pin 4, mode switch.

(5) Connect a 47kΩ, 1W resistor between TS1 tags 5 and 9. Cut short the existing mauve wire on tag 5.

(6) A tubular 0·01μF capacitor exists at tag 5. The other lead of this capacitor terminates on a tag below tag 4. (TS1 is a double-row connector strip). To this tag, 4A, connect one lead of a 4in. piece of flat, twin flex.

Earth the remaining lead on tag 3. This twin lead will eventually carry phone output.

(7) Remove the 3-switch assembly. Cut the wiring to the I/C switch and remove the switch. In its place, fit a single circuit phone socket (not self-shorting).

(8) Connect the phone output lead to the socket, then refit the switch assembly (hereafter "2-switch assembly").

(9) As found, the mode switch, when set to "C.W.", disconnects h.t. from V3A screen grid. To prevent this, connect TS1 tag 7A (lower row, under tag 7) to TS1 tag 9.

(10) Connect the headset clips to a phone jack, insert the jack into the phone socket, then recheck the receiver which is at present without A.V.C. and B.F.O.

Restoration of AVC and BFO

Removal of the relays interrupted the A.V.C. and B.F.O circuits. Restore them as follows.

(1) Locate a severed 3-wire cableform (Brown, Brown Yellow) passing close to the left of TS2 (looking from rear of the inverted chassis).

(2) Check for zero ohms between TS2, tag 4 (Fig. 2) and one of the brown leads.

(3) Extend the brown lead so found to wafer 3, tag 11 on the mode switch (include unused tag 8 when counting). Cut away any WS19 wiring existing on tag 11.

(4) Check for zero ohms between the yellow lead of the severed cableform and tag 3 on the 2nd i.f. transformer connection strip (Fig. 2).

(5) Extend the yellow lead to wafer 3, tag 2 of the mode switch, first cutting away existing wiring.

(6) Strap wafer 3, tags 12 and 1 and earth at TS1, tag 2.

The receiver can now be checked if desired, but B.F.O. is still absent. To restore B.F.O., continue as follows.

(1) Locate A NET switch on the extreme right of the panel face. Ensure the dolly is *upward* to prevent misleading results of ensuing checks.

(2) Set the mode switch to C.W., then unship the mode switch (held by two 4BA ch. hd. screws passing through the panel).

(3) Locate a mauve wire on wafer 2, tag 8. Check for zero ohms between this tag and V2B, pin 1.

(4) Also leaving tag 8 is a second mauve wire, part of a cableform including two whites, one yellow, one green, one red. All but the mauve lead will have been cut in earlier steps. Locate the red lead and check for zero ohms to TS1, tag 9.

(5) Solder the red lead to wafer 2, tag 10. With the A NET switch still *dolly upward,* check for zero ohms between TS1, tag 9 and V2B, pin 1. Set the mode switch to RT and check continuity between TS2, tag 9 and V2B, pin 1 is broken.

(6) Refit the mode switch; check the receiver for RT and C.W. operation. Note that M.C.W. position now behaves as C.W. position.

(Note . . . The A NET switch can bring in B.F.O. if switched dolly downward, independently of the mode switch. If this is considered undesirable, one lead to the A NET must be cut, but the switch is difficult of access).

I.F. Stages

Some receiver i.f. transformers have been modified by the services to give increased i.f. bandwidth. 100kΩ resistors were wired across both primary and secondary windings, and if visible on the underside of the i.f. transformers they should be removed.

Inclusion of Additional R.F. Stage

The receiver, as it now stands, has one r.f. stage. An additional stage can be obtained by making use of V5A (originally a buffer stage in the transmitter section and which is tuned to signal frequency by one section of the four-gang variable capacitor). Proceed as follows.

(1) Cut out all of the transmitter power amplifier wiring and remove all components other than the P.A. TUNING capacitor; a later modification involves this item. (See Fig. 1).

(2) Remove V5A. At point x, drill the chassis to pass a 15in. length of thin coaxial cable. Solder one end of the coaxial to the contact on AERIAL A plug (now freed by removal of wiring).

(3) Thread the coaxial up and between the A.F. GAIN control and chassis, over the threaded bush of the waveband switch, past the B.F.O. note control, under the adjacent pre-set capacitor, and terminate on a 100pF mica dielectric capacitor to be soldered to V2B, pin 3. If uninsulated cable is used, take precautions against short circuits where necessary.

(4) A similar coaxial lead is required between V6A, pin 5 and tag y on a 2-way strip fitted to the 4-gang capacitor (the tag-strip is located directly under the reference "C10A"). A route for the lead can be obtained through a screw-hole formerly used in supporting the P.A. tuning inductor; access to tag y is available at a grommet on the side of the 4-gang capacitor. Earth the coaxial sheath at pin Z on the inductor adjacent to V6A (see Fig. 1).

(5) The h.t. supply to V5A was severed at the relays. Restore it by connecting a lead to TS1, tag 9, pass the lead through a hole in the screen near to pin Z (see sub-para. 4) and connect it to the second tag clockwise from pin Z (looking along the inductor towards the panel). Be careful not to damage the inductor.

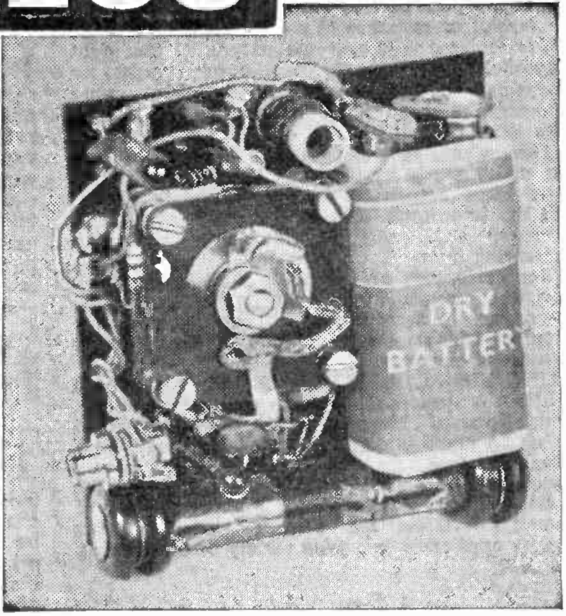
(6) Refit V5A. Do *not* fit V6A. Check the receiver as before and note that it is now possible to overload the receiver if the R.F. GAIN is set to maximum.

TO BE CONTINUED

PRACTICAL WIRELESS

SPECIAL IN NEXT MONTH'S ISSUE!

How to build the REFLEX 2 TRANSISTOR RECEIVER



Actual size

Simple step-by-step assembly instructions for building this specially designed 2-transistor 4-stage pocket radio receiver. Twin-gang tuning for added selectivity and sensitivity. Output suitable for crystal earpiece. Eyeletted circuit board for easy construction.

PLUS:

Privilege Price Book Offer

RADIO & TELEVISION REFERENCE DATA

for only 5/- (value 10/6)

Make sure of this invaluable book, packed with essential reference you'll use again and again!

Other Outstanding Features:

FREQUENCY METER/REV COUNTER

A useful dual-purpose instrument which can be used as a direct frequency meter (10c/s-1Mc/s) or as car engine revolution counter.

EL-KEY

Describes the electronic and mechanical construction of a versatile "bug" key. Controls are provided for time intervals of spaces, dashes, dots and overall speed.

EF91 PREAMP

How to construct a simple audio preamplifier and tone control unit, using the readily obtainable EF91 valve.

ORDER NOW!

Hand this Form to your Newsagent

To ________________________________ *(NAME OF NEWSAGENT)*

Please reserve/deliver the April issue of PRACTICAL WIRELESS (2/-), on sale March 3rd, and continue until further notice.

NAME ________________________________

ADDRESS ________________________________

BOOKS REVIEWED

UNIFIED CIRCUIT THEORY IN ELECTRONICS AND ENGINEERING ANALYSIS.

By J. W. Head, M.A., Cantab., F.Inst.P., A.M.I.E.E., F.I.M.A. and C. G. Mayo, M.A., B.Sc., M.I.E.E.; published by Iliffe Books Ltd.
174 pages, 8¾in. x 5½in. Price 42s.

THE purpose of this book is to show how the output or response of a linear system may be formulated whatever the nature of the input may be. Steady state conditions present no mathematical difficulties but decidedly more advanced techniques are required when dealing with the non-steady state.

The authors have a very easy style and, taking the reader gently by the hand, they show that the basic ideas associated with operational calculus and the impedance concept are extremely simple to grasp and, once understood, have a high "resolving power".

The early part of the book is concerned with electrical circuits having lumped elements; the latter part is more theoretical and extends the circuits which are still linear but contain distributed elements.

UNIFIED CIRCUIT THEORY has been written by practical mathematicians in simple, straightforward language with the purpose of providing practising engineers and students with a powerful tool for evaluating linear circuit responses irrespective of the input. Although the examples are expressed mainly in terms of electrical systems the methods employed are equally applicable to a wide variety of other fields. —*C.R.R.*

NON-LINEAR AND PARAMETRIC PHENOMENA IN RADIO ENGINEERING.

By A. A. Kharkevich—edited by Keats A. Pullen, Jr., Eng.D., published by Iliffe Books Ltd.
190 pages, 8¾in. x 5½in. Price 35s.

THIS book was originally published in Russia, where the author is currently Professor of Theoretical Radio Engineering at the Moscow Electrotechnical Institute of Communications, the book was subsequently translated, edited and brought up to date in the USA.

It is an extremely clear and interesting introduction to the theory of non-linear systems and its practical application to typical electronic problems. It opens with a chapter on non-linear circuits and fundamental non-linear processes, and amongst other things deals with voltage and current stabilisation, frequency multiplication, rectification, detection, and non-linear methods of amplitude modulation. The second chapter deals with the generation of oscillations, stability criteria, and various types of oscillator including those for micro-waves. The third chapter is concerned with the response of non-linear systems to external signals: rectifier operation, locking, the regenerative receiver, pulsed synchronisation and synchronisation of a relaxation oscillator.

The final chapter, which discusses circuits with variable, time-dependent, parameters, is of particular interest at the present time when variable-parameter devices having high quality characteristics have opened up new vistas in solid state electronics.—*C.R.R.*

TRANSISTORS IN LOGICAL CIRCUITS.

By J. Ph. Korthals Altes, published by Iliffe Books Ltd.
117 pages, 8¾in. x 5½in. Price 16s.

HERE is another addition to the Philips paperback series (P11). It covers in a basic form the field of modern switching techniques, starting whenever possible with known relay switching techniques and introducing those using semiconductor devices. The various chapters deal with concepts of switch algebra, the binary system, transistor switching, and-or-not operation, counting switch circuits, arithmetical operations, applications and practical hints. For those becoming interested in computors or measuring and control techniques this book offers a useful introduction. —*W.N.S.*

PICK-UPS: THE KEY TO HI-FI.

By J. Walton, published by Sir Isaac Pitman & Sons Ltd.
100 pages, 7¼in. x 5in. Price 10s.

THOUGH small physically this is a most useful little book, packed with information, advice and guidance. Writing is concise, making the most of the space available. The preliminary chapters cover material to be found elsewhere to be sure (fundamentals of recording and playback, principles of pick-ups, etc.), but the second half of the book deals exclusively with practical aspects of pick-up ills and cures and outlines in a very readable and lucid manner tests, causes and cures for these ailments.

Without a doubt anyone about to invest in a new pick-up, or who has trouble with his existing one, or—indeed—anyone interested in more than a casual way with hi-fi reproduction will find the price of this book a "sound" proposition.—*W.N.S.*

CIRCUITS USING DIRECT CURRENT RELAYS.

(Philips Paperbacks Series). By A. H. Bruinsma; published by Iliffe Books Ltd.
86 pages, 8½in. x 5¾in. Price 13s. 6d.

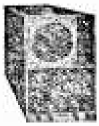
IN modern electronics the technician looks for simple and yet reliable circuits to solve his switching and amplifying problems. The relay still plays an important role in the solution of such problems, for although new devices now exist for replacing relays new opportunities for their use have also arisen during the past decade.

This book gives an insight into a number of uncommon circuits which have already proved themselves in practice and the possibility of applying d.c. relays in commanded or programmed sequence circuits is fully explained. The circuits are dealt with in such a way that the reader may obtain a great understanding of the properties of the relay without the use of complicated mathematics.—*C.R.R.*

Build a Heathkit model—
—*and save money*

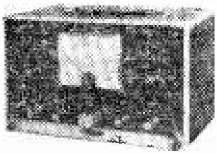
A KIT FOR EVERY INTEREST . . . HOME, SERVICE WORKSHOP, LABORATORY

TEST & SERVICE INSTRUMENTS


10-12U

5" OSCILLOSCOPE, 10-12U (TB 10c/s-500kc/s)
Kit **£35.17.6** Assembled £45.15.0
3" OSCILLOSCOPE, OS-2 (TB 20c/s-200kc/s)
Kit **£22.18.0** Assembled £30.8.0
4½" VALVE VOLTMETER, V-7A
Kit **£13.18.6** Assembled £19.18.6
6" VALVE VOLTMETER, IM-13U
Kit **£18.18.0** Assembled £26.18.0
RF and HV probes available as extras.
REGULATED POWER SUPPLY, IP-20U (Transistorised)
0·5-50v d.c. to 1·5A Kit **£35.8.0** Assembled £47.8.0
TV ALIGNMENT GENERATOR, HFW-1 (3·6-220M/cs)
Kit **£37.18.0** Assembled £47.10.0
RF SIGNAL GENERATOR, RF-1U (Up to 100Mc/s fund)
Kit **£13.8.0** Assembled £19.18.0
MULTIMETER, MM-1U (wide V, A, res, dB ranges)
Kit **£12.18.0** Assembled £18.11.6
ELECTRONIC SWITCH (Scope Trace doubler) S-3U
Kit **£12.18.0** Assembled £18.10.0
AUDIO SIGNAL GENERATOR, AG-9U
10c/s—100kc/s Kit **£22.10.0** Assembled £30.10.0
AUDIO SINE/SQ GENERATOR, AO-1U
Sq Wave 20c/s—25kc/s Kit **£14.15.0** Assembled £21.5.0
SINE/SQUARE GENERATOR, IG-82U Freq. range 20c/s—1 Mc/s Kit **£24.10.0** Assembled £36.10.0
AUDIO VALVE MILLIVOLTMETER, AV-3U Freq. resp. 10c/s—400kc/s Kit **£16.10.0** Assembled £22.18.0

HARMONIC DISTORTION METER, IM-12U



Enables, fast, accurate noise and distortion measurements to be made in amplifiers, etc.

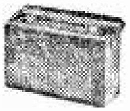
Send for Full Details.

Kit **£24.15.0** Assembled £34.0.0

Other instrument kits include: **R/C Bridge,** C-3U, £10.10.0. **Wattmeter,** AW-1U, £17.5.0. **Cap. Meter,** CM-1U, £15.15.0. **Transistor Tester,** IM-30U, £24.18.0.

Power Supplies, Decade R and C Boxes, etc.
Many other instruments in the American range. Full details and catalogue, 1/-, post paid.

TRANSISTOR RADIOS



"OXFORD" LW/MW RECEIVER, UXR-2
Kit **£14.18.0,** incl. P.T.
6 TRANSISTOR PORTABLE, UXR-1, LW/MW. Kit **£12.11.0,** incl. P.T.
"MOHICAN" GENERAL COVERAGE RECEIVER, GC-1U
Kit **£37.17.6** Assembled £45.17.6
ELECTRONIC WORKSHOP, EW-1 (Experimental Kit)
Kit **£7.13.6,** incl. P.T.
JUNIOR RADIO, UJR-1
Kit **£2.7.6,** incl. P.T.
Headphones 30/- extra. Additional amplifier stage (will work speaker), 16/6 extra.

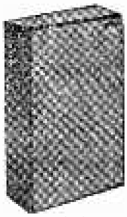
A WIDE RANGE OF BOOKS ON ELECTRONICS AND RADIO. PLEASE SEND FOR LISTS AND PRICES.

AUDIO HI-FI


FM Tuner

F.M. TUNER (in two parts)
Total price Kit **£16.8.0,** incl. P.T.
AM/FM TUNER (in two parts).
Total price Kit **£27.5.0,** incl. P.T.

6W STEREO AMPLIFIER, S-33H.
Kit **£15.17.6** Assembled £21.7.6
6W STEREO AMPLIFIER, S-33
Kit **£13.7.6** Assembled £18.18.0
18W STEREO AMPLIFIER, S-99
Kit **£28.9.6** Assembled £38.9.6
40W ALL TRANSISTOR STEREO AMPLIFIER, AA-22U
Kit **£39.10.0** less cabinet. Cabinet £2.5.0 extra.
5W MONO AMPLIFIER, MA-5
Kit **£10.19.6** Assembled £15.10.0
10W POWER AMPLIFIER, MA-12
Kit **£11.18.0** Assembled £15.18.0
50W POWER AMPLIFIER, MA-50
Kit **£19.18.0** Assembled £27.18.0
MONO TAPE PRE-AMPLIFIER, TA-1M
Kit **£19.18.0** Assembled £28.18.0
"STUDIOMATIC" 363 TAPE DECK (MONO)
£13.10.0 with TA-1M Kit **£31.5.6**
TRANSISTOR MIXER, TM-1 (Battery operated) 4 channels.
Kit **£11.6.6** Assembled £16.17.6

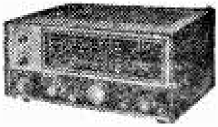

Berkeley

BERKELEY SLIM-LINE SPEAKER
An outstanding 2 speaker kit with **elegant** fully finished walnut cabinet, stand it on the floor or mount in a bookshelf. Only 7¾" thick.
Kit **£18.10.0** Assembled £23.0.0
Send for details.

COTSWOLD SYSTEMS (3.L.S)
Standard or Either kit **£25.12.0**
M.F.S. supplied in the white.
LOW-PRICED SPEAKER SYSTEM SSU-1
legs 14/6 extra Kit **£11.17.6** incl. P.T.
A range of Record Players, Cabinets, Mics, etc.

'AMATEUR' EQUIPMENT

A wide range of models including:



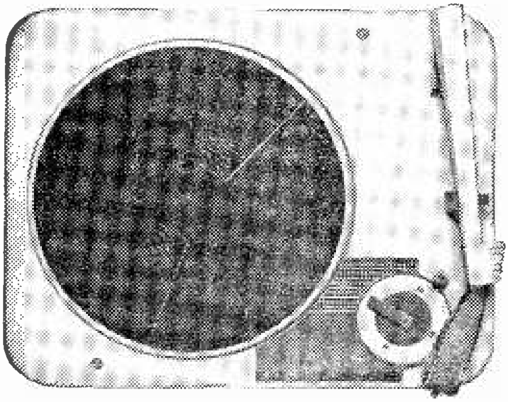
AMATEUR BANDS RECEIVER, RA-1 (160-10m)
The ideal fixed station, portable or mobile receiver. Many features incl: 'S' meter Kit **£39.6.6**
Assembled £52.10.0

COMMUNICATION TYPE RECEIVER, RG-1 (600kc/s-1·5Mc/s 32Mc/s-1·7Mc/s) Kit **£39.16.0** Assembled £53.0.0
AMATEUR TRANSMITTER, DX-100U (160-10m)
Kit **£79.10.0** Assembled £104.15.0
AMATEUR TRANSMITTER, DX-40U (80-10m).
Kit **£33.19.0** Assembled £45.8.0
Other kits in range include: **SSB Adaptor,** SB-10U **£39.5.0. Variable Freq. Oscillator,** VF-1U, £10.17.6. **Balun Coil Unit,** B-1U, £4.15.6. **Grid-Dip Meter.** GD-1U, £10.19.6. **Q Multiplier,** QPM-1 £8.10.0 **Reflected Power Meter,** HM-11U, £8.5.0.
Also wide range of American models. Please send for details

WELCOME TO OUR
LONDON HEATHKIT CENTRE
In response to the request of many customers, we have opened a showroom and retail stores at 233 Tottenham Court Road.
WHEN YOU ARE IN TOWN, WE HOPE THAT YOU WILL VISIT US THERE.

To DAYSTROM LTD. Dept. P.W.-3, GLOUCESTER, ENG.
Please send me FREE BRITISH CATALOGUE (Yes/No)
Full details of model(s)...
American Catalogue, 1/- Post Paid (Yes/No)
NAME ....
ADDRESS ....
....

An integrated hi-fi turntable unit from only 11 gns?



YES!

Only Goldring's 60 years of experience of making gramophone turntables and pick-ups could lead to a unit like this . . . the ideal integrated turntable, arm and pick-up for do-it-yourself hi-fi aspirants . . . at such a modest price. Just look at the features of this remarkable G.66 unit:

Silent, specially made Swiss mains motor. Pressed steel turntable on precision bearings evens out mains current fluctuations. Die-cast light alloy arm with full stylus pressure adjustment. Plug-in head shell, wired for mono and stereo, takes alternative pick-up cartridges. Eddy-current speed control (as fitted on some professional units) varies the four standard speeds by ± 10%. Pick-up raising/lowering device coupled to on/off switch and idler-wheel disengagement mechanism. Deck size 12½″ x 10″.

See the Goldring G.66 at your dealers—or write for descriptive leaflet.

THE GOLDRING G.66

G.66/MX.2	£9.18. 8	+	£1.12.4 P.T.	**£11.11.0**
G.66/CS.80	£10.10. 0	+	£1.14.2 P.T.	**£12. 4.2**
G.66/CS.90	£12.12.10	+	£2. 1.2 P.T.	**£14.14.0**

Goldring Manufacturing Co. (GB) Ltd.,
486-488 High Road, Leytonstone, London **E.11**
Telephone: Leytonstone 8343

RETURN-OF-POST

ON CASH OR C.O.D. ORDERS

● GARRARD GRAMOPHONE EQUIPMENT

(Illustrated list sent free) **RECORD CHANGERS**	Cash Price	Credit Terms Deposit	Monthly Payments	Total Credit
Model 50 (GC8 Mono PU)	£9.19.6	£1.19.6	12 of 15/5	£11. 4.6
Model 1000 (GC8 Mono PU)	£8. 9.6	£1.13.6	12 of 13/5	£9. 14.6
Model 3000 (9TAHC Stereo/ Mono PU)	£12.15.0	£2.12.0	12 of 19/-	£14. 0.0
AT60 (GC8 Mono PU) ..	£12.19.6	£2.12.6	12 of 19/5	£14. 5.6
A70 (Deram PU) ..	£25.19.6	£5. 3.6	12 of 39/-	£28.11.6
LAB80 (Deram PU) ..	£31.19.6	£6.19.6	12 of 47/9	£35. 2.6
SINGLE RECORD PLAYERS				
SP25 (GC8 Mono PU) ..	£12.15.0	£2.12.0	12 of 19/2	£14. 0.0
SP25 (Deram PU) ..	£16.10.0	£3. 6.0	12 of 24/9	£18. 3.0

IMPORTANT—When ordering units with the Decca Deram Pick-Up, please state whether Stereo or Mono required.

● GOODMANS LOUDSPEAKERS

(Send for free illustrated list)	Cash Price	Credit Terms Deposit	Monthly Payments	Total Credit
Axiom 201 12″ 15 watts ..	£11. 8.9	£2. 5.9	12 of 17/4	£12.13.9
Axiom 10. 10″ 10 watts ..	£6.12.4	£1.12.4	6 of 20/-	£7. 12.4
Axiette 8. 8″ 6 watts ..	£5.10.11	£1.7.11	6 of 17/2	£6. 10.11

● MULLARD AMPLIFIER KITS

We stock many of the components for the Mullard 510, 3-3, Two and Three Valve Pre-Amplifiers, Tape Pre-Amplifier. Stereo, Pre-Amplifier Seven Watt and Three Valve Stereo Amplifiers all as described in the Mullard Manual for Audio Circuits. We can supply this publication for 9/6 post free. *Detailed list sent free on request.*

● LATEST TEST METERS

All the latest models from current production. Illustrated list available.

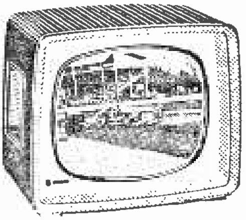
	Cash Price	Credit Terms Deposit	12 monthly payments	Total Credit
AVO 8, Mk. 3	£25. 5.0	£5. 5.0	£1.17. 6	£27.15.0
AVO Multiminor Mk. 4 ..	£9.10.0	£1.18.0	14. 9	£10.15.0
Taylor Model 88B ..	£24.10.0	£4.18.0	£1.16.10	£27. 0.0
Taylor Model 127A ..	£10.10.0	£2. 3.0	16. 0	£11.15.0
TMK Model 500	£8.19.6	£1.16.6	14. 0	£10. 4.6

All Cash and COD orders are dealt with on day of receipt. Credit orders are subject to only the minimum of delay.

WATTS RADIO (Mail Order) LTD

54 CHURCH STREET, WEYBRIDGE, SURREY
Telephone: Weybridge 47556
Please note: Postal business only from this address.

EX-RENTAL TELEVISIONS



14 in. 17 in.
£7.10.0 £11.10.0

12 months' 3 star Guarantee
★Tube★Valves★Components
COLOURED FREE LIST
Channels for all areas
Demonstrations daily from Large Selection.
Personal collection or Insured Carr. 14in. 20/-; 17in. 30/-.

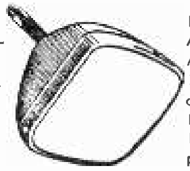
AERIALS. BBC/ITA combined Loft and room aerials—from 25/-. BBC2/UHF and colour aerials—from 29/6. SEND FOR FREE LIST.

EX-MAINTENANCE TESTED TUBES

17in.—35/- Most makes and types available. **14in.—15/-**
Guaranteed good picture. Carriage 5/- extra.

ONE YEAR GUARANTEED TUBES

21 in.	**99/6**
17 in.	**79/6**
15, 14 **12 in.**	**59/6**



100% REGUNNED Add 10/- or old tube. All 110°—99/6 plus 30/- refundable on old tube. Carr. 10/6. 14in. Slimline 17 & 19 in. — overseas postage 30/-.

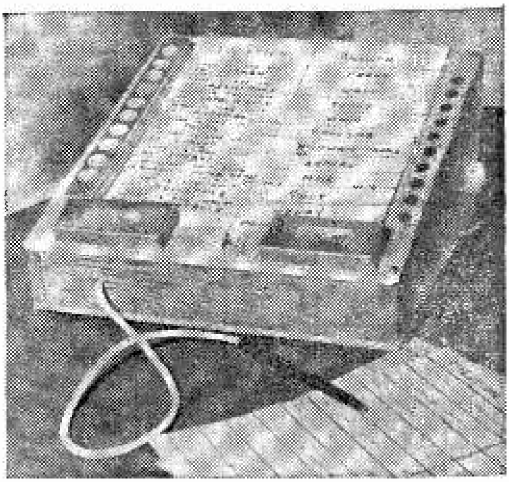
VALVES £1 per 100. Assorted TV and Radio. Surplus ex-rental diamantled receivers. Post 4/6. Send for list.
CONDENSERS, 10/- per 100. New Assorted Electrolytics and pFs. P. & P. 2/6.
RESISTORS , 5/- per 100. New, Mostly High Stabs. Assorted. P. & P. 2/-. Overseas 3/6.
SPEAKERS, 7/9. 6in., 8in., 7 x 4in., 8 x 3in. Ex-mfd. Salvage. P. & P. 2/3. Overseas, 4/-.

DUKE & CO. (LONDON) LTD.

621/3 Romford Road, Manor Park, E.12
Liverpool St.—Manor Pk.—10 mins.
Phone: ILFord 600-1-2-3. Stamp for Free List

AERIAL BARGAINS

Latest 6 array combined all channels: Loft, **39/6**; Outdoor **49/6**. P. & P. 4/6. BBC2/UHF 6 element pencil, **29/6.** 5 element add on extension, **11/-.** P. & P. 2/6.



An Educational
QUIZ MACHINE

A NOVEL PROJECT FOR
EXPERIMENTERS, CLUBS
AND SCHOOLS

by Michael J. Hughes M.A.

PART TWO—WIRING

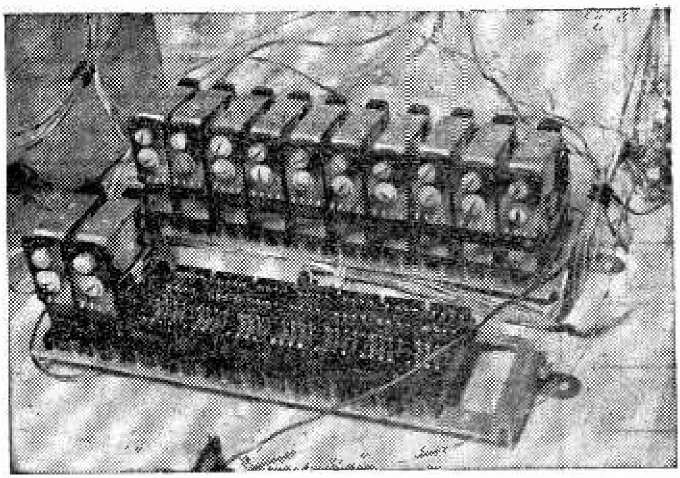
THE wiring procedure for the quiz machine will vary a little according to the type of relays used, and it is recommended that if relays different from those used by the author are resorted to, a rough wiring diagram be drawn up before any wiring is commenced. Fig. 9 shows the underside pin connections for the relays used in the prototype.

As said previously, the sockets for the relays were mounted in banks; one bank of ten, holding RLA to RLJ, and second bank of two, RLR and RLW.

Fig. 8 shows how the banks of relays are interconnected. To save time, and to speed up the soldering operation, it is quicker to cut all the lengths of jumper wires in one operation, and bare all their ends before starting to solder. The colour coded flying leads to the panel should be left at least 18in. long; these will be cut to length on connecting them to the tag strips.

The wiring on the underside of the front panel is shown in Fig. 10. If colour coding is adopted, it is imperative that the correct wires go to the correct tags otherwise there may be great difficulties in sorting out faults, for instance if a relay sticks it can be readily found by referring to the coding and the question position (A piece of paper containing the code should be stuck in side the instrument in case servicing is necessary).

The flying leads to the answer contacts can go either direct to the contacts in a random order, or can be routed via the programme switch. For the small extra cost, it is well worth while incorporating this switch as it broadens the scope of the instrument considerably.



View of the relay banks.

Programme Switching

The number of programmes available is limited only by the capacity of the switch (there are 3,268,800 different possible combinations). but in the prototype it was decided that three different arrangements would suffice.

The switch required will be ten pole three way for a triple programme, and Fig. 7 shows one suggested wiring system There are, of course, many possible wiring arrangements, but the one shown here is simple in that it has a symmetry by grouping consecutive questions in threes.

The switch used in the prototype was of the wafer type, as this was the most convenient way of obtaining the ten poles. Four, three pole three way wafers were ganged on one spindle.

The wiper contacts (numbered from 1 to 10) are connected to the corresponding "Answer" positions of Fig. 4, and the output connections labelled A to J are connected to the answering contacts on the front panel.

If the wiring of Fig. 7 is strictly adhered to, the following table shows the position in the answer column of the correct answer to each question for each of the three programmes. As with the colour code, it is useful to keep a record of the combinations shown below.

The relays used in the prototype were all 50

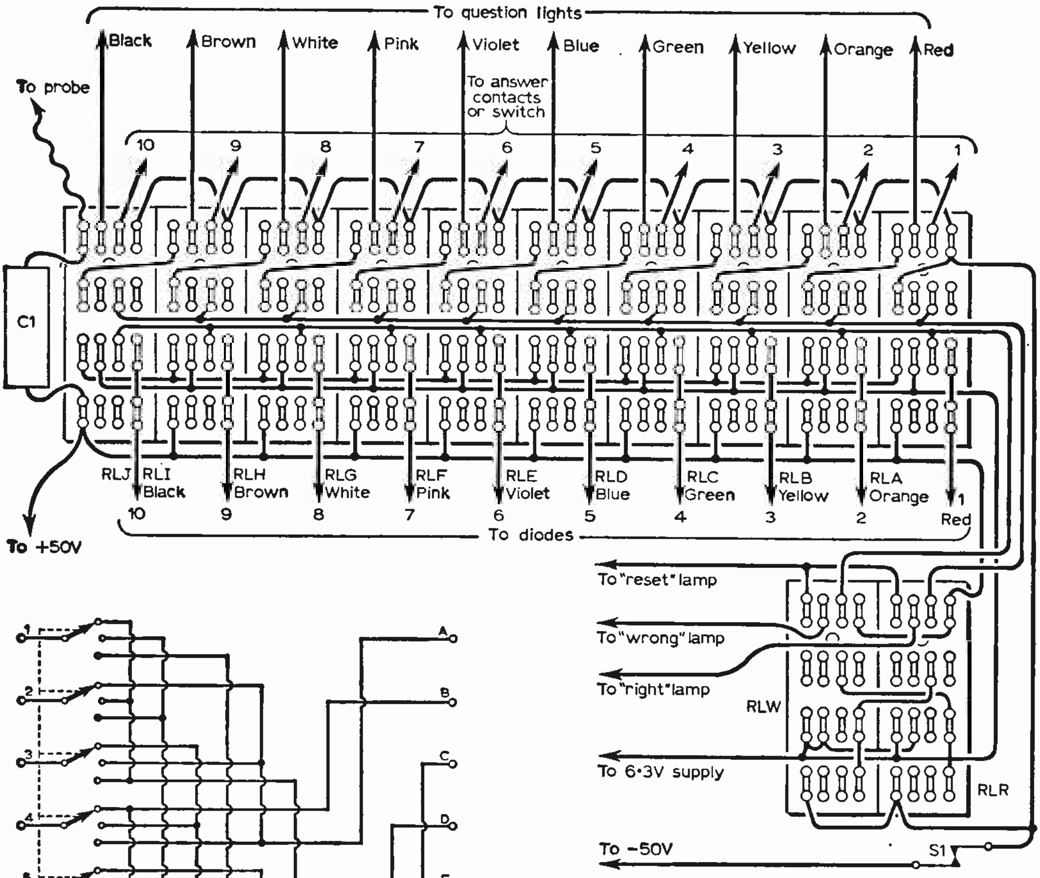


Fig. 8: Wiring diagram of underside of relays.

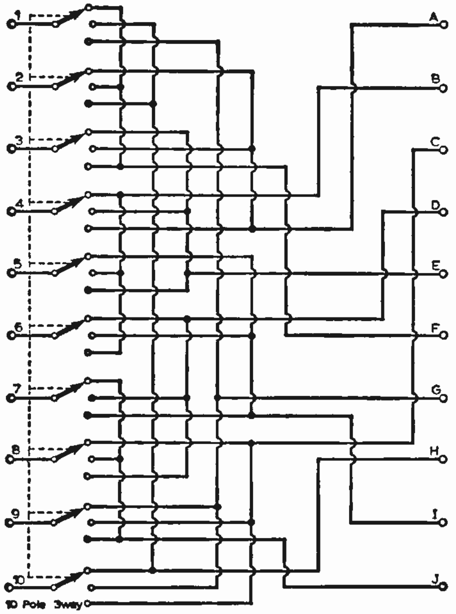


Fig. 7: Suggested wiring of programme switch.

QUESTION	ANSWER POSITION		
	Programme 1	Programme 2	Programme 3
1	F	H	G
2	A	F	H
3	E	A	F
4	B	E	A
5	I	B	E
6	D	I	B
7	J	D	I
8	C	J	D
9	G	C	J
10	H	G	C

Positions in answer columns to questions.

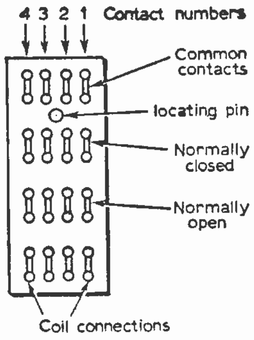


Fig. 9: The underside pin connections of relays used in the prototype.

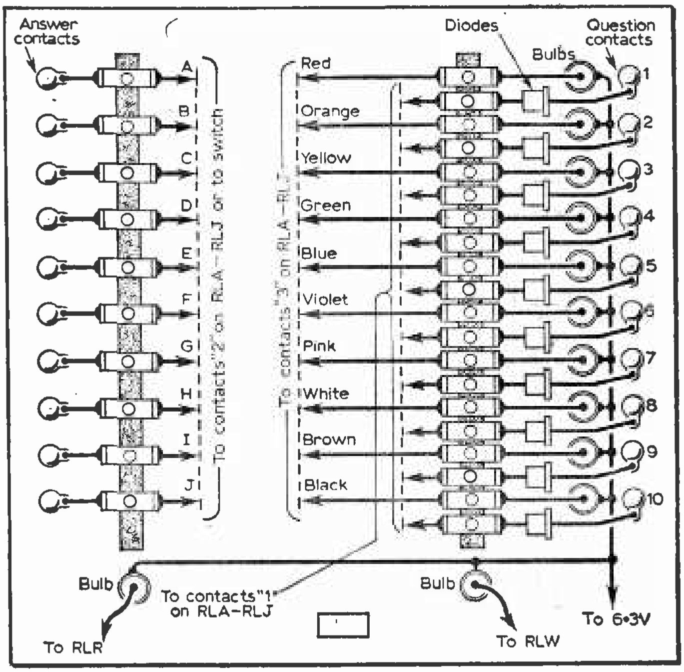


Fig. 10: The underside wiring of the front panel.

volt working, and as most of the working voltages are exposed at the contacts, it is worth bearing in mind that children may use the machine. The author is of the opinion that 50 volts can be regarded as comparatively safe, but other people's opinions may vary on this point, therefore it is worth bearing this matter in mind before using some of the high impedance relays that are available which require quite high voltages.

No details are given in this article about a suitable power supply, but the requirements are such that any suitable voltage source may be used: good smoothing is not required, therefore a conventional R-C pi network will be sufficient for the supply to the relays, and the output from a heater transformer will be more than adequate for the bulbs. This unit can be incorporated in the same cabinet.

It should, however, be noted that if the instrument is run from a mains power supply, the supply should be isolated via a transformer for the same reasons as stated above. ■

A COMMENTARY BY HENRY

PRACTICALLY WIRELESS

No. 19

Oh, but it Hertz!

ONE of these days, the term "cycle" will merely denote that contraption you keep folded in the boot of your inter-city car to beat the Barbara-ban on parking.

Already, leading technical journals in the United States have adopted standard European symbols. From henceforth c/s becomes Hz and kc/s is (or are) kHz. Even one of our own specialist magazines admits to keeping a watching brief on the situation.

The term "Hertz" derives from Heinrich Rudolph Hertz, who transmitted the first radio wave across a room in Frankfurt in 1888. Yes, I looked it up. And in the course of doing so was intrigued by the time-scale between discoveries and inventions. For example—it hardly seems possible that the theory of electro-magnetic waves had already been expounded (from a purely mathematical premise, admittedly) by James Clerk Maxwell nearly 25 years earlier!

Hardly seems possible in these days, when every post brings news of fresh techniques, and what the Press Officer of each electronic giant insists on calling a "break-through".

This telescoping of the time-scale was brought home to me forcibly the other day when reading a piece about "mechanised h.f. systems". Briefly, the argument was for machine telegraphy, using low-power h.f. networks with programmed instructions and remote control, taking away much of the operators' chores of locating and locking on to a weak and distant signal.

Every post brings news of fresh techniques.

It seemed strange that there was no reference to the "frequency synthesiser". After all this now-popular plaything of the Defence Departments of several countries is the answer to continuous tuning and signal-locking. By transmitting a great number of channels simultaneously, and locking the receiver to the desired one by a process of division and phase-locking, using reference oscillators and a voltage-controlled oscillator energised by the incoming signal, completely private and accurate tuning is effected. So why did the writers of the other article not mention it?

Looking up the dates provided the clue—the first article was published about a year ago. Not that the principle of frequency-synthesis is all that new. Like Mr. Maxwell's ideas, it gave birth to erudite argument some twenty years earlier. In fact, there was a description of the technique in *IEE Proceedings* of 1943.

But when one remembers the cumbersome man-packs of those days and considers that the system requires some thousands of transmitters instead of just one, it can be seen that the theory had to await the development of micro-miniaturisation and the solid-state device to become practice.

The time-lag seemed even more pronounced when this innocent explorer stumbled upon the subject of fibre-optics. Here, it seemed, was something well worth further research. Bending light around corners has long been a kind of alchemist's dream to the experimenter. Now, by directing the light to the end of a glass fibre, coated with a slightly more opaque glass to give the required refractive characteristics, the light can be obtained at the other end of the fibre, practically undiminished. The ray simply goes along the fibre, bouncing along the walls gaily, undeterred by bends.

A handy toy for finding the gas-meter.

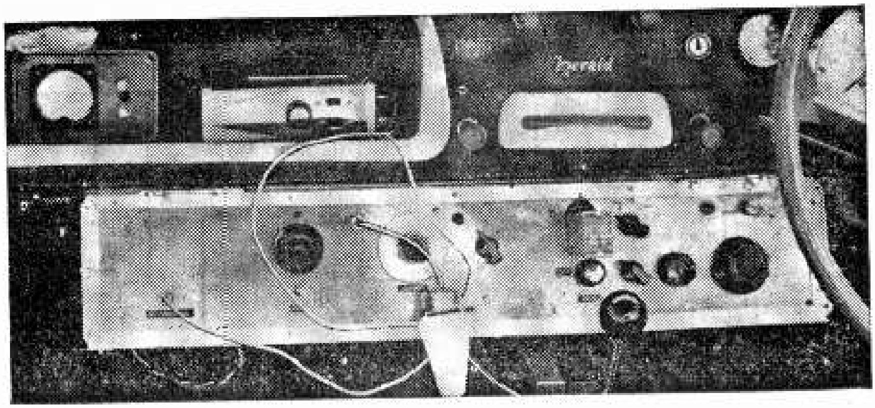
A handy toy, you'd say, for finding the gas-meter at the back of the boot cupboard. But there's more to it than that, for the fibres can be spun so thin that 150,000 of them would not exceed the diameter of a match, and their ends can be scanned by the light beam so that the emitted result follows the same pattern. You see where we are leading? Yes, the flat cathode ray tube, picture on the wall television, and all that. Exciting breakthrough, you would think.

So did Henry, till he discovered that the original patent was taken out by—John Logie Baird! He would have had to wait 30 years to see the progress in glass tube drawing perfected to the state needed to make use of his ideas.

But the time lag can hardly have been so well demonstrated as in the case of Patent 997,670, Peter Gilhead, UK. A transistor oscillator and amplifier with output electrodes sensitive to low resistance paths, for locating pressure-sensitive points on the skin.

The pay-off line is that this is for use in the healing process of Acupuncture. Practised by the Chinese 3,000 years ago.

TRANSISTOR MOBILE TX



Ten watts on Top Band

F. C. JUDD, G2BCX

FOR the past six months or so the writer has been carrying out research and development in high-efficiency transistorised mobile (or fixed station) transmitters the result of which is the circuit shown in Fig. 1. It should be carefully noted that the r.f. amplifier shown in Fig. 1 employs a Texas 2N1907 power transistor and that no other should be used. The p.a. circuit operates at an efficiency approaching 100%, which is impossible to achieve with any conventional class C valve amplifier. In other words, for 10W d.c. power input as rated by the GPO licence for 160m operation the 2N1907 p.a. stage will deliver very nearly 10W of r.f. power to the aerial. A class C valve amplifier would deliver only 6 to 7W of r.f. power for a d.c. input of 10W. Mobile operators will at once realise the value of this and the fact that the transistor transmitter of Fig. 1 will modulate to 100% as any normal transmitter. The transmitter consumes no power from the car battery unless one is actually transmitting and when fully operational consumes less current than the heater circuits alone of any valve transmitter of comparable power. The total drain from a 12V car battery, including the transistor modulator, is only 1½A.

High Efficiency P.A.

Firstly then how is the high efficiency of the p.a. stage maintained? The answer is simple, for the transistor is pulsed or switched at the operating frequency (1·8 to 2Mc/s) but the duty cycle—the time during which the p.a. transistor conducts—is very short. The duty cycle is only a small portion of the negative part of the drive signal. A current meter connected in the 12V h.t. rail will therefore only read the average d.c. current consumed by the p.a. stage.

It should be noted that a v.f.o.-controlled version of this transmitter has been designed and used with equal success. The only reason for presenting the crystal-controlled version is the simplicity of the circuit. The v.f.o.-controlled

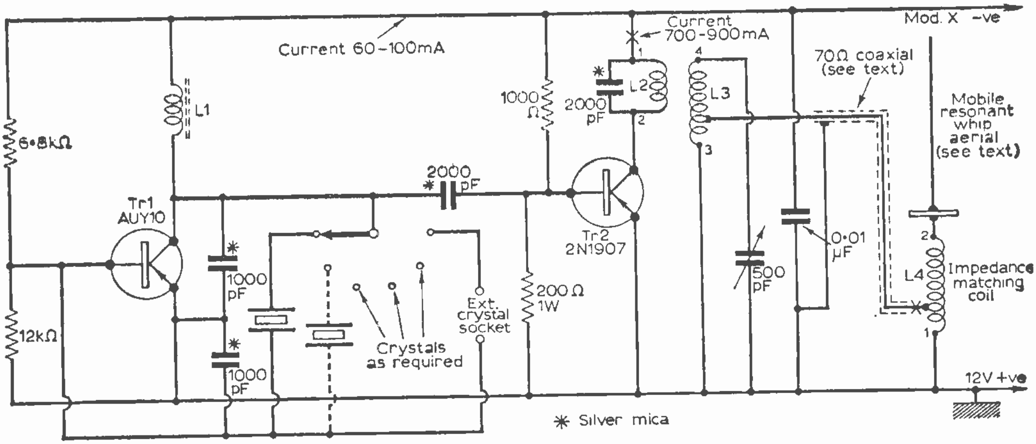


Fig. 1: Circuit diagram of the transmitter. L1 is a Vinkor pot core LA2105 with 6 turns of 20s.w.g. wire. Details for L2, 3, 4—see Figs. 3 and 4.

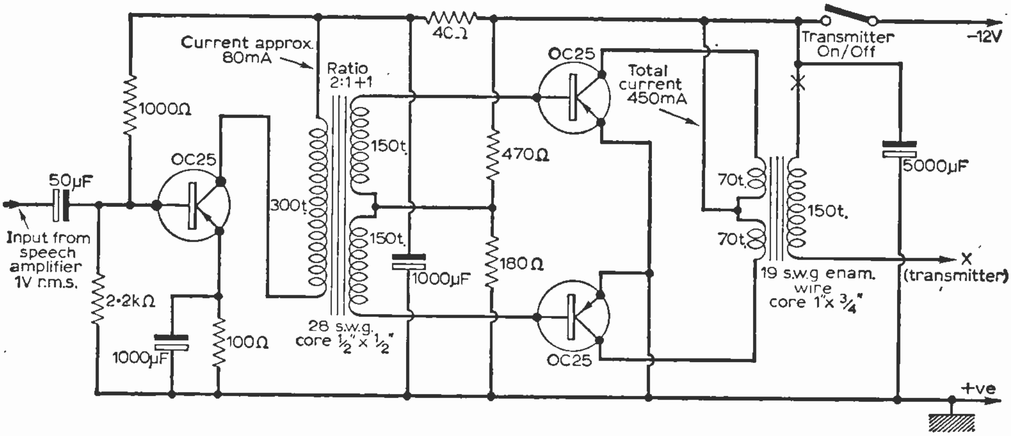


Fig. 2: Circuit of the modulator unit.

transmitter required a rather more elaborate drive stage and transistor v.f.o.s are not the most stable devices to use.

Points to Note

The construction of the transmitter is not critical, i.e. no particular screening is required (a photograph of the completed transmitter mounted in the writer's car is shown in the heading. What is important is that the following are strictly adhered to:

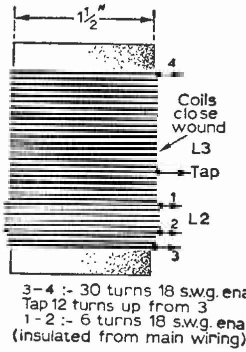
1. Mica capacitors of good quality *must* be used where shown.
2. Paper capacitors *must not* be used in the oscillator or p.a. stage.
3. The tuning coils L1, L2 and L3 must be constructed exactly as described.
4. The impedance matching unit L4 must be used in conjunction with the transmitter and the aerial if the whip aerial as shown is used.
5. The p.a. stage will not drive from a valve or other type v.f.o. Instant destruction of the p.a. transistor could result by attempting to do this.
6. On no account should the p.a. transistor collector current be allowed to exceed 1A.

The circuit has been carefully designed and thoroughly tested and modifications to component values could result in destruction of either one of the transistors or at least poor operation of the circuit.

Modulation

A suitable modulator is shown in Fig. 2 and may be operated with any small transistor microphone preamplifier such as those made by Walgain or a home-constructed type with an output of about 1V r.m.s. It is advisable to operate the speech preamplifier from its own dry battery.

Details of the modulator transformer are given in Fig. 2 but some idea of its working power can be ascertained by connecting a dummy load across the secondary. The dummy load may consist of a 6·3V 0·3A flashlight bulb, which should light to full brilliance on modulation peaks. It would, of course, be more ethical to check with an audio generator and oscilloscope plus a dummy load of about 1Ω.



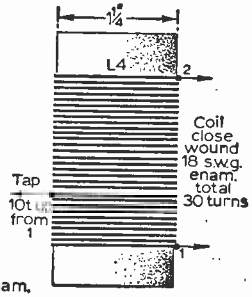


Fig. 3 (left): Details of L2/3.
Fig. 4 (right): Details of L4.

Tuning and Impedance Matching

The crystal oscillator collector coil consists of six turns of 20 s.w.g. enamelled wire wound on the bobbin of a Vinkor pot. core type LA2105. The coil resonates to the approximate centre of the 1·8 to 2Mc/s amateur band. (Note that none of the coils are suitable for other bands and details for other band operation cannot be given.) The p.a. coils L2 and L3 are wound on a paxolin or other type former as shown in Fig. 3. The impedance matching unit L4 is most important when using the whip antenna shown in Fig. 5. The coupling line between the p.a. tuning coil L3 and the impedance matching unit must be not less than 6ft of 70Ω coaxial line if using this whip. The line may be longer, up to 12ft if necessary, which is more than sufficient to cover the length of a car from the transmitter inside to an aerial mounted at the back.

Construction

No constructional details have been given as most mobile operators will wish to make up the transmitter to fit into some convenient part of the car, usually under the dashboard. The photograph shows the transmitter in a case which was tailor made of dural, aluminium or mild steel. The diagram of Fig. 6 may serve as a guide to constructors.

An important item is the heat sinks for the various transistors. The heat sinks for Tr1 and Tr2 of Fig. 1 must be not less than 6in. x 5in. and made of dural, aluminium or mild steel. The transistors may be insulated with the usual mica washer arrangement but if mounted directly on to the heat sink then the heat sinks themselves must be insulated from the chassis. Much the same comments apply to the heat sinks for the driver and modulator OC25 transistors.

Suitable Mobile Aerial

Details of the aerial actually used with the high-efficiency transistor transmitter are given in Fig. 5. The major part of the coil is double wound to reduce coil r.f. resistance losses, but remember, slight adjustment of the lower part of the coil and/or the aerial section above the coil may be required, i.e. a few turns on or a few turns off. Such adjustment should be carried out with a 6V 0·5A lamp in a two-turn link coupled around the lower part of the coil. The lamp should light to almost full brilliance when the transmitter is developing full power and the aerial is correctly adjusted to resonance at the centre frequency of the band, namely 1,900kc/s. The tuning circuit L3 will automatically tune the aerial to other frequencies within the band. Current through the 70Ω coaxial line should be 0·3 to 0·4A when the transmitter and aerial are properly tuned. A means of monitoring the current to the p.a. is desirable and, of course, very useful for the initial tune up. The circuit diagrams indicate typical readings and indeed an ammeter, say 0-1A, connected at point X in Fig. 1 would be very useful in ensuring that the current here did not rise above, say, 900mA. (Note: Under no circumstances should this current exceed 1A.) At present 2N1907s are expensive and attempting to squeeze out the last watt of r.f. could easily prove a very costly process.

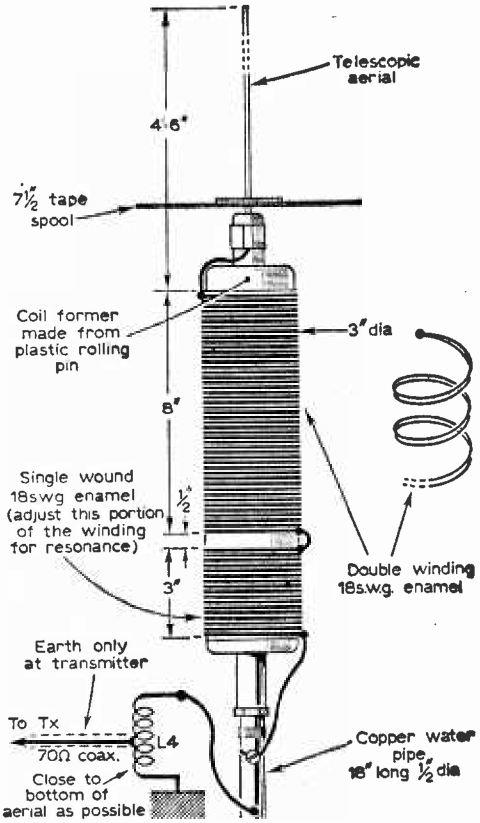


Fig. 5: Details of 160m aerial.

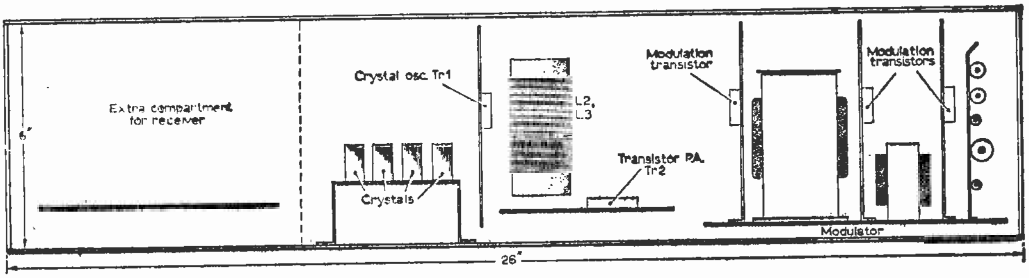


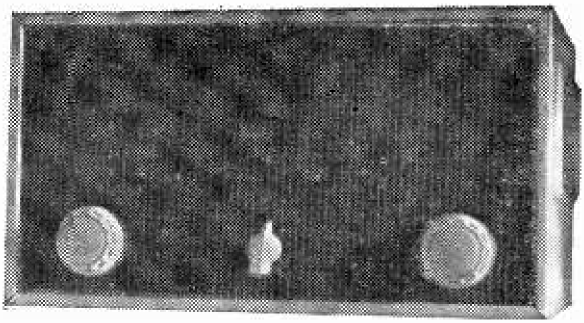
Fig. 6: Layout of prototype, with compartment for receiver.

The modulator and driver transformers were made from a couple of audio transformers which were to hand. The core sizes and winding details are given in Fig. 2.

The writer has been using both a v.f.o. and the crystal-controlled version (as in Fig. 1) for some time and ranges of over 200 miles have been obtained using the transmitter and aerial as described.

The transmitter has been used with equal success for "fixed" station as well as portable operation and is probably the most efficient yet most economic mobile transmitter design available. ■

A SWITCH-TUNED SUPERHET



F. L. THURSTON

A RECEIVER was required by the lady of the house for use in the kitchen. The most popular stations, in this particular case, were Caroline and Luxembourg, but it had been found, however, that these two stations were often difficult to locate on the more conventional type of receiver. The solution to the problem was to make these stations switch-tuned.

It was eventually decided to make up a receiver that was switch tuned to the following four stations: Home, Light, Caroline, and Luxembourg. These last two stations are often subject to fade and adjacent channel interference, as well as being very weak in many areas. When designing the receiver, therefore, a superhet was indicated.

One of the major disadvantages of the conventional superhet is that the oscillator section is subject to a fair amount of drift, and the circuit is thus generally not suitable for use as a switch tuned receiver, unless exceptional care is taken to obtain the required stability. The t.r.f., on the other hand, is not subject to drift of this kind and so is ideal for use as a switch tuned receiver of fairly powerful stations, such as Home and Light, but it does not have the required selectivity or a.g.c. that is essential for good results on the weaker stations.

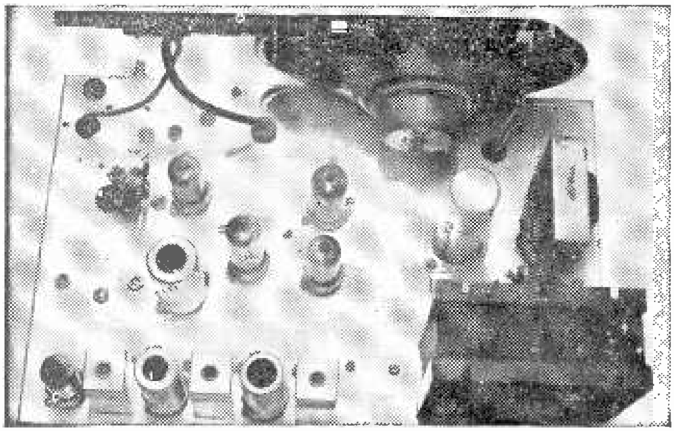
When designing the receiver that forms the basis of this article, a superhet was deemed essential, but with the following five outstanding characteristics: Very high gain, low noise, good selectivity, good a.g.c., and excellent stability, the last of these characteristics being the most important.

CIRCUIT DETAILS

In the final circuit, all five of these characteristics have been obtained. In view of these characteristics, the resulting circuit is ideal for adaptation, by substituting a variable tuning gang and range selection facilities in place of the switch tuning used in the prototype,

The full circuit diagram of the receiver in its final form is shown in Fig. 1. The r.f. signal is picked up by the ferrite rod aerial which has provision for the coupling of an external aerial, if required. The ferrite aerial is tuned by one of the trimmer capacitors, C21—C24, and the selected signal is fed to the grid of V1, the preselector stage. A radio frequency transformer is used as the anode load of V1 with its secondary winding tuned by one of the trimmers, C25—C27, and the tuned signal is fed to the grid of V2, the mixer.

An EF91 pentode is used as the mixer, with its screen grid held at a fixed potential by the divided chain R3—R4, and decoupled by C3. The local oscillator voltage is injected into the mixer cathode via C18. The



Showing the general layout of above-chassis components.

mixer generates exceptionally low noise.

The local oscillator uses one half of a double-triode (V3a) in a conventional circuit. The output of the local oscillator is fed to the grid of a cathode follower (V3b) via C15. With its high input and low output impedance the cathode follower acts as a buffer between the mixer and oscillator, and eliminates any "pulling" of the oscillator frequency which might otherwise occur via the mixer. The h.t. to the oscillator and cathode follower is stabilised by V4, the regulator valve. Exceptional oscillator stability is obtained due to this stabilising and buffering. A small trimmer capacitor, C32, is mounted on the front of the receiver, and was fitted so that any drift that did occur in the oscillator could be counteracted. Drift has proved to be so low in practice, however, that, although at the time of writing the receiver has been in use for over six months, operating under adverse temperature conditions, the trimmer has not so far needed adjustment.

It should be noted that the range switching is so arranged that, on any given tuning coil, certain of the trimmer capacitors are switched in parallel, so that their capacitances are additive for station changing. When aligning the receiver, then, these trimmers must be adjusted in the correct sequence.

The 465kc/s output of the mixer is selected by i.f.t.1, and passed on to the i.f. strip. Two stages of i.f. amplification follow, via V5 and V6 (EF92 var-mu pentodes), which have a.g.c. applied. Each of these valves has an i.f. transformer as its anode load (i.f.t.2 and i.f.t.3 respectively), and in each case the transformer primary winding is damped by a 47kΩ resistor. These damping resistors limit the Q, and therefore the gain of each transformer, and results in vastly improved circuit stability (no screening is used in the prototype receiver). As three i.f.'s are used in all, no adverse loss of selectivity results, and it is in fact necessary to de-tune the i.f.'s if an acceptable quality of telephony is to be received.

The amplified i.f. signal is detected by diode D1, and the r.f. component is filtered out by the network C8, R12, C9, and R13, and the a.f. component is passed to the audio amplifier stage via C10 and RV1. The a.g.c. voltage is obtained via the above filter network plus an additional time constant network, comprising R24 and C20. In this circuit, the a.g.c. line has an impedance of about 200kΩ, which is less than one fifth of the value obtained in most circuits; this comparatively low impedance results in far greater stability than is obtained in the conventional home-built radio. The a.g.c. line is wired to an output socket to facilitate the lining up of the tuned circuits if a multimeter is available.

The a.f. section comprises an EF91 amplifier and a double-triode, with the two sections wired in parallel, as the power output stage. About half a watt of a.f. is available, which is considered to be adequate for normal domestic use.

continued overleaf

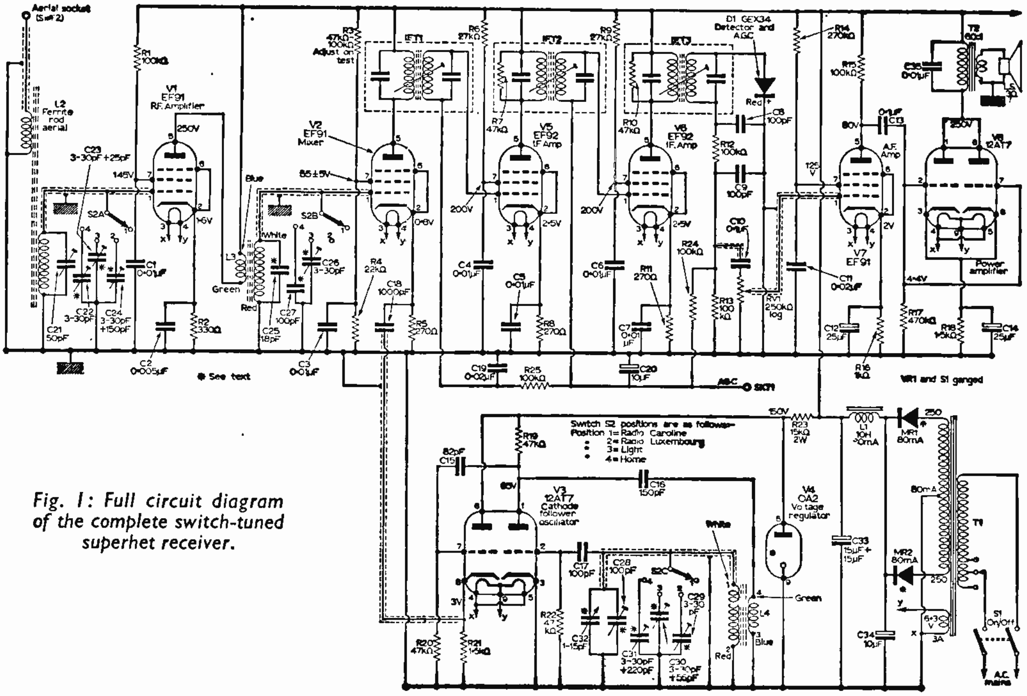


Fig. 1: Full circuit diagram of the complete switch-tuned superhet receiver.

THE CHASSIS

The switch-tuned receiver uses a standard 12in. x 8in. x 2½in. chassis, the main drilling and cutting dimensions of which are shown in Fig. 2. The chassis has corner brackets fitted, as shown in the photographs, and these are employed as securing points when the chassis is mounted in the cabinet. The speaker is bolted directly to the chassis, and a cut-out must be provided, as shown.

As the wiring is fairly complex, it is considered that the best approach to the construction is to build the receiver in a number of distinct stages. As well as having the advantage of simplifying construction, this procedure also has the advantage that the set can be built as a "progressive", in which valuable experience in superhet practice can be obtained. The oscillator and mixer sections can be built in a number of versions, to show experimentally the advantages and disadvantages of these types.

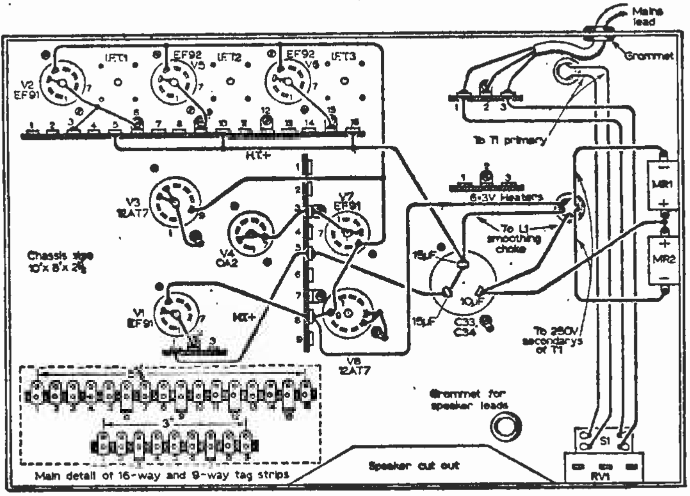


Fig. 3 (above): Constructional details for Stage I.

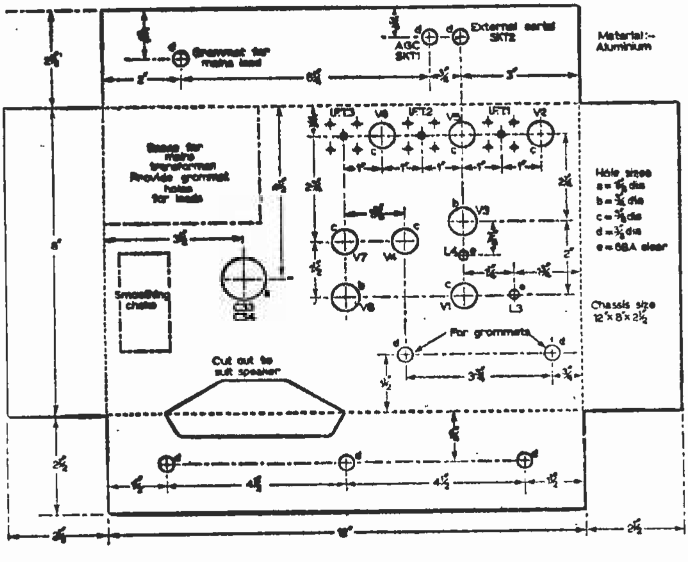


Fig. 2 (left): Drilling and cutting details for the chassis.

CONSTRUCTION: STAGE I

Cut and drill the chassis as shown in Fig. 2. Bolt the mains transformer in place (T1), with the mains winding facing to the rear of the chassis. Bolt the smoothing choke, L1, in place. Bolt the loud speaker in place in the cut-out provided at the front of the chassis. Drill three holes, approximately ⅜in. diameter, for grommets, one to the left of the speaker, and one in front and the other behind the mains transformer, as shown in the photographs and diagrams.

Secure the large triple value capacitor, C33—C34, in place. The particular type and order number of this component is shown in the components list; a near value to this may be fitted, however, if difficulty is found in obtaining the recommended type.

Fit the eight valveholders, *taking care to note the correct orientation,* as shown in Fig. 3. Also note that V3, V5, and V6 valveholders must be provided with screens. Fit variable resistor RV1, with its built-in 2 pole, 2 way mains switch, in place on the front left of the chassis. Secure the three 3-way tag strips in the positions shown. Fit the 9-way and 16-way tag strips EXACTLY as shown in the diagram (Fig. 3), this is most important. Both of these tag strips are cut from standard types, and the position of the tags is considered to be so important in the construction of the receiver that sketches of the two types, showing positions of insulated and earthed tags, as well as major dimensions, have been included in Fig. 3.

In the prototype set two 250V, 80mA half wave rectifiers, of the old "finned" type were used, mounted to the left-hand side of the chassis. Any other type of rectifier may be used, however, provided it is suitably rated. A full wave type may be used in place of the two half-wave ones. The rectifiers should, however,

COMPONENTS LIST

Resistors:

R1 100kΩ
R2 330Ω
R3 47kΩ to 100kΩ
(Adjust on Test)
R4 22kΩ
R5 270Ω
R6 27kΩ
R7 47kΩ
R8 270Ω
R9 27kΩ
R10 47kΩ
R11 270Ω
R12 100kΩ
R13 100kΩ

R14 270kΩ
R15 100kΩ
R16 1kΩ
R17 470kΩ
R18 1·5kΩ
R19 47kΩ
R20 47kΩ
R21 1·5kΩ
R22 47kΩ
R23 15kΩ, 2W
R24 100kΩ
R25 100kΩ
RV1 250kΩ log
+ 2p. 2w switch (S1)

All carbon, ½ Watt, 10%,
unless stated otherwise

Capacitors:

C1 0·01µF 350 volt
C2 0·005µF 350 volt
C3 0·01µF 350 volt
C4 0·01µF 350 volt
C5 0·01µF 350 volt
C6 0·01µF 350 volt
C7 0·01µF 350 volt
C8 100pF
C9 100pF
C10 0·1µF, 150 volt

C11 0·02µF 250 volt
C12 25µF, 25 volt
C13 0·1µF, 350 volt
C14 25µF, 25 volt
C15 82 pF
C16 150pF
C17 100pF
C18 1000pF
C19 0·02µF
C20 10µF, 25 volt

C21 50pF postage stamp trimmer
C22 3-30pF
C23 3-30pF + 25pF
C24 3-30pF + 150pF
C25 18pF Mica
C26 3-30pF
C27 100pF
C28 100pF postage S
C29 3-30pF
C30 3-30pF + 56pF
C31 3-30pF + 220pF
** see text
C32 1-15pF (see text) Front Panel Trimmer
C33 15 + 15µF Triple type
Electrolytic
C34 10µF HUNTS, type K553
C35 ·01µF, 350 volt
** 3-30pF = Philips 'beehive' type trimmers

Valves:

V1 EF91, 6AM6
V2 EF91, 6AM6
V3 12AT7, ECC81
V4 OA2
V5 EF92

V6 EF92
V7 EF91, 6AM6
V8 12AT7, ECC81
D1 GEX 34 or similar

Rectifiers:
MR1, MR2 250 volt, 80mA (see text)

Transformers:
T1 Mains transformer
250-0-250 v., 80mA 6·3 volt, 3A
T2 Output transformer
Ratio 60 : 1 for 3 ohm speaker. See text

Sockets, etc.:
2 off B7G valve-holders,
with screens (V5, V6)
4 off B7G valve-holders,
without screens (V1, V2, V4, V7)
1 off B9A, with screen (V3)
1 off B9A, without screen (V8)
1 off Radiospares 2-way aerial socket
(see text)

Switches:
S1 see RV1
S2 3 pole, 4 way. See text

Coils:
L1 10H, 80mA smoothing choke
L2 Ferrite rod aerial. See text
L3 Weymouth HH3
L4 Weymouth HO4
IFT1, IFT2, IFT3 "MAXI-Q", type IFT11/465

Misc. Components:
Chassis, 12 x 8 x 2½". Aluminium, with corner brackets
1 off Ferrite rod, 10" x ⅜".
3 off 3-way tag strips
1 off 9-way tag strip
1 off 16-way tag strip
1 off tag board
See text
Wire, screened wire, solder tags, grommets, etc

be mounted in roughly the position shown.

Mount the three i.f. transformers in place. A miniature type MUST be used, and the "MAXI Q" type IFT11/465 is recommended. Mounting instructions are included in the instructions provided with the i.f.t's.

Finally, wire-up the mains connection, power supply and l.t. to all valves (except V4), as shown in Fig. 3. When this has been done, check over the wiring and switch on. If a multimeter is available, check that the h.t. is available; it should be over 300 volts. Plug-in all valves, except V4, and check that their heaters are working correctly. This concludes Stage 1.

STAGE 2. THE A.F. SECTION

Secure the output transformer, T2, in place below chassis to the left-front, as shown. In the prototype, a 60:1 ratio was used for the 3Ω speaker, the precise ratio is not critical, however, and almost any output transformer of roughly this ratio may be used.

Wire-up the circuit as shown in Fig. 4 using screened leads between the grid of V7 and the volume control, and between the volume control and C10. The loose end of C10 may be temporarily secured to a spare tag.

Check the wiring and switch on, after first making sure that the speaker is connected to T2 secondary. With the volume control turned full up, touch a finger to the loose end of C10: a strong 50c/s hum should be heard. If a multi-

—continued on page 993

U.H.F. and V.H.F. Designs

Designs frequently appear in Practical Wireless for the construction of equipment suitable for the h.f. bands, i.e. 160m, 80m, 40m and 20m.

Why are there no articles on equipment for the v.h.f. and u.h.f. bands? Surely these represent more of a challenge. From memory I can recall but one design for receiving transmissions above 50Mc/s (other than f.m. broadcast sets) and that was for building a simple t.r.f. set.

Several times one reads of amateurs holding a G3 licence condemning the G8 licence as providing "an easy way out", but is it such an easy way out? Perhaps that is why no designs for v.h.f. and u.h.f. equipment appear—it is below the fully licensed ham who has passed his Morse test to use these bands—leave them for the rabble who are too lazy to pass the Morse test and provide us with designs or information for them.

S. Peat.

Frodsham,
Cheshire.

Can Anyone Help Please?

Some time ago in Practical Wireless a reverberation unit consisting of springs, was published.

My huge collection of Practical Wireless surprisingly, does not contain this issue. Would any kind readers please lend me this issue? It would be highly appreciated.

W. F. Wright.

9 Priory Road Caravan Site,
Ruskington,
Sleaford,
Lincolnshire.

* * *

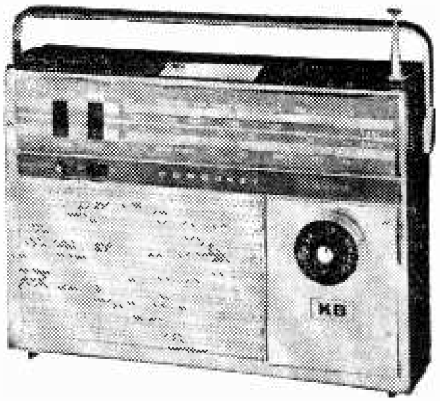
On behalf of Bury and Rossendale Radio Society, I should like to appeal to your readers for any surplus literature relating to amateur radio. We would welcome back numbers of P.W., and handbooks relating to both commercial and ex-govt. equipment. Postage costs etc. will be refunded.

A. Cooper.

58 Spring Street,
Bury,
Lancashire.

NEWS AND

A "CONQUEST" FOR KB



A development of the KR 016, the KR 026 "Conquest" transistor radio, is the newest model from KB.

The "Conquest" has long, medium, short, and v.h.f. wavebands.

Attractively styled in a shock resistant black plastic cabinet, with chrome speaker grille and trim, the "Conquest" has nine transistors and seven diodes.

The speaker is 5in. x 3in. and there is a ten-section telescopic aerial for short and v.h.f. bands.

The illuminated scale and wave-band selection are push-button operated and there are thumb-edge controls for volume and tone.

Other features include separate on/off switch, concentric tuner and fine tuner, sockets for car and external v.h.f. aerial and ear-piece.

Price: 23 guineas (including p.t.).

"LIFELINE" FOR SHERPA HOSPITAL

The world's most remote hospital, 13,000 ft. up the slopes of Everest, is to have two powerful radiotelephones to provide a "lifeline" with civilization.

Sir Edmund Hillary will lead a New Zealand expedition into Nepal this year to begin construction of a six-bed hospital for 4,000 Sherpas in the Khumbu area of the Himalayas. The expedition will carry with it two compact single-sideband transmitter-receivers, manufactured by Pye of Cambridge, which will give hospital staff a vital link with Katmandu, 160 miles away. The sets, which are Pye SSB 125's, have been presented to Sir Edmund by Mr. G. A. Wooller, managing-director of Pye (New Zealand), Limited.

COIL FORMERS FROM CAMBION

Cambion Electronic Products Ltd., Castleton, Nr. Sheffield, announce the new printed circuit solid pin flangeless coil formers 3618 and 3619. Well suited for use with "pi-"wound coils, these two new coil formers from Cambion incorporate all standard Cambion features including a moulded diallyl phthalate base and a polypropylene liner. Both are engineered with unique flangeless construction to facilitate greater use of the winding space area.

Engineered for vertical mounting on ·200in. centres in printed circuit applications, these new coil formers can be used wherever an r.f. coil is required. The 3618 coil former measures ·325in. above the board, while the 3619 former measures ·480in. Both formers have a ·375in. square base with solid brass pins (hot solder dip) integrally moulded. Cambion coil formers 3618 and 3619 come with standard powdered irons in yellow, red, green, white, purple and blue. These cover the frequency ranges ·2 to 1·5 Mc/s through to 40·0 to 300 Mc/s.

..COMMENT

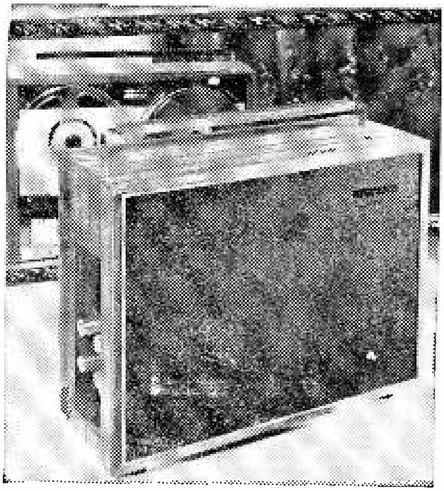
SALON INTERNATIONAL DES COMPOSANTS ELECTRONIQUE

English Electric Valve Company are exhibiting on Stand 160 Allee 2 at the Paris Components Exhibition, where the display will show a selection from the very wide range of specialised electronic valves and tubes made in England at either the Chelmsford or Lincoln production plants.

Special prominence is being given to the new generation of High Power Klystrons, with output powers ranging up to 40kW and utilising water vapour cooling with the collector uppermost. These tubes have been developed for high efficiency operation in u.h.f. television transmitters or translators and have a perveance figure of 2.

Another large display will feature the range of X and S-Band TR and TB Cells and Microwave switching devices. These have been developed to meet the needs for reliable and inexpensive units in microwave duplexers. The range includes types developed for marine, airborne and land based equipments.

HIGH QUALITY TAPE RECORDER



From the newly-formed company of Van Der Molen, comes the VR.4 three-speed, four-track tape recorder. It has Italian motors specially designed for vertical operation, and instead of incorporating a mains transformer, an overwind on the motors provides the h.t.

Wow and flutter is not greater than 0·35% at $1\frac{7}{8}$ i.p.s., 0·25% at $3\frac{3}{4}$ i.p.s. and 0·15% at $7\frac{1}{2}$ i.p.s. Frequency response at $7\frac{1}{2}$ i.p.s. is 40 c/s to 15 kc/s ± 3dB, at $3\frac{3}{4}$ i.p.s., 40 c/s to 10kc/s ± 3dB and at $1\frac{7}{8}$ i.p.s., 60 c/s to 5 kc/s ± 3dB. The amplifier output is 5W and the signal to noise ratio is better than 40dB. The loudspeaker is an 8in. round unit mounted in the back of the recorder. A three digit tape position indicator is featured.

The amplifier has three inputs (1) microphone 2mV at $50k\Omega$ (2) pickup or tuner 30mV at $1M\Omega$ (3) mix 200V at $100k\Omega$. Outputs are (1) internal amplifier or headset 2—4V r.m.s. at $10k\Omega$ (2) extension speaker—8Ω (3) alternative head output average 2mV at 1 kc/s.

The amplifier controls are volume, mixing, treble, base and track selector and ten semiconductors are employed in the circuitry.

Record monitoring facilities are provided, by means of the internal speaker.

Dimensions are $15\frac{1}{4}$in. x $12\frac{1}{4}$in. x $7\frac{3}{4}$in., the weight 16 lbs. and the price 59 guineas.

The makers say that VR.4 is the first in a line of high quality products.

The photograph shows the VR.4 in a vertical position facing a mirror to show the deck.

Hawaiian Guitar

Having built the Hawaiian guitar (June, 1965, issue), amplification did not come up to expectations when plugged into the pick-up sockets of a radiogram.

Here I found an ideal application for the small three-transistor amplifier which appeared in Practical Wireless, May, 1965.

When this amplifier was connected between the guitar preamplifier and the pick-up sockets on the radiogram the volume resulting was more than ample.

It was a simple matter to arrange the input, output or both jack plugs on the transistor amplifier so that current was being drawn only when both plugs were in position.

A. Cunningham.

Liverpool 5.

The Cost of Radio

Amateur radio today is a very complex hobby. Indeed two amateurs in the same town may not know that the other is on the air.

Most amateurs, if they use ready-made gear, are not pleased with it and they will try and improve and make it just that bit better. Amateur radio is much like yesteryear, only today it is much more expensive.

F. Rose, G2DRT.

High Wycombe,
Bucks.

Sir, I would be grateful if any reader could sell or loan me . . .

. . . any part for the "Soundmirror" tape recorder produced by Thermionic Products Ltd. If anyone can help, could they please write to me. All letters will be answered.—John Wills, St. Helier, Bovey Tracey, South Devon.

. . . circuit diagram of 3 or 4 transistors to manufacture a transistor set to receive 2 or 3 broadcasting stations from a distance of about 200 miles with an output of 50mW minimum on loudspeaker, with a short aerial and no earth connection. I shall send Indian Gifts.—Pramod Prakash Pyar, c/o Dr. Bachna Ram Goel, near Jain Mandir, Dhuri, Dt. Sangrur, Punjab, India.

. . . ferrite rod aerial for Cossor 524 a.m./f.m. receiver.—T. F. Jones, Flat 2, Block 3, Wychbury Court, Highfields Estate, Halesowen, Birmingham.

by P. A. Newbury

"15 + 5"

QUALITY AMPLIFIER

★ FREQUENCY RESPONSE	20c/s—20kc/s better than ±2dB
★ DISTORTION	0·1% at 15 Watts
★ MAXIMUM POWER OUTPUT	21·5 Watts

THE article to be described was built to fulfil a dual purpose. Namely, to provide high-fidelity reproduction from records, microphone or guitar, etc., at the lowest reasonable cost. As the two most expensive single items in a high quality amplifier are the mains and output transformers, attention was given primarily to the design of the output stage. After studying many valve specifications the author formed the opinion that a pair of 6L6's functioning with an 8,000Ω load in

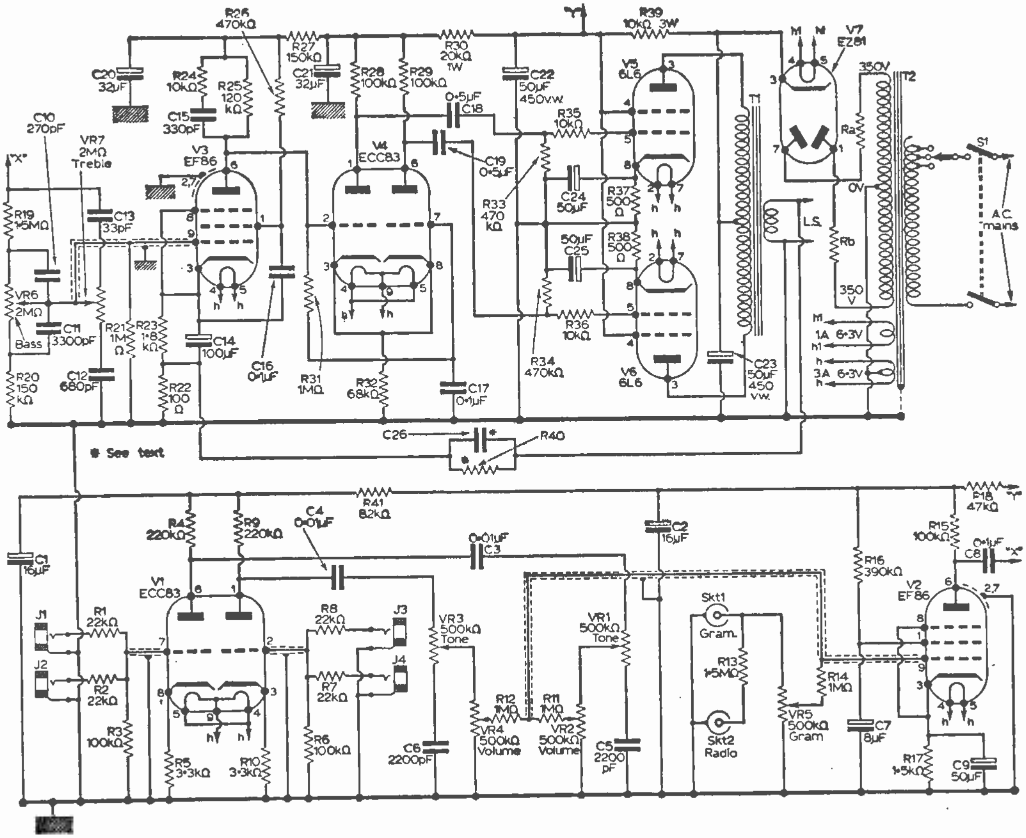
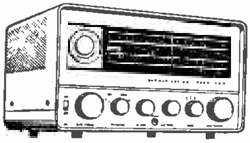
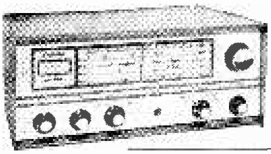


Fig. 1: Circuit diagram of the amplifier.



LAFAYETTE HA 63 COMMUNICATION RECEIVER

7 valves + 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.



CODAR EQUIPMENT

Main London Agents

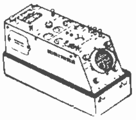
CR.70A. Communication Receiver	£19.10.0
P.R.30 Preselector ..	£5.10.0
A.T.5 Amateur Transmitter	£16.10.0

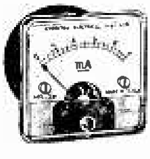
Postage extra.

OS/8B/U OSCILLOSCOPES

High quality Portable American Oscilloscope. 3in. c.r.t. T/B 3c/s-50 kc/s X Amp: 0-500 kc/s Y Amp: 0-2 Mc/s. Power requirements 105-125v. A.C. Supplied in "as new" condition, fully tested.

£25. Carr. 10/-. Suitable 230/115v. Transformer, **15/6.**





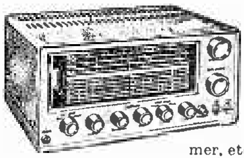
CLEAR PLASTIC PANEL METERS

First grade quality. Moving Coilpanel meters available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows. Type MR38P 1 21/32in. square fronts.

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

POST EXTRA. Larger sizes available—send for lists.

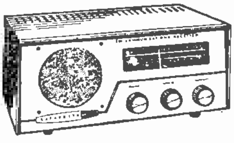
ILLUMINATED "S" METER 1 21/32 in. square front. Cal. in S units. 6V. lamp. **29/6.** P.P. 1/-. Ditto 2 5/16in. square, **39/6.** P.P. 1/-.



NEW MODEL LAFAYETTE HA-230 AMATEUR COMMUNICATIONS RECEIVER

Supersedes model HE-30. 8 valves + rectifier. Continuous coverage on 4 bands. 550 Kc/s—30 Mc/s. Incorporates 1 RF and 2 IF stages, Q Multiplier, BFO, ANL, 'S' meter, electrical bandspread, Aerial trimmer, etc. Supplied brand new and guaranteed. **£33.** SAE for full details.

Also available in Semi-Kit form **25 Gns.**

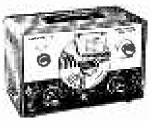


NEW MODEL LAFAYETTE HA-55 AIRCRAFT RECEIVER

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/-.

TE-20 RF SIGNAL GENERATOR

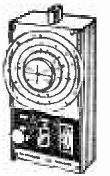
Accurate wide range signal generator covering 120Kc/s—260Mc/s on 6 bands. Directly calibrated. Variable R.F. attenuator. Operation 200/240 V A.C. Brand new with instructions. **£12.10.0.** Carr. 7/6.



LAFAYETTE 46 RESISTANCE CAPACITY ANALYSER

2pF. 2,000 mFd. 2 ohms. 200 megohms. Also, checks impedance. Turns ratio. Insulation 200/250v. A.C. Brand New. **£15,** carr. 7/6.

LAFAYETTE NUVISTOR GRID DIP METER



Compact true one hand operation. Frequency range 1.7-180Mc/s. 230v. AC operation. Supplied complete with all coils and instructions. **£12.10.0, carr. 5/-.**

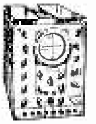
GARRARD RECORD PLAYERS

Brand new and Guaranteed

SRP-10 Player	£4.17.6
AUTOSLIM Changer	£5. 5.0
1000 Changer	£5.19.6
2000 Changer	£7.10.0
3000 Changer—Stereo	£8. 8.0
SP25 Player—Stereo	£11.19.6
DECCADEC, with Deram	£17.17.0
A70 (less cart.)	£22. 1.0
LAB80—Mono	£27. 0.0
401 Transcription	£30. 0.0

All plus P. & P. 5/-.

ERSKINE TYPE 13 DOUBLE BEAM OSCILLOSCOPES



Timebase 2 c/s - 750 kc/s. Separate Y1 and Y2 amplifiers. Up to 5.5 Mc/s. calib at 100 kc/s. and 1 Mc/s. 110/230 v. A.C. Guaranteed perfect. **£27.10.0.** Carr. 20/-

MINE DETECTOR No. 4A

Will detect all types of metals. Fully portable. Complete with instructions, **39/6** each. Carr. 10/-. Battery **8/6** extra.

MAGNAVOX 363 TAPE DECKS

New 3 speed tape deck, supersedes old Collaro studio deck.

2 track, **£10.10.0.**

4 track, **£13.10.0.**

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 batts. & wall bracket. **£6.10.0** pair. P P. 3/6.

SILICON RECTIFIERS

200 P.I.V.	200mA	2/6
1,000 P.I.V.	650mA	7/6
800 P.I.V.	500mA	5/6
400 P.I.V.	3 amp	7/6
400 P.I.V.	500mA	3/6
150 P.I.V.	165mA	1/-
70 P.I.V.	1 amp	3/6
95 P.I.V.	3 amp	5/6

Post extra.

AMERICAN TAPE

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

3in.	225ft. L.P.	4/-
3¼in.	600ft. T.P. mylar	10/-
5in.	600ft. std. plastic	8/6
5in.	900ft. L.P. acetate	10/-
5in.	1200ft. D.P. mylar	15/-
5in.	1800ft. T.P. mylar	35/-
5¾in.	1200ft. L.P. acetate	12/6
5¾in.	1800ft. D.P. mylar	22/6
5¾in.	2400ft. T.P. mylar	45/-
7in.	1200ft. std. mylar	12/6
7in.	1800ft. L.P. acetate	15/-
7in.	1800ft. L.P. mylar	20/-
7in.	2400ft. D.P. mylar	25/-
7in.	3600ft. T.P. mylar	58/6

Postage 2/-. Over £3 post paid.

TWO-WAY RADIOS

Superb quality. Complete with all accessories and fully g't'd.

3 T'nsistor **£7.19.6** pr

4 T'nsistor **11** gns. pr

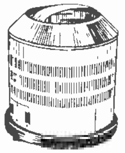
9 T'nsistr **£22.10.0** pr

10 T'nsistr **28** gns. pr.

Post extra. (S.A.E. for full details).

These cannot be used in U.K. without licence.

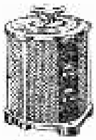
VOLTAGE STABILIZER TRANSFORMERS



Will stabilize your mains voltage. Ideal for TV receivers and Industrial equipment. Input 80-120 v. and 160-240 v. Constant output 110 v. or 240 v. 250 watts. Brand new guaranteed. **£10.10.0** Carr. 7/6.

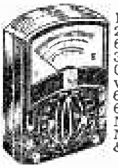
VARIABLE VOLTAGE TRANSFORMERS

Brand New Guaranteed. Fully Shrouded. Input 230v. 50/60 c/s. Output 0-260 v.



1 Amp	£4.10.0
2.5 Amp	£5.17.6
5 Amp	£9. 0.0
8 Amp	£13.10.0
10 Amp	£17.10.0
12 Amp	£19.15.0
20 Amp	£32.10.0

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



MODEL TE-12

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

MODEL 500

30,000 o.p.v. 0/.5/1/2.5/10/25/50/100/250 / 500 / 1,000 v. DC 0/2.5/10/25/100/250/500/1,000 v. AC 0/50µA/5/50/500mA/12amp DC. 0/60K/6 Meg/60 MegΩ. **£8.17.6.** Post Paid. S.A.E. for full details.

TE-51 NEW 20,000Ω VOLT MULTI-METER

0/6/60/120/1,200 V. A.C. 0/3/30/60/300/600/3,000 v. DC. 0/60µA/12/300 mA DC. 0/60K/6 Meg. ohm, **£4.5.0.** Post & pack. 2/6.

OPEN 9 a.m. to 6 p.m. EVERY DAY MONDAY—SATURDAY

Trade Supplied.

G.W. SMITH & CO (RADIO) LIMITED

Phone: GERRARD 8204/9155

Cables: SMITHEX LESQUARE

3-34 LISLE STREET, LONDON, W.C.2

D. & B. TELEVISION (WIMBLEDON) LTD.

131 KINGSTON ROAD · SOUTH WIMBLEDON · LONDON S.W. 19
Telephone: CHErrywood 3955

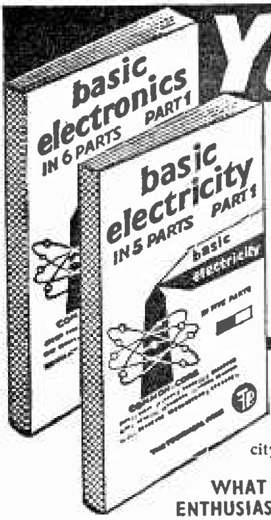
ALL BRAND NEW VALVES GUARANTEED 3 MONTHS

Postage and Packing on Valves 6d. each.

AZ31	10/6	EF80	7/-	PCF80	8/4	UCH81	7/8	6F25	10/9
DAF91	7/10	EF85	7/-	PCF82	9/4	UCL82	8/8	6F28	9/8
DAF96	7/10	EF86	9/4	PCF86	10/6	UCL83	10/8	6L1	15/6
DF91	6/8	EF89	7/-	PCF801	10/-	UF41	7/6	6L18	12/6
DF92	6/8	EF91	11/-	PCF802	10/-	UF42	9/-	6/30L2	9/8
DF96	7/10	EF92	9/-	PCF806	10/-	UF80	7/6	10C2	12/-
DK91	7/10	EF183	9/8	PCL82	8/4	UF85	7/6	10F1	8/6
DK92	7/10	EL33	10/6	PCL83	9/8	UF89	7/-	10F9	8/-
DK96	7/10	EL34	9/9	PCL84	8/8	UL41	7/6	10F18	8/0
DL92	6/8	EL36	9/9	PCL85	8/8	UL46	10/6	10P13	12/6
DL94	6/8	EL41	8/-	PCL86	8/8	UL84	8/8	10P14	11/-
DL96	6/8	EL84	6/4	PL36	10/-	UY41	5/6	20F2	11/-
DY86	7/-	EM80	7/8	PL81	8/4	UY85	5/6	20L1	12/6
DY87	7/-	EM81	7/8	PL82	6/4	5Y3	5/5	20P1	15/-
EABC80	7/6	EM84	8/8	PL83	8/4	5Z4	7/6	20P3	12/-
EAF42	8/6	EM85	10/-	PL84	7/-	6V6	7/7	20P4	13/-
EB91	4/8	EY51	7/-	PL500	14/-	6X5	7/5	20P5	13/-
EBC33	11/2	EY86	7/-	PY33	9/6	R19	14/3	30C15	9/6
EBC41	7/2	EZ40	5/6	PY80	6/-	U25	10/3	30C17	11/6
EBC81	6/6	EZ41	5/6	PY81	7/-	U26	10/6	30C18	10/-
EBF80	7/-	EZ80	5/6	PY82	5/6	U191	9/9	30F5	10/-
EBF89	7/-	EZ81	5/6	PY83	9/6	U193	7/-	30FL1	10/8
ECC81	7/4	EZ90	5/-	PY88	7/-	U251	11/8	30L15	13/8
ECC82	7/4	GZ32	11/-	PY800	7/-	U281	13/9	30L17	11/6
ECC83	7/4	GZ34	11/-	PY801	7/-	U282	13/9	30P12	9/6
ECC84	7/8	HBC90	6/4	UABC80	7/-	U301	13/9	30P4	12/-
ECC85	7/4	PABC80	7/6	UBC41	7/-	U801	19/-	30P19	12/-
ECF80	9/6	PC86	8/10	UBC81	7/-	UU9	8/6	30PL1	12/6
ECH35	13/-	PCC88	8/10	UBF80	7/-	6F1	9/6	30PL13	12/6
ECH42	8/6	PC97	7/6	UBF89	7/-	6F13	12/8	30PL14	11/8
ECH81	7/-	PCC84	7/4	UCC84	8/10	6F14	15/-	30FL14	10/6
ECL80	7/4	PCC85	7/4	UCC85	7/4	6F15	12/6	30FL12	10/6
ECL82	8/8	PCC88	12/6	UCF80	9/4	6F23	10/6	30FL18	10/6
ECL83	10/6	PCC89	10/6	UCH42	9/6	6F24	10/9		
ECL86	8/8	PCC189	10/6						

We are open 9 a.m. to 6 p.m. Monday, Tuesday, Thursday and Saturday 9 a.m. to 7 p.m. Friday. Closed all day Wednesday

SERVICE SHEETS TELEVISION ! ! ALL MAKES AND MODELS 4/- P. & P. 4d.



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 DAY WE RECEIVE LETTERS PRAISING THESE BOOKS, HERE ARE A FEW FROM THIS MONTH'S POSTBAG.

"*. . . I am delighted with them and consider them a most excellent set of books. They are all your other readers claim for them . . .*"
G. P., Harrogate.

"*. . . I have a copy of BASIC ELECTRONICS and feel sure that for instructional purposes they are miles ahead of any other book of comparable subjects in England . . .*"
A. J. C., London.

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 ....

Class AB₁, push-pull, would give the desired performance. For a total current consumption of 93mA with a h.t. of 360V, an undistorted output of 15W is obtainable while, assuming that a fairly efficient output transformer is used, an output of over 20W can be expected. The output transformer used was an obscure make but gave surprisingly good quality. However, various output transformers are available, from less than thirty shillings to more than four pounds, and the reader is left to decide to borderline between quality and economy.

It will be noticed that there are four tone controls. Two provide tone control over the whole power amplifier, giving more than ample compensation. To keep the gram or radio response as set, these controls must not of course, be interfered with. Thus, simple treble cut controls (VR1, VR3) were provided after the two channels. These channels each have jack inputs (J1—J4) with sensitivities of around 2mV. The gram input (Skt1) thas a sensitivity of approx. 50mV and the radio (Skt2) a sensitivity of approx. 300mV. The rest of the amplifier is of conventional design and will be described below.

The Main Amplifier

The tone controls in the main amplifier provide a lift and cut of +10dB and −10dB at 10kc/s (VR7) and lift and cut of + 11dB to −5dB at 20c/s (VR6). From the sliders of these controls the signal is fed to the EF86 (V3). This stage provides a gain of about 150 times. Overall negative feedback is also introduced in this stage. The r.c. network in the anode circuit comprising R24, C15, reduces any tendency towards high-frequency instability. High-stability resistors are used to reduce noise. Direct coupling is employed between the anode of V3, and the phase-splitter, V4.

A word of advice here. The difference between the anode voltage of V3 and the cathode voltage of V4, provides bias for the phase splitter. It is important that this bias is correct, i.e. the grids of V4 must be at a potential 2·5V less positive than that of the cathode with respect to chassis. If the bias is too low, grid current will flow on peak signals causing distortion. If it is too high, distortion will be caused because the phase splitter will operate on a non-linear part of its characteristic. The phase splitter is the commonly used cathode coupled type.

The Output Stage and Power Supply

The output stage being relatively simple, there is little left to say except that separate cathode resistors are used to compensate for unequal d.c. in the two output valves. It is an interesting point to note that the same configuration of output stage employing a 3·8kΩ load will produce a maximum output of 40W. However, this power was not needed and the cost incurred by the larger output transformer would ruin the whole reason for using 6L6's, i.e. economy. The power supply utilises a transformer with a secondary rating of 350—0—350V at 100mA. There are many transformers of this type on the market, most under thirty shillings in cost. The rectifier used was an EZ81.

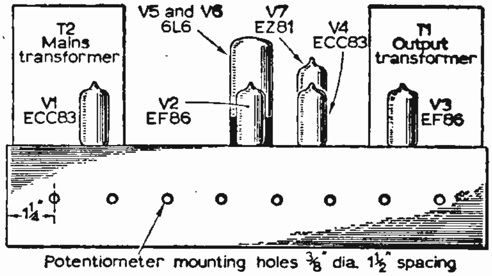


Fig. 2: Front view showing position of components.

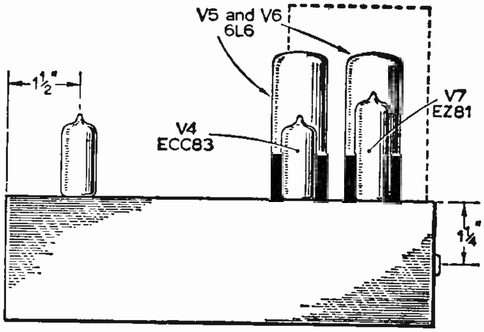


Fig. 3: Side view of chassis.

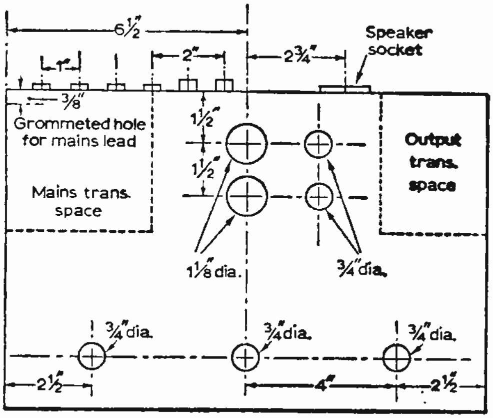


Fig. 4: Top view of the chassis.

There are two resistors shown in the circuit diagram, namely RA and RB. These should be used to bring the resistance of each half of the h.t. secondary winding, to at least 190Ω per section. There must be two heater supplies one of **6·3V** 3A and one of 6·3V 1·0A.

Construction

The unit was constructed upon a chassis of the measurements 13 x 9 x 2½in. A matching base plate was constructed to fit. Sketches of the

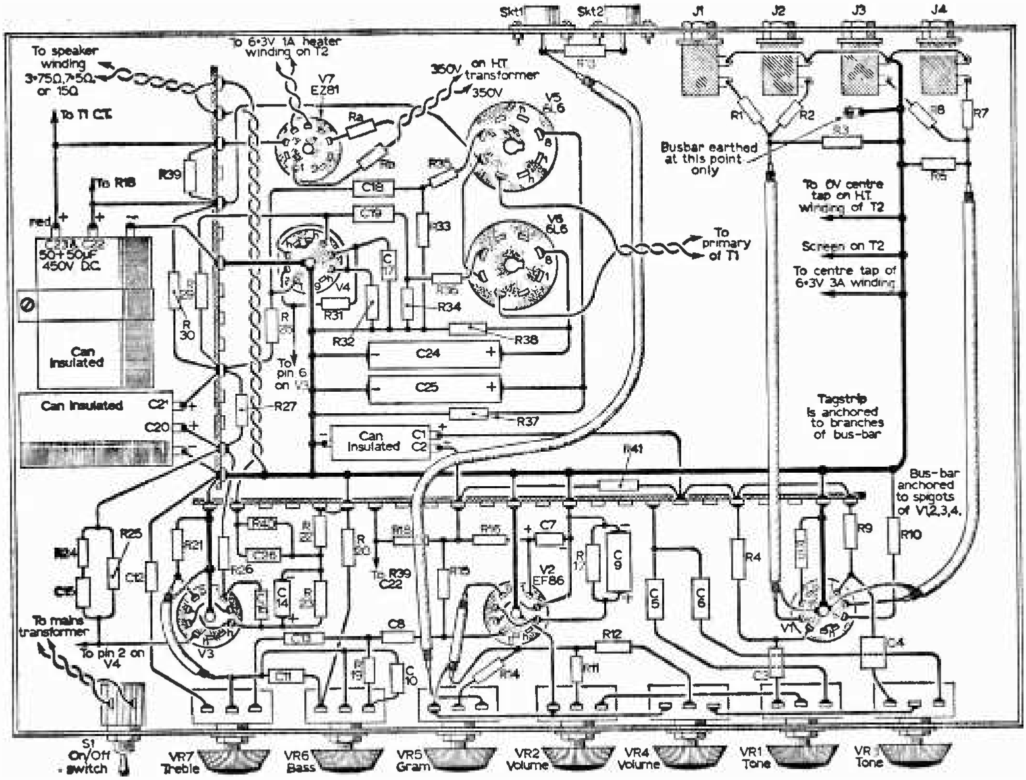


Fig. 5: Underchassis wiring and component·layout.

author's amplifier are shown to give the reader some idea of construction. The layout is not critical but attention should be given to the following details:—

(i) screening of signal leads either more than one inch long or near to other signal leads.

(ii) leads, especially those of grid circuits and tone controls, should be as short as possible.

(iii) heaters should be placed as shown.

Table I

Voltage checks with 20,000 Ω/V meter

Point	Reading
V1 1st Anode	60V ± 15%
V1 2nd Anode	60V ± 15%
V2 Anode	90V ± 15%
C21	220V ± 15%
C22	280V ± 15%
C23	380V ± 15%
V4 each Anode	200V ± 15%
V4 Cathode	63·5V ± 15%
V4 Grid	61V } See text
V1 Anode	61V
V2 Screen	72V

The author purchased a piece of perspex for the front panel for about 1s. 6d., and this imparted a very professional finish. Jack sockets and coaxial sockets were mounted on the rear. The author used the type of sockets that fitted flush and did not protrude. This was merely for reason of compactness. The mains transformer used had the voltage adjuster fixed in the shrouding but as others may not, space was left in the sketch for a voltage adjustment panel. The speaker output was a normal two-pin socket, to take split pin wander plugs. Figs. 2, 3 and 4 front, side and top views show the layout of main components and drilling dimensions. Fig. 5 shows the basic position of components on the underside of the chassis. The list of voltage readings are guides to the reader when testing the amplifier. When construction is finished, testing should take place.

Testing

The unit is inverted and switched on with a voltmeter connected across C23. After a few seconds the needle should swing to approximately 380V. The reading should not be less than 360V. If an abnormally low reading is obtained, the anode and screen grid currents of the output valves

26½gn TAPE RECORDER for ONLY £19.10.

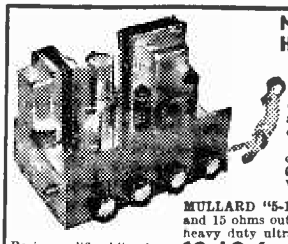
carr. 12/6

Bargain of the Year Offer —cancelled Export Contract

Famous manufacturers brand new unused and factory tested 2 speed 3¾ and 7½ i.p.s. twin track tape recorder 3 Watt output. Tape position Rev.-counter, fast forward and rewind. take 7" reels, mike and gram input. Straight through amplifier facilities. Output sockets for ext. speaker, monitor or external amplifier. Super-imposed switching magic eye recording level and mains neon indicator. Volume and tone controls 7" x 4" speaker. Attractively styled cabinet with detachable lid mike and reel storage facilities. A.C. 200/250 volts operation. Complete with crystal mike, tape spare reel and screen lead, etc.

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 +1 dB, 100mV for 3W, less than 1% distortion. Bronze escutcheon panel. Complete Kit only 7 gns. Carr. 7/6. 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 transformer

Basic amplifier kit price **£9.19.6** Carr. and Ins. 7/6.
Ready built 11½ gns.

CONTROL PANEL KIT. Bass, Treble and Volume controls with 4-position selector switch for radio tape and 11in. x 4in. escutcheon panel.

AMPLIFIER KIT AND CONTROL PANEL KIT, £11.19.6. Ditto, ready wired. £14.19.6.

2-VALVE PRE-AMP. UNIT. Based on Mullard's famous 2-valve (2xEF86) circuit with full equalisation, with volume, bass, treble and 5-position selector switch Size 9x6x2¼in. Ready Built £7.19.6, Carriage 3/6.

RECORDING TAPE—Reduced Prices

Famous American Columbia (CBS) Premier Quality Tape at REDUCED PRICES. A genuine recommended Quality Tape—TRY IT! Brand new, boxed and fully guaranteed. Fitted with leader and stop foils.

	Standard	Long Play	Double Play
5in.	600ft. **13/-**	900ft. **17/6**	1,200ft. **31/6**
5¾in.	900ft. **16/-**	1,200ft. **19/6**	1,800ft. **37 6**
7in.	1,200ft. **21/-**	1,800ft. **28/6**	2,400ft. **47/6**

P. & P. per reel 1/-. 6d. on each additional reel

SPECIAL BARGAIN. 3in. Message Tape, 150ft., 3/9. P. & P. 6d. **3in. L.P. 225ft. 4/9., 3in. D.P. 30 ! 6/6.**

Plastic Tape Reels .. .. .. 3in.. 1/3; 5in. 2/-; 5¾in., 2/-; 7in., 2/3
Plastic Spool Containers 5in., 1/9; 5¾in., 2/-; 7in., 2/3

Alumin. Chassis. 18g. Plain Undrilled, folded 4 sides, 2" deep, 6" x 4". **4/6;** 8" x 6", **5/9;** 10" x 7", **6/9;** 12" x 6", **7/6;** 12" x 8", **8/-**, etc.
Alumin. Sheet. 18g. 6" x 6", **1/-;** 6" x 9", **1/6;** 6" x 12", **12/-;** 12" x 12", **4/6**, etc.

Jack Plugs. Standard 2½" Igranic Type, **2/6.** Screened Ditto, **3/3.** Miniature scr. 1½", **2/3.** Sub min. **1/3.**
Soldering Irons. Mains 200/220V or 230/250V. Solon 25W Inst., **24/6.** Spare Elements, **5/6.** Bits, **1/3.** 65W, **29/6**, etc.

DE-LUXE RECORD PLAYER KIT

Incorporating 4 Sp. Garrard Auto-Slim unit and Mullard latest 3 watt printed circuit amplifier (ECL 86 and EZ 80), vol., bass and treble controls, with 8" x 5" 10,000 line speaker. Contemporary styled 2-tone cabinet, charcoal-grey and off-white with matching blue-relief. Size 17½" x 16" x 8". A stylish unit capable of quality reproduction. Circuit and const. details 2/6 (free with kit).

COMPLETE KIT £13.19.6

Carr. and ins. 12/6 Ready wired **30/-** extra. Illuminated perspex control panel escutcheon, **7/6** extra. Four contemporary mounting legs 6in. **10/6;** 9in. **11/6;** 12in. **12/6** extra.

TRANSISTOR COMPONENTS

Midget I.F.'s—465 Kc/s 9/16in. diam. first, second or third . . 5/6
Osc. Coil M. & L.W. 9/16 in. dia. 5/-
Midget Driver Trans. 9:1 .... 6/-
Midget Output Trans. Push-Pull—3 ohms.............. 6/-

Elect. Condensers—Midget type 1 mFd.-50 mFd. ea. 1/9, 100 mFd. 2/-, 12V. Wkg.

Condensers 150 v. working: .01 mFd., .02 mFd., .03 mFd., .04 mFd. 9d; .05 mFd., .1 mFd., 1/-; .25 mFd., 1/3; .5 mFd., 1/6, etc.

Midget Tuning Condensers. J.B. "OO" 208 pF and 176 pF, 8/6, ditto with trimmers, 9/6. J.B. 220 pF and 105 pF conc. slow motion 10/6. 365 pF single 7/6. Sub. min. ¾in. Dilemin 100 pF, 300 pF, 500 pF, 7/- each.

FERRITE AERIALS, M. & L.W. car aerial coil 9/3.

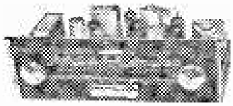
Midget Vol. Control with edge control knob, 5 K/ohms, with switch 4/9; Ditto less switch 3/9.

Speakers: P.M.; 2in. Plessey 75 ohms 15/6. 2½in. Continental 8 ohms, 13/6. 7 x 4in. Plessey 35 ohms, 23/6.

Ear Plug Phones—Min. Continental type 3ft. lead, jack plug and socket. High Imp., 8/-. Low Imp., 7/6.

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

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. Diodes and high output Sockets with gain control. Illuminated 2-colour perspex dial 11½" x 4", chassis size 11¾" x 4" x 5¾".

A recommended Fidelity Unit for use with Mullard "3-3" or "5-10" Amplifiers. Now available as complete kit as illustrated, inc. power unit. Carriage 7/6.

Ditto, but less power unit. **£9.19.6**, carriage 7/6. Circuit and construction details, **4/6**, free with kit.

£10.19.6

Carriage 7/6.

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 and 0.1/350V., **9d.** 0.02-0.1/500V., **1/-.** 0.25 Hunts **1/6,** 0.5 T.C.C. **1/9,** etc., etc. **Close Tol. S/Micas**—10% 5pF-500pF **8d.** 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.** (Midget type modern rating) 1W, **5d.,** 2W, **9d.** **Hi-Stab.** 5% ½W, **6d.** (100 ohms-1 meg). **Other values 9d.** 1% ½W, **1/6** etc., etc.

Volume Controls—5K-2 Meg. ohms. 3in. Spindles. Morganite Midget Type 1¼in. diam. Guar. 1 year. LOG or LIN. ratios less Sw. **3/-.** DP. Sw. **4/6.** Twin Stereo less Sw **7/6** 100k to 2M ohms with DP Sw. **9/6.**

WAVECHANGE SWITCHES. 1 p. 12-way 2p. 2-way 2 p. 6-way, 3 p. 4-way, 4 p. 2-way, 4 p. 3-way, long spindle, **3/6** ea.

EXPANDED ANODISED METAL. Attractive gilt finish ¼in. x ¼in. diamond mesh **4/6** sq. ft. Multiples of 6in. cut. Max. size 4ft. x 3ft. **47/6,** plus carr. Do., finer pattern mesh **4/6** sq. ft., multiples of 12in, max. size 3 ft. x 2 ft., **27/6** sheet.

ENAMELLED COPPER WIRE— ¼lb. reels 14g-20g, **3/-;** 22g-28g, **3/6;** 36g-38g. **4/9;** 39g-40g, **5/-,** etc.

JASON FM TUNER UNITS. Designer-approved kit of parts. **FMT1. 5 gns. 4 valves 20/-. FMT2, £7.10.0.** 5 valves, **35/-. JTV MERCURY 10 gns.** 3 valves, **22/6. JTV2 £13.19.6.** 4 valves, **28/6. NEW JASON FM HANDBOOK, 2/6.** 48 hr. Alignment Service, **7/6.** P. & P. 2/6.

TRIMMERS. Ceramic (Compression Type)—30pF, 50pF, 70pF, **9d.**; 100pF/150pF, **1/3;** 250pF, **1/6;** 600pF, **1/9.**
PHILLIPS. Bee Hive Type (conc. air-spaced)—2-8pF, **1/-;** 3-30pF, **1/-.**
KNOBS—Modern Continental types Brown or Ivory with Gold Centre; 1" dia., **9d.** each; 1⅜" **1/-** each; Conc. knobs ivory with Gold Centre 1¾" dia. **2/9** per pair. Matching ditto **2/6** ea.
LARGE SELECTION AVAILABLE.
METAL RECTIFIERS, STC Types— RM1, **4/9;** RM2 **5/6;** RM3, **7/6;** RM4, **16/-;** RM5, **21/-;** RM4B, **17/6.**

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

7 VALVE AM/FM RADIOGRAM CHASSIS

New 1965 Model now available

Valve line-up ECC85. ECH81. EF89, EABC80, EL84, EM81, EZ80.
Three Waveband and Switched Gram. positions. Med. 200-550 m. Long 1,000-2,000 m. VHF/FM 88-95 Mc/s. Phillips Continental Tuning Insert with permeability tuning on FM and combined AM/FM IF transformers. 400 Kc/s. and 10.7 Mc/s. Dust core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction of a very high standard. Chassis size 13½ x 6½in. Height 7½in. Edge illuminated glass dial 11½ x 3½in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250v. operation. Magic-eye tuning. Circuit diagram now avalable. Aligned and tested ready for use **£13.19.6.** Carr. & Ins. **7/6.**
Comp. with Tape, O/P socket, ext. sp'k'r and P/U sockets and indoor F.M. aerial and 4 knobs—walnut or ivory to choice. 3 Ω P.M. Speaker only required. Recommended Quality Speakers 10" R.A., **27/6.** 13½" x 8" E.M.I. Fidelity, **37/6.** 12" R.A. with conc. Tweeter, **42/6.** Carr. 2/6.

BONDACOUST Speaker Cabinet Acoustic Wadding (1 in. thick approx.) 18 in. wide, any length cut, **2/3** per ft., **6/-** per yard. **TINNED COPPER WIRE,** 16-22g. 4/- ¼lb. **ERSIN MULTICORE SOLDER.** 60/40 **4d.** per yard. Cartons **6d., 1/-, 2/6** etc.

TYGAN FRET or Vynair, 12 x 12in. **2/-;** 12 x 18in. **3/-;** 12 x 24in. **4/-**, etc.

TRS

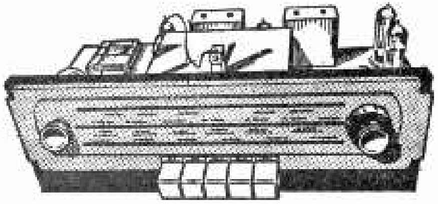
Est. 1949

We manufacture all types Radio Mains Transf., Chokes, Quality O/P Trans.. etc. Enquiries invited for Specials. Prototypes for small production runs. Quotation by return. Send for detailed bargain list, 3d. stamp.

RADIO COMPONENT SPECIALISTS

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

BRAND NEW AM/FM (V.H.F.) RADIO GRAM CHASSIS AT £13.13.0 (Carriage Paid)



Chassis size 15 x 6¾ x 5¾in. high. New manufacture. Dial 1.¾ x 4in. in 2 colours, predominantly cream. 200-250v. A.C. only.
Pick-up. Ext. Speaker. Ae., E., and Dipole Sockets. Five push-buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. O.P. Transformer. Tone control. 1000-1900 M.; 200-550 M.; 88-98 Mc/s. Valves EZ80 rect.; ECH81, EF89, EABC80. EL84, ECC85, 3-ohm speaker required.
9 x 6in. ELLIPTICAL SPEAKER, 20/- to purchasers of this chassis.
TERMS: (Chassis), £3.10.0 down and 5 monthly payments of £2.4.0. Cheap Room Dipole for V.H.F., 12/6. Feeder 6d. per yard.

ALTERNATIVE DESIGN. Similar to above chassis. With addition of Shortwave 6-17 Mc/s. Price £15.15.0 (carr. paid). **TERMS:** £3.10.0 down and 6 monthly payments of £2.4.0. Total H.P. Price £16.14.0. Circuit diagram 2/6. Carriage to N. Ireland 20/- extra.

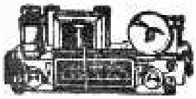
NEW 6 PUSH-BUTTON STEREOGRAM CHASSIS M.W.; S.W.1; S.W.2; V.H.F.; Gram; Stereo Gram. Two separate channels for Stereo Gram with balance control. Also operates with two speakers on Radio. Chassis size: 15 x 7 x 6¼in. high. Dial cream and red, 15 x 3in. Price £17.17.0, carr. paid or £4.0.0 deposit and 6 monthly payments of 50/-. Total H.P. price £19.0.0. Cream moulded escutcheon for dial, 7/6 extra.

BATTERY ELIMINATOR

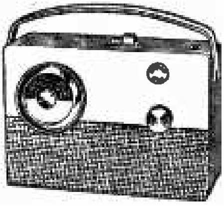
For 4 low consumption valves (96 range) 90v. 15mA and 1.4v. 125 mA, 42/6. (4/- post), 200-250v. A.C. Also for 250mA, 1.4v. and 90v. 15mA at same price. Two units each 3¾ x 3¾ x 1¾in.

SELF-POWERED VHF TUNER CHASSIS

Covering 88-95 Mc/s. Dims. 8 x 6 x 6in. high. Valves ECC85, EABC80 and 2-EF89's 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.

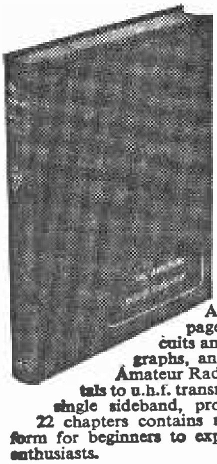
★ All new parts. ★ 6 transistors and diode. ★ 350mW output. ★ Superhet circuit. Ferrite rod aerial. ★ Weymouth Radio printed circuit board. ★ Component positions and references printed on back of board. ★ Nicely styled wooden cabinet, 11 x 7½ x 3½in. ★ Vinyl covered in various colours. ★ 6 x 4in. speaker 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.

PLUS 5/- POST. COMPLETE KIT ONLY **£4.0.0**
OR FULLY BUILT £6.7.6. *Tax & Carr. Paid*

8 WATT PUSH-PULL O.P. AMPLIFIER £5.5.0 (6/- Carr.)

200-240 A.C. mains. Bass, treble and vol. controls. EZ80, ECC83 and 2-EL84's. Chassis 12 x 3½ x 3½in. With o.p. trans. for 2-3 ohm speaker. Front panel (normally screwed to chassis) may be removed and used as flying panel. With Cream/Black control panel whole length of front chassis.

GLADSTONE RADIO
66 ELMS ROAD, ALDERSHOT, Hants.
(2 mins. from Station and Buses). Aldershot 29240
CLOSED WEDNESDAY AFTERNOON
CATALOGUE 6d.
Regret overseas orders cannot be executed



RSGB 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 book itself may be obtained from the publishers:

RADIO SOCIETY of GREAT BRITAIN
Dept. PW, 28 Little Russell Street,
London, W.C.1. *HOLborn 7373, 2444,*

BARGAINS FROM BROADWAY ELECTRONICS

GARRARD Latest Model A.T.60. Mono or Stereo £12.0.0. Autoslim £5.5.0. A.T.5 Stereo £6.15.0. Autoslim pick-up arm fitted with Ronette Stereo 25/-: A.T.6 shells 5/-. GC8, GC2, cartridges with brackets 15/- each.

The **"BLAKE"** 12in. Heavy Duty Cabinet. Size 24¾ x 18 x 9in. The Baffle is ¾in. thick. Covered in Rexine and Vynair, 85/-. De Luxe model veneered with wood grain Formica and standing on smart 6in. legs, £5. Please add 10/- for postage.

"HAYDON" Cabinet. 16¾ x 15 x 7½ins. Fabric covered suitable 12in. speaker, 45/-. Postage 7/6.
Vynair speaker cloth 50in. wide, 14/- yard.
Rexine leather cloth 50in. wide, 10/6 yard. S.A.E. for samples.

The **BM.3. CRYSTAL MIKE,** 30/-; table stand for same, 9/6.

GUITAR PICK-UP complete with clip and screened lead, 12/6.

NEON PANEL LIGHTS, 240v. A.C. Arcolectric, 2/6 each.

BARGAINS IN TRANSISTORS
AC127 (NPN) 5/- each. AF114, AF115, AF116, AF117, AF118, AF119, OC169, OC170, OC171, OC172 4/6 each. OC81M, OC71 2/6 each. OC72, OC75, OC82 all at 3/- each. RF Packs two OC45, OC44 8/6; AF Packs two OC81, OC81D 6/-; AF Packs two GET119 (OC83 equiv.) GET118. Driver 5/6; OC26, OC29 7/6; ORP12 Light Cell 7/6; Diodes OA81 2/3; OA91 1/9.

TRANSISTOR ELECTROLYTICS: 1, 2, 4, 5, 8, 10, 16, 32, 50, 100 mfd. all at 15 volts, 1/3 each. 100 mfd. 6v. 9d. each special offer. 25 mfd. 50v, 50 mfd. 50v, 50 mfd. 100v, 250 mfd. 25v, 500 mfd. 25v, 100 mfd. 50v, 1,000 mfd. 12v. all at 3/- each.

EARPIECES with cord and 3.5 mm plugs, 8 ohm magnetic 3/-; 250 ohm 4/-; 180 ohm magnetic with clip 6/6; Crystal 4/-.

BROADWAY ELECTRONICS
92 MITCHAM ROAD, TOOTING, S.W.17
Phone: BALham 3984
(four minutes from Tooting Broadway Underground Station)

www.americanradiohistory.com

COMPONENTS LIST

Resistors:

R1	22kΩ 20% ¼W	R8	22kΩ 20% ¼W
R2	22kΩ 20% ¼W	R9	220kΩ 20% ½W
R3	100kΩ 20% ¼W	R10	3·3kΩ 20% ¼W
R4	220kΩ 20% ½W	R11	470kΩ 20% ¼W
R5	3·3kΩ 20% ¼W	R12	470kΩ 20% ¼W
R6	100kΩ 20% ¼W	R13	1·5MΩ 20% ¼W
R7	22kΩ 20% ¼W	R14	470kΩ 20% ¼W
R15	100kΩ 10% High Stab. ½W		
R16	390kΩ 10% High Stab.		
R17	1·5kΩ 10% ¼W	R20	150kΩ 10% ¼W
R18	47kΩ 20% 1W	R21	1MΩ 10% ¼W
R19	1·5M 10% ¼W		
R22	100Ω 5% High Stab. ½W		
R23	1·8kΩ 5% High Stab. ½W		
R24	10kΩ 5% High Stab.½W		
R25	120kΩ 5% High Stab.½W		
R26	470kΩ 5% High Stab.½W		
R27	150kΩ 10% 1W		
R28	100kΩ 5% High Stab. ½W		
R29	100kΩ 5% High Stab.		
R30	20kΩ 10% 1W	R35	10kΩ 10% ¼W
R31	1MΩ 10% ¼W	R36	10kΩ 10% ¼W
R32	68kΩ 10% 1W	R37	500Ω 5% 3W
R33	470kΩ 5% ¼W	R38	500Ω 5% 3W
R34	470kΩ 5% ¼W	R39	10kΩ 10% 3W
R40	15Ω spkr–18kΩ, 7·5Ω spkr–12kΩ, 3·75Ω spkr–8·2kΩ		
R41	82kΩ 1W		
RA	See text (5W each)		
RB			

Capacitors:

C1	16μF+16μF 350V.W.		
C2			
C3	0·01μF	C5	220pF
C4	0·01μF	C6	220pF
C7	8μF 250V.W.	C9	50μF 250V.W
C8	0·1μF		
C10	270pF 10% silver mica		
C11	3300pF 10% silver mica		
C12	680pF 10% silver mica		
C13	33pF 10% silver mica		
C14	100μF 12V		
C15	330pF 5% silver mica		
C16	0·1μF	C18	0·5μF
C17	0·1μF	C19	0·5μF
C20	32μF+32μF 450V.W.		
C21			
C22	50μF+50μF 450V.W.		
C23			
C24	50μF 25V	C25	50μF 25V
C26	15Ω speaker 150pF 7·5Ω speaker 220pF 5% 3·75Ω speaker 330pF		

Valves:

V1	ECC83	V5	6L6
V2	EF86	V6	
V3	EF86	V7	EZ81
V4	ECC83		

Transformers:

T1	8kΩ to 3·75, 7·5 or 15Ω 20W rating
T2	350–0–350V 100mA 6·3V c.t. 3A 6·3V 1·0A

Miscellaneous:

VR1, VR2, VR3, VR4, VR5—500kΩ log.
VR6, VR7—2MΩ log.
S1 D.P.S.T.
5 89A valve holders, 2 I.O. valveholders.
4 open circuit jacks. 2 coaxial sockets.
1 speaker socket. Chassis 13 x 9 x 2½in.
Base plate 13 x 9in. 7 control knobs.
Nuts, bolts, wire, grommets, etc.

should be checked and should be 44mA and 2·5mA respectively. If the current readings are correct then the mains tranformer and rectifier should be checked. High or low currents drawn by the output valves mean incorrect cathode loads and will lead to distortion and low output. R37 and R38 should be adjusted to give as near as possible equal currents through each valve. The correct phase of negative feedback can be decided aurally. The rest of the voltage checks should be made as per Table 1. Applying a 50c/s signal so as to overload the amplifier completely should give about 19-20V across a 15Ω load.

Final Notes

If the constructor can afford to be really lavish, a beautiful job can be made of this unit and it could, if need be, be built on a larger chassis to accommodate the transformers etc. It will form the perfect basis for a hi-fidelity reproduction system and the constructor will be able to say truthfully that is as good as many commercial products. ■

on the Short Waves

MONTHLY NEWS FOR DX LISTENERS

All times are in G.M.T. All frequencies are in kc/s.

The Broadcast Bands—by John Guttridge

Holland: *Radio Nederland Wereldomroep* (P.O.B. 222, Hilversum) now uses 9,590 for the 0130—0220 English transmission.

Italy: *R.A.I.* (Casella Postale 320, Rome) transmits in English as follows: 1205—1230, 11,865/9,575; 2020—2040, 9.710/7,275/7,235/6.050/5,990; 0100—0120, 9,630/6,030; 2205—2225, 9,710/6,010; 2115—2135, 7,235/6,050.

Monaco: *Trans-World Radio* (Rue de la Poste 5, P.O. Box 141, Monte Carlo) has daily English transmissions, all on 7,260, from 0730—0800, and on Sundays at 0800—1100, 1230—1330 and 1600—1630.

Norway: *Radio Norway* (Oslo) now transmits as follows: 0300—0430, 1,578/6,185/7,240/9,610; 0745—0815, 9,610/21,730/7,240/15,175/17,825; 1100—1230, 7,240/21,730/25,900/9,610/15,175/17,825; 1300—1430, 9,610/21,730/25,900/11,850/15,175/17,825; 1700—1830, 7,240/9,610/11,850/15,175; 1900—2030, 6,185/7,240/9,610/11,850; 2100—2230, 6,185/7,240/9,610/11,850; 2300—0030, 1,578/6,185/9,610/11,850. Home Service transmissions are relayed on 6,130. This station will also QSL its medium wave home service transmissions. Best outlets to try are 890/1,313/1,578.

Poland: *Radio Warsaw* (Al Niepodleglosci 75/77, Warsaw) transmits: English to Africa at 1900—1930 on 7,285/9,675 and 2200—2230 on 7,125/7,145/7,285/11,840.

Portugal: *Radio Portugal* (Rua S. Marcal 1A, Lisboa) has the following English transmissions: 0730—0815 and 0815—0900, 11,840/17,880 or 17,890; 1345—1430 and 1815—1900, 21,495/17,880 or 17,890; 2015—2100, 7,285/6,025; 2245—2330, 1,061/755; 0200—0245, 0400—0445, 6,185/6,025; 0300—0345, 5,985. A DX programme is broadcast every second and fourth Friday at 0745, 0830, 1400, 1830, 2030, 2300, 0215, 0315, 0400. Portuguese-by-Radio lessons are transmitted every Tuesday and Friday for the last quarter of an hour of all short wave transmissions. A special booklet for the lessons is available. A competition, "Make Your Dreams Come True", is being run until June 19. A new quarterly programme guide is available on request.

Rumania: *Radio Bucharest* (P.O.B. 111, Bucharest) has the following English transmissions: 1930—2030, 7,195/6,190; 2230—2300, 7,195/6,190/155; 0130—0230, 11,810/9,590/9,510/6.190/6.150/5,990; 0300—0330 and 0430—0500, 11,810/9,590/9,570/9,510/6,190/6,150/5,990; 1500—1530, 15,380/11,940/11,885/11,810.

U.S.S.R.: *Radio Kiev* (Ukrainske Radio, Radio Centre, ul Khreshchatik 24, Kiev) can just be heard in English from 1200—1230 on 11,925.

Radio Moscow (Moscow) has English for North America at 2200—2230 on 9,680/7,360/7,250/7,170/7,150 and 0000—0030 on 9,680/9,570/7,360/7,330/7,310/7,250/7,200/7,150.

Vatican: *Radio Vatican* is reported on 11,735 with English at 2230, Mondays, Wednesdays and Saturdays.

Egypt: *Cairo Radio* (Propagation and Monitoring Department, U.A.R. Broadcasting and TV, Maspero, Cairo), using the additional outlet of 9,675 to Europe from 1830—2330. Other frequencies are 9,475/11,915. An hour-long English transmission can be heard at 2130.

Ethiopia: *Radio Voice of the Gospel*, ETLF (P.O. Box 654 Addis Ababa) can be heard signing on at 1300 on 15,410. There is interference from a BBC World Service outlet on this frequency.

Liberia: *Voice of America* relay, Monrovia (Washington 25, D.C., U.S.A.), may be heard in English from 2200—2215 sign off on the new frequency of 7,130.

Mali: *Radio Mali* (B.P. 171, Bamako) can be around 2045 on 9,745.

Japan: *N.H.K.* (Tokyo) has changed frequencies for some General Service transmissions. Affected transmissions are 0100—0130, 15,105/15,300/15,425, and 0200—0230, 0300—0330, 0400—0430, 11,705/15,195/15,300.

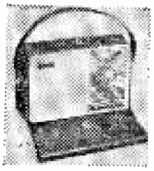
Windward Islands: Windward Islands Broadcasting Service (St. George's, Grenada, W.I.) transmits to the British Isles from 2000—2145 on 11,895. Other short wave outlets are: 1545—2240, 5,010; 2155—0215, 3,280; 2245—0215, 2,420.

Ecuador: *La Vos de los Andes*, HCJB (Casilla 691, Quito), has two evening English transmissions to Europe. They are at 1845—2000 on 17,780/15,405 and 2100—2130 on 15,115/11,755.

Austria: Osterreichischer Rundfunk (Wien IV,

EXCLUSIVE TO PRACTICAL WIRELESS READERS

TRANSISTOR POCKET RADIOS



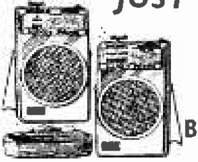
BULK PURCHASE ENABLES US TO MAKE THIS FANTASTIC OFFER — AND WITH MONEY BACK GUARANTEE ! ! !

The "SAN REMO" . . . so tuned that it brings the voices of star entertainers and vocalists dramatically to life—in your home office, etc. Only 4¾ x 2⅝ x 1¼in. Fits easily into your pocket, or handbag. Works for months off 1/2 battery. Should last a lifetime, **anyone can assemble it in an hour or two** with our easy plan. Miniature speaker—everything, only **28/6**, 2/6 P. & P. (Parts can be bought separately). Limited **period—so rush your order before it's too late.**

ONLY 28/6

NO MORE TO PAY

DON'T WALK- JUST TALK ! !



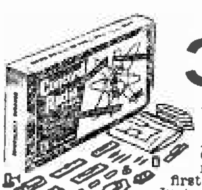
INTERCOM OUTFIT & BABY ALARM

LIMITED QUANTITY SAVE £3.16.6

ONLY 49/6

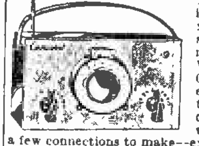
Robustly made, brand new current models. You get 2 separate, fully transistorised intercommunicating sets — each can speak or listen to the other — complete with 60ft. connecting wire. **Fixed in a flash.** Ends baby-crying worries. Ideal for Workshop to House, Sickroom, hundreds of uses! Hangs on wall or stands up. **Our absurd price 49/6, battery 2/6 extra Post, etc. 3/6. Money refunded if not 6gns. value!**

MAKE 5 DIFFERENT TRANSISTOR RADIOS FOR 35/-

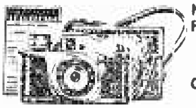


NO EXPERIENCE NECESSARY. No Soldering. Only 8 connections for **first radio to work.** Just look, you get A.B.C. Plans, Cabinet, Loudspeaker (alone 17/6). Earphone, 4 Semi-conductors, Coils, Condensers, Resistors, Tuner, Switch, Screws, etc. **YES — EVERYTHING!** Loud clear English and Foreign reception. 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.**

IT HAD TO COME EVENTUALLY! THE "SKYSCRAPER" PERSONAL COMMUNICATIONS RECEIVER Highly sensitive. World-wide short-waves reception including news in English and countless other broadcasts from **RUSSIA, AMERICA, etc., etc.**



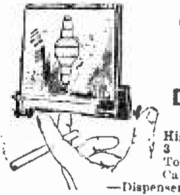
Take it anywhere—it's featherweight! 6in. x 3½in. x 1¾in. Band-spread Tuning, Vernier dial. Miniature Valve Circuits, Plug-in Coils, Own Rod Aerial, etc. 50% of production to be exported. **Anyone can assemble it within 2 hours—only a few connections to make—experience unnecessary.** Parts incl. Case, Personal phone. **Easy-to-follow plan—49/6, plus 3/6 Post, etc.**



MINIATURE PRECISION SPY CAMERA

Only 12/6 Post 2/6

Offered at a fraction of its **Real Worth. Brand new precision made photographic instrument in chromed steel and leather.** Two speed shutter, 2¼in. x 1⅛in.! **Easily concealed in Palm-of-hand! and takes crystal clear photographs.** The rage of America and offered at the absurd price of **12/6,** incl. solid leather case—add 6/- for pack of 6 films which give 60 photos. you will be thrilled with this fantastic piece of superb craftsmanship in miniature. **Send immediately.**



CAR CIGARETTE LIGHTER DISPENSER

High Class Stores sell at 3 gns. — save £2.4.6. Top quality chromium. Car cigarette lighter—Dispenser. Fixed in a jiffy — Pressing Button delivers ready-lit Cigarette into your hand! Takes **10 cigarettes—King size or any size! As fitted to luxury cars. Safe, fool-proof.** 4¾ x 4 x ½in. Lifetime tested, ready to use. **Refund if not worth 3 gns. 750 only. 18/6 plus 1/6. P. & P. (state 6 or 12v.).**

ONLY 18/6

AUTOMATIC POCKET CALCULATOR

Adding and Subtracting up to 999,999 at your finger tips for

ONLY 8/6 plus 1/6 P. & P.

This superfast, lightweight calculator is simple to operate yet fantastically accurate. Precision engineered by craftsmen and factory tested for reliability. Ideal for use in Offices, Shops, Stores, During Games, etc. Complete with carry case. Slips easily into the jacket pocket or purse. Decimal tables, included for engineers—A terrific bargain that you'll enjoy using.

Read what just a few of our satisfied customers say

R.C. of Harringay writes *Received with thanks Skyroma . . . Very pleased. Working well.*

B.M. of Harrogate writes . . . *I would like to thank you . . . It was a real bargain.*

L.S. of London W.8 writes . . . *given it a good try out and I am very pleased with the results.*

S.B. of Somerset writes . . . *delighted with this radio . . . glad if you could send one more.*

T.F. of Stevenage writes . . . *I would just like to say how pleased my son is with this radio.*

MORE TERRIFIC OFFERS FROM CONCORD !

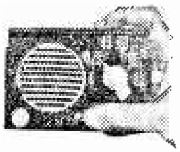
FULLY TRANSISTORISED

LUXURY MINIATURE RADIO

Price slashed TO ONLY 37/6 + 3/6 P. & P.

Looks like a powder compact — sounds like a large radio. This wonderful little radio gives amazingly clear reception — pulls in your favourite programme and pop stars. Slips easily into the pocket, handbag or can be carried by its gilt chain handle. The powerful mini speaker has a gilt ship's wheel design with sparkling gem in the centre. Batt. 2/6 extra. We guarantee that you'll be delighted with this superb bargain.

NEW RADIO



VOLKSRADIO ANYONE CAN BUILD IN 2-3 HOURS

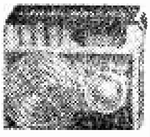
19/6

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 2⅞ 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 a 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 19/6 plus 2/6 post, etc.**

PARTS AVAILABLE SEPARATELY

AMAZING CIGARETTE RADIO

ONLY 18/6



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 and it is working wonderfully . . .*" ALL PARTS including Semi-Conductors, A.B.C. Plans, etc. **ONLY 18/6 plus 2/6 post, etc.**

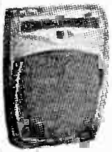
PARTS AVAILABLE SEPARATELY

CONCORD ELECTRONICS (Mail Order Only)
LTD. (DEPT. P.W.30) 77 NEW BOND ST., LONDON, W.1

WIRECOMP ELECTRONICS

TRANSISTOR POCKET RADIOS

Ideal Gifts—all supplied complete with personal earpiece, battery and carrying case. Fully guaranteed. **Post Free.**



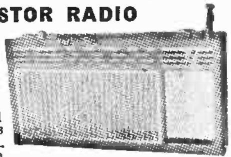
BOY'S 2 TRANSISTOR MODEL (Illustrated)
In attractive plastic case. Size only 4 x 2¼ x 1in. 2¼in. speaker. Uses PP3 battery. Tunable over full medium waveband. 39/6

BOY'S 4 TRANSISTOR MODEL 45/-

6 TRANSISTOR MODELS
In plastic case. 4 x 2¼ x 1in. with 2¼in. speaker. Uses PP3 type battery Tunable over full medium waveband. 59/6

2 Waveband (Long and Medium) Model size 5 x 3 x 1¼in., cream/black plastic case. 89/6

FAMOUS MAKE TRANSISTOR RADIO THE "STELLA"



7 transistor portable radio. Long, Med. and Short wavebands. Fitted tone switch and sockets for personal earphone and external aerial; chrome telescopic aerial Uses four 1.5 v. torch batteries Plastic cabinet in beige and red. size 4 x 7 x 1¼in. Excellent tone. 3in. p.m. speaker. Comp. with shoulder strap and external aerial. Full guarantee. List price 17 Gns.

WIRECOMP'S PRICE **£9.19.6** P. & P. 5/-

WONDERFUL BARGAIN FROM RUSSIA THE "SOKOL"

7 transistor radio covering full Medium and Long wavebands with exclusive rechargeable battery which can be recharged from any 110/250 v. A.C. mains supply. Can also operate on PP3 type dry battery. High quality P.M. speaker. Ivory and black plastic case with metal trim—size 6 x 3¼ x 1¼ in. Sockets for external aerial and earpiece. Complete with real leather case, dry battery, rechargeable battery and charger, personal earpiece.

WIRECOMP'S PRICE **£6 9.6** P. & P. 2/6

WIRECOMP'S BARGAIN STORE
48 Tottenham Court Road, London, W.1
Thousands of bargains: Transistor Radios—Record Players—Tape Recorders—Radiograms—**Rock Bottom Prices**

THE "REALISTIC" 7

Transistorised Portable Receiver made to the highest professional standard. Comprises 7 Mullard Trans. plus Crystal Diode. 350 milliwatt output to 4in. speaker.—I.F. frequency 470 Kc/s—fully tunable over medium and long wavebands. Two-tone plastic cabinet with handle—size 7 x 10 x 3¼in. fitted socket for car aerial. Complete with full instructions.

MAY BE BUILT FOR £5.19.6 **All parts sold separately Battery 3/9 extra**

P. & P. 4/6 extra. (Circuit diagram 2/6, free if all parts bought.) **Also De Luxe Model** with superior PVC covered wood cabinet and full view tuning dial. **ONLY £1 EXTRA. All parts sold separately. Battery 3/9 extra. P. & P. 4/6.**

SINCLAIR SUPER MINIATURE POCKET RADIOS

THE MICRO-6. Pocket radio only $1^{4}/_{5}$ x $1^{3}/_{10}$ x ½in. Complete with **earphone and detailed construction data. Can be built for only** **59/6**

THE SLIMLINE. The new 2-transistor pocket radio size only 2¼ x 1¼ x 1¼in. **Can be built for** **49/6**

INTERNATIONAL BRAND TAPE—Fully Guaranteed

MYLAR BASE		**ACETATE BASE**	
3¼in. Triple play, 600ft.	15/-	3in.—150ft.	3/6
4in. Triple play, 900ft.	17/6	3in.—225ft.	4/11
5in. Double play, 1,200ft.	15/-	3in.—300ft.	7/6
5in. Triple play, 1,800ft.	35/-	5in. Long play, 900ft.	10/-
5¾in. Double play, 1,800ft.	22/6	5¾in. Long play, 1,200ft.	12/6
5¾in. Triple play, 2,400ft.	45/-	7in. Stand. play, 1,200ft.	10/-
7in. Stand. play, 1,200ft.	12/6	7in. Long play, 1,800ft.	15/-
7in. Long play, 1,800ft.	19/6	**P.V.C. BASE**	
7in. Double play, 2,400ft.	25/-	5in. Stand. play, 600ft.	8/6
7in. Triple play, 3,600ft.	58/6	5¾in. Stand. play, 840ft.	11/6

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

323 EDGWARE RD., LONDON, W.2. AMBassador 7115
All Branches open all day Saturday. Early closing Thursday

378 HARROW RD., LONDON, W.9. CUNningham 9530
Mail Orders to the above address for prompt service

THE PEMBRIDGE COLLEGE OF ELECTRONICS PROVIDES TRAINING IN RADIO AND TELEVISION

FULL-TIME COLLEGE COURSE IN RADIO AND TELEVISION

Our Course has now been extended to sixteen months' duration to include theoretical and practical instruction on transistor television receivers, U.H.F. television receivers and colour television.

Next course commences 5th January, 1966.

This Course is recognised by the Radio Trades Examination Board (R.T.E.B.) for the Radio and Television Servicing Certificate examinations.

Provides excellent practical experience on valve and transistor radio receivers and all well-known makes of television receivers.

To:
The Pembridge College of Electronics (Dept. P11)
34a Hereford Road, London, W.2.

Please send, without obligation, details of the Full-time Course in Radio and Television.

Name______________________________

Address____________________________

CHP1

Argentinierstrasse 30a) has a transmission on Saturdays and Sundays at 1700—2000 on 9,610.

German Federal Republic: *Deutsche Welle* (Bruederstrasse 1, Postfach 344, 5 Koln) now uses 17,830/11,890 for its 1555—1630 English transmission. The 2020—2050 and 0430—0500 English transmissions from the Kigali, Rwarda, relay have been dropped.

German Democratic Republic: *Radio Berlin International* (Berlin-Oberschoneweide, Nalepastrasse 18-50) is now using 6.115/6.080/7.185/1.430 for its 2200—2230 European English transmission.

Thanks for contributions go this month to the Middlesbrough Boys' High School Short Wave Club, S. Shaw, L. Sapiets, B. Burling, T. Black, S Ormerod and W. Finch.

The Amateur Bands—by David Gibson G3JDG

REGULAR readers will be sorry to hear of the illness of your regular columnist G3JDG, which has resulted in this emergency write-up by your editor. Latest news is that Dave is now recovering and we hope he will be able to resume his usual role by next issue.

The LF Bands

Coinciding with good m.w. DX conditions, Top Band has been producing some interesting calls including OK, SP, ZB2AM, VO1FB, VP9EU, 9M4LP, 6Y5XG, YVØAA, HK4EB, 2C4GC, EP21W and others. Best times to listen are from around midnight and around dawn. Australia has also been reported, as have plenty of W's.

"80 metres seems *very* busy with DX activity", says **N. Bristow** (Stafford), who reports VO1DD, YV5AGA, HKØKL, and HC5, ZB2 and others, all on s.s.b. between 0100—0200. On c.w. much of interest has been heard by members of the staff from late evening onwards and at "breakfast time". Samples—ET3USA, VP2SY, VK5NQ, EP2BQ, HI3PC, 6Y5BB and many U's.

7Mc/s

For those who persevere, 40m. can still be rewarding. Best times are late evening and the early a.m.'s, at breakfast time and also early and mid afternoons. Much fine DX has been heard, notably on c.w. of course, such as: ET3USA, KR6DB, ZD8AR, KX6BX, VS6FF, VP5AR, VS9ADF, CR6DA. Japan has been heard in quantity from midday to late evening and VK/ZL during the same period UAØ's have also been logged.

14Mc/s

It never fails! Although the band has been closed in the evenings, a lot has been happening during daylight hours, particularly the periods 0500—1000 and early evenings.

N. Bristow found 9M2SS, VK2MO, VK3UQ, VK3AHR, VK6NS all between 1300—1400 on s.s.b. A4378 of Cardiff pulled in VP2VE, PY9HL, PY7YS, VK3AHO, VK9DR, VK6GP, HK3AVE, YV1QN, HI3XEC, ZB2AJ, HR1JMF, KH6EDX/P, 6Y4DM, UA9KCF—all in three days, on s.s.b.

I. Black of Gillingham logged EA8CR, EA9IC (Ifni), HI1SO, HI8JSM, HZ1AT, MP4BCC, MP4TBO, OD5BZ, 7Q7PBD, 7X2MD, 9G1TF 9M6AP, 9Q5AA, OY2H, many VK's, VP5RB, VP9MK, XE2WH, ZC4JU, ZL1AOU, 6W8CW, 6Y5MG, 4X4DK etc—all on phone.

Those who can read c.w. might have heard some of these: VR2EW, YJ1DL, ZD7IP, ZD9BE, BV1USA, CR3AD, CR8CA, FR7ZG, FB8XX, KX6SZ/Ebon.

21 and 28Mc/s

Well, as expected, 28Mc/s has been virtually dead, although a very few DX signals did struggle through between the hours of 1000—1500. 21Mc/s, however, has been a little more helpful, with some fine DX at times. Our friend **A4378** of Cardiff logged 9H1R, SV1DB, EA8CR, ZS6RA, ZS6FJW, PY9HL, WAØHHX, KØGQG, VP9DL, ZE6JL and others, all s.s.b.

On c.w., these are some of the stations heard recently: ZD8AR, TT8AE, VQ8AW, FL8MC, JA3API, VS6FF, ZE3JJ, CR7IZ, TY3ATB, VS9AMD, VS6FO, XE1OE, XW8BD, ZD5M, ZD7IP, 9K2AD, 5R8CQ, 9M4MY. Also VK, ZL, etc.

General

G3FNF is now on from St. Helena as **ZD7RH**, and ZD9BE is on from Tristan da Cunha on 14Mc/s c.w. If you want Ifni, try for EA9IC (**I. Black** heard him on 14Mc/s). We hear that Nauru may be hearable by means of KG6SZ/VK9. Another VK9 to watch for is VK9PL—a rare one indeed (Papua), operation on 21Mc/s.

MEDIUM WAVE DX

The correspondence received following the article on m.w. DX in the November issue, clearly shows that there is a submerged section of the fraternity quietly working away in the background on this band.

If sufficient readers express interest we could well start a regular feature next season. Please write and let us know if you would welcome this move. In the meantime, serious m.w. DX chasers are advised to drop a line to Ken Brownless, 7 The Avenue, York, who, with Al Woodland and Bernard Brown, is collating m.w. DX information.

Beginners should note that conditions are still good. At the time of writing, East Coast Americans/Canadians are often at good strength from 2100 and at superb strength by midnight. Easy ones to try for include CBA Sackville (1070kc/s). Radio America, Swan Island (1157), CJCB, Sydney (1270), WINS New York (1010), CBM Montreal (940), CBT Grand Falls (540), WHDH Boston (850), WNBC New York (660), WOR New York (710), Transworld Radio Bonaire (800), WNEW New York (1130), CJON St. Johns (930), WCBS New York (880), WEZE Boston (1260). Latin Americans are also often good, from 2230 or so. Afternoons and evenings sometimes yield Asiatics, notably Anwhei, China (940), V.O.A. Okinawa (1078), Baghdad (760).

A SHORT SERIES FOR THE EXPERIMENTER

OSCILLATOR CIRCUITRY

R. Leyland

1—TRANSISTOR R-C OSCILLATORS

CIRCUITS that originated in a thermionic form can usually be translated into a transistorised version and this is so with phase-shift oscillators. The sine wave which these develop is indispensable for testing amplifiers and much better able to reveal any severe distortion than is the square wave produced by a multivibrator. Square waves have an application in showing the transient response, but in checks upon both frequency response and upon distortion, such as that due to incorrect bias conditions it is necessary to use sine waves.

The simplest sine wave oscillator is not much more complicated than a multivibrator circuit and its frequency stability may well be superior since it does not depend upon switching levels but upon phase-shifting properties.

Limiting

Sine waves are also preferable as fundamental a.f. signals because square waves are more easily produced from sine waves by auxiliary limiting or switching stages than are sine waves from square ones. In fact uncontrolled and excessive amplification in a sine wave oscillator gives rise to squaring on the peaks, as also does a run-down battery. A multivibrator cannot generate a sine wave however the amplitude may be controlled and sine waves can only be extracted from square ones by suppressing the upper harmonics with low-pass filters or tuned circuits, which is not a very convenient method and quite different from the principle of the phase-shift oscillator.

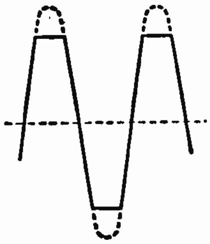


Fig. 1: Clipping of the output waveform in an overdriven stage.

It is possible by listening to a loudspeaker for variations in the tone produced by a sine wave (which as an audible tone resembles a continuous whistle) to detect the presence of harmonics caused by distortion, but a better method is to observe the waveform on an oscilloscope.

Squaring, or limiting on the peaks, is indicative of an overdriven valve or transistor and, like other forms of amplitude distortion, is equivalent to the introduction of harmonics which might be described as ripples at higher frequency. Square waves on analysis, resolve into a very large number of these sine wave components, forming a harmonic series of 1, 3, 5, 7 . . . times the fundamental frequency or first harmonic (with even harmonics missing).

A filter can reduce the proportion of upper harmonics relative to the fundamental, but when a pure sine wave is required it is preferable to reduce distortion at its source by restricting the waveform excursions of a sine wave oscillator to the linear part of its amplifying characteristic.

Input Waveform

Distorted waves are also produced in transistor oscillators (Fig. 3) if considerations of impedance level are ignored. The input impedance of a transistor is only about 1kΩ in grounded emitter and may be only 200Ω in grounded base. What matters even more, however, is that this input impedance is non-linear, which implies that the waveforms of the input current and voltage are not alike except for very small inputs. The output

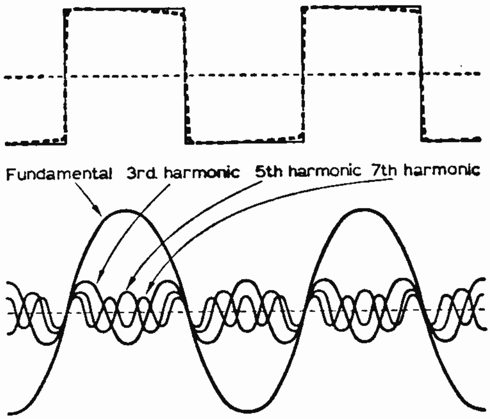
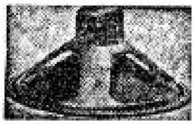


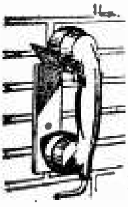
Fig. 2: Sine wave harmonics composing a square wave. Finite rise and sag times modify the square waveform as shown.

Speaker Bargain



12in. High-fidelity loudspeaker. Highflux magnet type with either 3 ohm or 15 ohm speech coil. Will handle up to 10 watts. Brand new by famous maker. Price 29/6 + 3.6 post and insurance.

SELF ENERGISED TELEPHONES



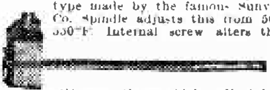
These require no batteries: in fact they have only to be connected by a pair o. wires. They can thus be fitted into existing bell circuits. Results are extremely good and maintenance costs are nothing. Handsets only 15/- each. Post etc. 2/6. Two post free.

Cabinet Snip

This fine cabinet as illustrated but less control knobs is available this month at a special snip price of 12/6 plus 3/6 post and insurance. Size is 13½in. x 9in x 4in. and it is nicely covered in two tone I.C.I. fabric.

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 'C' is a small porcelain thermostat as fitted to electric blankets, etc. 1½ amp. setting adjustable by screw through side. 8/6. P. & P. 6d.

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.

9-Way push-button switch

Each way having two single pole change over and one shorting switch, good length push rods 30/- per doz. 3/6 each. post 2/9 per doz.

Waterproof Heater Wire

16 yds. length 70 watts, self regulating temperature control. 10/- post free.

Three Unusual Items

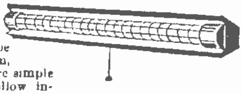
OZONE OUTFIT—for removing smells and generally improving any oppressive atmosphere Kit consists of Philips Ozone Lamp and mains unit, only needs box. 19/6 plus 3/6 post and insurance.

BLACK LIGHT UNIT. 40 watt intensity, comprises lamp, lamp holder and 40 watt choke. Only 19/6 plus 6/6 carr. & ins.

TIMER KIT. Special offer of all components except metal box to make mains operated interval timer for photography etc. 12/6 plus post 2/6.

Where postage is not definitely stated as an extra then orders over £3 are post free. Below £3 add 2/9.

INFRA RED HEATER



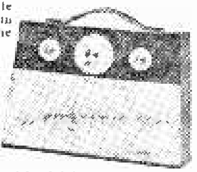
Make up one of these latest type heaters ideal for bathroom, kitchen, bedroom. etc. They are simple to make from our easy to follow instructions—use silica enclosed elements designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and metal casing as illustrated. 21/6 plus 3/6 post and insurance. Pull switch 3/- extra.

B.S.R. UA16 RECORD PLAYER only £4.19.6

WHICH IS THE BEST RECORD CHANGER TO BUY?

If you want a "pretty" unit which will give next to perfect results and years of trouble-free service even though it may not always get the most careful treatment then the unit for you is the B.S.R. UA16. It operates at usual four speeds off standard A.C. mains, takes one to ten records (mixed sizes if you like), is super slim and fitted with famous "Full-Fi" head for 38 or 78 records. You can have one of these brand new in perfect order, guaranteed and sent by insured transport for only £4.19.6 plus 7/6 carriage and insurance.

TRANSISTOR BARGAIN



Transistor set case with carrying handle size 10" x 8" x 3". Strongly made from best plywood and covered Two tone fabric—looks very smart—suitable for receiver — amplifier — extension Speaker etc.—Originally listed at 29/6—but offered this month at only 15/- plus 5/- post and insurance also given free with it is a printed circuit board to suit it and building instructions for fine two wave radios—Don't miss this grand offer.

THIS MONTH'S SNIP

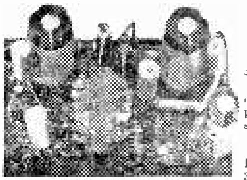
Complete set of parts to build this famous 6 transistor, 2 wave band, superhet receiver until recently retailing at almost £10. It's yours if you act quickly for only 39/6 plus 3/6 postage and insurance.

PRINCESS 2 WAVE

Its circuit features all the latest refinements:—

A.V.C., Push-pull output, Feedback etc., etc. includes efficient ready wound aerial and 2¼" P.M. speaker. Transistors—case—everything supplied except battery. Instructions supplied but if required separately 1/6d.

750 mW 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.
35 ohm Speaker 12/6 extra.

CAPSTAN DRIVER

Tape Recorder

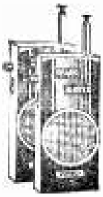
Although some well made spool driven machines give remarkably good results there is no doubt that to achieve anything like perfection and to have versatility a Capstan Driven Tape is essential. Now at last we can offer you a Capstan Driven, completely portable, battery operated instrument at a remarkably low price. So low in fact that you can easily afford to have a second machine for use in your car, office, home etc. or to give to reps or relations to exchange tapes.

SPECIFICATION:—200/7000 C.P.S.—400 MW output—double track-twin speed (3¾ and 7½) fast rewind time—3in. spool gives one hour playing with standard tape weight 7 lbs. Size 8 x 11 x 5½. Complete with batteries, microphone—tape spool and instruction manual. Nothing to go wrong if you use a good tape and keep heads clean. Demonstration gladly given at our Croydon shop.
Special Snip Price This Month. £11.11.0. Post and Insurance 6/6.

BATTERY ELIMINATOR

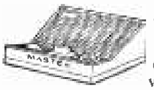
With this you can operate your pocket radio from the mains. You can also re-charge PP3 batteries five or six times. Only 18/6 plus 3/- post and ins. Will save its cost in no time.

TWO WAY RADIOS



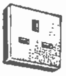
Give communication over ¼ mile. FULLY transistorised—crystal controlled built-in telescopic aerial—press button operation—PP3 batteries—pair instruments complete and ready to use. £7.9.6. plus 5/- post and insurance. G.P.O. Licence required if used in this country.

FOUR-STATION INTER-COM



Will save time and improve efficiency. Ideal in home—office—shop—surgery, etc. Complete outfit comprises Master unit and three substations each of which can call the master and have full two-way working. No wiring problems as subs fitted with 60ft. twin flex and they plug into sockets. Also included is packet of staples—and battery. Nothing else to buy—£7.15.0 plus 4/6 post and insurance.

13 AMP SOCKET



Change all those old-fashioned ones to these modern fused types or install a new ring main. White sockets for surface mounting for letting into wall or skirting—best make (G.E.C.), 5/6 with switch or 3/9 less switch. Six or more post free, otherwise add 2/-.

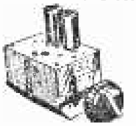
HEAT & LIGHT UNIT

Gives 300 watts of heat with approx. 150 watts of light and simply fits in place of lamp. 29/6. Plus 3/6 carriage and insurance.

SEED AND PLANT RAISING

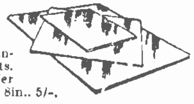
Soil heating wire and transformer. Suitable for standard size garden frame. 12/6 plus 2/6 post & ins.

TURRET TUNERS



By the famous Cyldon or Brayhead firms complete with coils, but less coil cover valves and knobs—all 35 mc/s—wonderful bargain at 6/6 each plus 2/9 post.

Sheet Paxolin



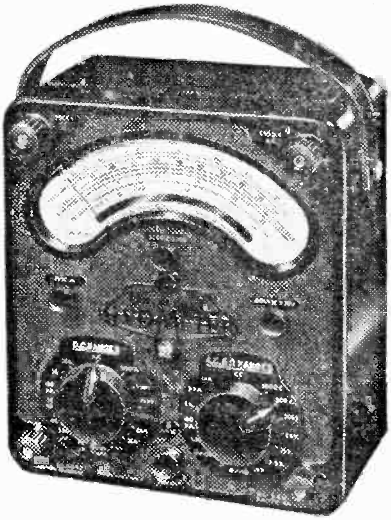
Ideal for transistor projects. Special offer 12 panels 5 x 8in.. 5/-.

MAINS POWER PACK

Designed to operate transistor sets and amplifiers. Adjustable output by —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 comprise mains transformer rectifier, smoothing and load resistor, 5000 and 500 mfd condensers, zener diode and instructions. Real snip at only 14/6, plus 3/- post.

ELECTRONICS (CROYDON) LTD

Callers: 266 LONDON ROAD, WEST CROYDON, SURREY
Post orders to: Dept. P.W., 4 Springfield Road, Eastbourne, Sussex



Designed for Dependability!

Model 8 Avometer

The Model 8 Universal Avometer is a high sensitivity multi-range ac/dc electrical testing instrument providing 31 ranges of readings on a 5-in. hand calibrated scale. Quick range selection is effected by two interlocking rotary switches for ac and dc respectively.

This latest model, Mk. 3, incorporates increased sensitivity in the lower ac ranges and wide frequency characteristics. A fused ohms circuit provides increased protection against inadvertent overload, and there is an improved temperature coefficient over the whole range.

With the aid of a range of dc shunts measurements can be made up to 400 amps dc.

See the latest AVO Coil Winders and Electrical Testing Instruments on Stand HH4, A.S.E.E. Exhibition.

Write for fully descriptive Folder or for complete Catalogue of AVO Instruments.

AVO LTD AVOCET HOUSE - 92-96 VAUXHALL BRIDGE ROAD - LONDON, S.W.1 - *Phone: VICtoria 3404*

M GROUP

SOUDOGAZ Blowlamp for the handyman

Modern, clean and efficient...

Ready for instant use at the strike of a match, operated by expendable 200 cartridge, gives instantaneous heat at 2198°F. (1200°C.) for approximately 2½ hours. With the three accessories, solderings on lead, bronze, silver, zinc, and aluminium, electrical installations, defrosting pipes, paint stripping, gutter repairs, etc., can be quickly completed.

CAMPING gaz

SOUDOGAZ Blowlamp 45/- (Complete with normal Jet Burner). 200 Cartridge 3/9 extra. Paint Stripper, Fine Jet, Soldering Iron each 9/- extra.

CAMPING GAZ INTERNATIONAL
DIVISION
P.T.C. South Street, Dorking, Surrey

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; Servomechanisms; 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
3.66

BRITISH NATIONAL RADIO SCHOOL

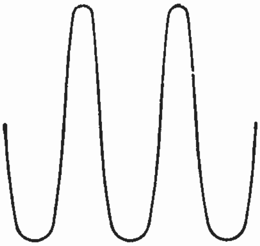


Fig. 3: Distortion of a sine waveform which occurs when the transistor input is fed from a low impedance source.

current reproduces the waveform of the input current, so the required sinewave has to be supplied in the form of a current. A voltage sine wave can only be used if the non-linearity of the transistor input is overcome either by a high series resistor or by negative feedback applied in such a way as to increase the effective input impedance. This "swamping" of the transistor input impedance by making it a small part of the total circuit impedance amounts to a mismatch of impedance levels, and a similar mismatch is required at the output of the amplifier section of the oscillator to ensure a constant input to the phase-shifting network, especially when variable tuning is employed.

Oscillation

Sine waves are produced through the action of the R-C network and stable oscillation involves reproducing the sine wave input for the amplifying section of the oscillator from its own output via the phase-shifting network. Oscillation occurs at the frequency where the overall phase-shift of the amplifier and network is zero provided that the loop gain is greater than unity. It also depends upon positive feedback, but sine waves cannot be generated in the absence of a frequency determining network. Under direct coupling the amplifier then merely acts as a trigger circuit, switching from one voltage level to another when an impulse is applied. With two a.c. couplings the circuit switches automatically as a multivibrator, the frequency depending upon the rate at which the coupling capacitors can charge and discharge between two levels.

Phase Reversals

Positive feedback implies an output in phase with the input. Feedback from the collector to the emitter of a single transistor would be positive, but as the collector current is less than the emitter current oscillation cannot occur without some further amplification. The same is true of feedback from the emitter to the base except that here it is because the emitter voltage is lower than the base voltage. Feedback from the collector to the base is negative feedback and cannot produce oscillation directly. However, a ladder network converts negative into positive feedback at one frequency and thus is able to produce sine wave oscillation if the gain of the transistor is adequate to overcome the attenuation.

When the oscillator contains two transistors a number of circuit arrangements can yield positive feedback. For example, a double phase reversal brings the output back into phase with the input. If there is a phase reversal in only one transistor, as in Fig. 4, a ladder network is used.

Phase reversal in a transistor does not depend upon frequency and is less a phase shift than inversion of the input waveform, but as the negative and positive peaks of a sine wave are alike it is indistinguishable from a phase shift of 180° or one half-cycle such as occurs in a ladder network at one particular frequency and with considerable attenuation. The inverted waveform at the collector is, of course, amplified with respect to the base input. Voltage movements at these electrodes are in opposite directions just as for the grid and anode of a valve.

Some additional internal phase shift occurs in a transistor at high frequencies and this departure from an exact anti-phase relationship is, of course, undesirable since the object is to concentrate all the frequency dependent phase shift into the R-C network. It can be minimised by using r.f. transistors in the oscillator, so enabling its performance to be extended into the lower radio frequencies.

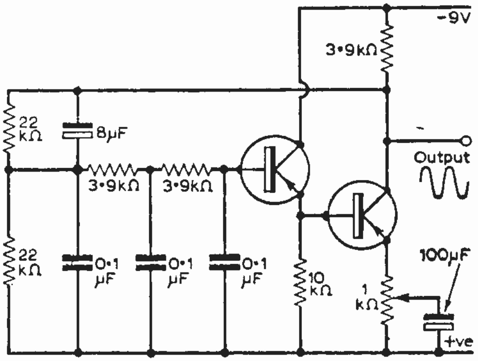


Fig 4: 1 kc/s oscillator for average transistors, with potentiometer amplitude control.

Amplitude Control

Means must be provided of controlling the loop gain of a sine wave resistance capacitance oscillator since harmonics are not suppressed to anything like the extent possible with high-Q tuned circuits.

If the gain is insufficient oscillation will not occur, while if it is excessive there will be squaring of the peaks. Sometimes the amplitude or gain control can take the form of a potentiometer in the emitter circuit of a transistor with the slider grounded through a decoupling capacitor. Over a narrow range of gain adjustment a sine wave output is obtained of amplitude depending on the gain setting. Thus the oscillator is sensitive to small changes in initial gain and to make the amplitude less liable to variation it is desirable to stabilise the amplifier gain by means of negative feedback, thus offsetting the effects of supply voltage variation and of decrease of gain at high frequencies.

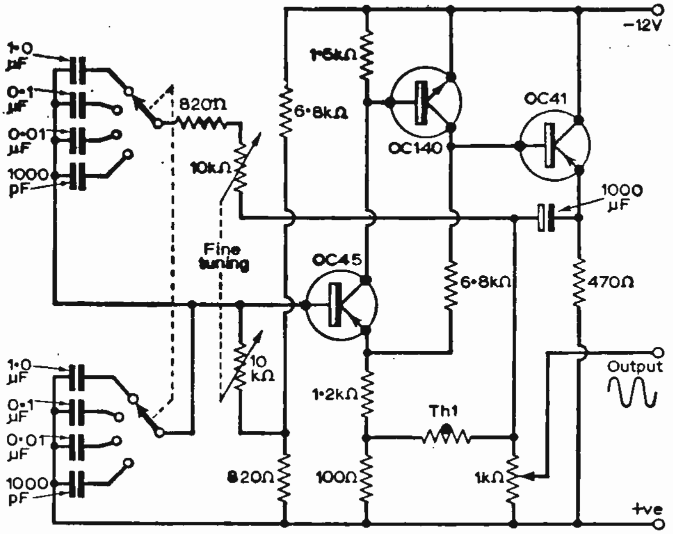


Fig. 5: Variable frequency oscillator with automatic amplitude control by a thermistor (acknowledgements Mullard Ltd.)

The extra potentiometer for controlling the loop gain is no longer necessary when there is automatic control. Thermionic valve oscillators often incorporate a small lamp (3-15W), its resistance adjusting automatically to keep the amplitude at a constant level. A thermistor can be used instead and consists of a minute bead of temperature sensitive material mounted on wire leads in a glass envelope filled with an inert gas. The thermistor has a negative temperature coefficient, while the lamp is used as a series element in a positive feed-back loop, or as a shunt element in a negative feed-back loop, while the thermistor is normally the series element in a negative feed-back path but could be used as a shunt element in a positive feed-back loop. A blocking capacitor is included to keep direct current from passing through the thermistor, but this precaution is not always observed with a lamp which is sometimes placed in the cathode circuit of a valve.

Good ventilation is required in a valve circuit as otherwise heat from the valves will reach the thermistor, causing a slow drift. This problem does not arise in a transistorised oscillator but the power in transistor circuits is small and special thermistors are necessary with the thermistor element in a vacuum instead of inert gas. These offer a sensitive means of control but the safe power dissipation is very much smaller. A further difference is the much longer thermal time-constant, which implies sluggishness of response. A readjustment to the tuning may cause the temporary cessation of oscillation and it may be a second or two before recovery takes place and the thermistor resumes control. This "amplitude hunting" is not an unusual occurrence in thermionic valve oscillators using lamps or thermistors for control, although to a lesser degree.

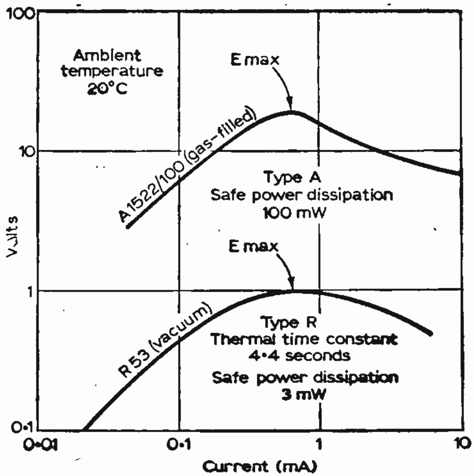


Fig. 6: Thermistor characteristics (S.T.C.). Power Sensitivity of R type is about X14 that of A type. Both obtainable in a range of E max values.

The effectiveness of control is increased when the thermistor is one arm of a bridge arrangement. Impedance variations exert more influence in a bridge circuit because some of the unvarying part of the voltage is balanced out. Although with a negative temperature coefficient the resistance of a thermistor decreases as the current is increased the voltage only falls after a peak has been reached at a certain value of current (see Fig. 6). This represents the largest r.m.s. voltage that can be maintained across the thermistor, and for larger currents the resistance decreases so rapidly that the voltage falls with rising current. The thermistor is therefore unable to absorb an excess voltage and passes it on to act as negative feedback. Thus the output of the oscillator will tend to stabilise at a value determined by the maximum voltage of the thermistor.

Alternative methods of amplitude control are sometimes used but are not always as satisfactory, e.g. a limiter followed by sharply selective circuits to remove harmonics or control of amplifier gain in a low-level stage by means of a d.c. bias developed by rectification of the output. Such methods are inherently non-linear, while the thermistor has a short-term linearity, i.e. its resistance changes slowly and only varies during the cycle at very low frequencies.

Next Month: Design Problems.

Brand new individually checked and guaranteed

VALVES

AC/HL	4/6
ACP4	6/-
AC6PEN	5/-
AL60	5/-
ARP3	8/-
ARP12	2/6
ARP24	3/6
AR8	5/-
ARTP1	6/-
ATP4	2/3
ATP7	5/6
AU7	55/-
AZ31	9/-
B6H	15/-
BD78	40/-
BL63	10/-
BS4	8/-
BS5	20/-
BS84	37/6
B2134	16/-
BT19	25/-
BT35	25/-
BT45	150/-
BT83	35/-
CC3L	2/-
CL33	9/-
CV71	3/-
CV77	5/-
CV102	1/-
CV103	4/-
CV4004	7/-
CV4014	7/-
CV4015	5/-
CV4025	10/-
CV4049	6/-
CY31	6/6
D1	1/6
D41	6/-
D61	6/-
D77	3/3
DA30	12/6
DAF96	6/-
DD41	4/-
DET5	3/-
DET20	2/-
DET25	15/-
DF73	5/-
DF91	3/-
DF92	3/-
DF96	6/-
DH63	5/-
DK92	6/6
DK96	6/6
DL92	5/-
DL93	6/-
DL94	5/9
DL96	6/-
DL810	8/-
DL819	15/-
E80F	23/-
E88CC	12/-
E90CC	10/-
E1148	2/6
E1266	50/-
E1415	30/-
E1524	12/6
EA50	1/-
E173	7/-
EABC80	5/9
EA91	3/6
EAF42	8/-
EB34	1/6
EB91	3/-
EBC23	6/-
EBC41	7/-
EBC81	5/-
EBF80	6/6
EBF83	7/6
EBF89	6/9
EC52	4/-
EC53	12/6
EC70	4/-
EC90	2/-
EC91	3/-
ECC81	4/-
ECC82	5/-
ECC83	6/-
ECC84	5/6
ECC85	6/6
ECC88	9/-
ECC91	4/-
ECF82	7/-
ECH42	8/-
ECH81	5/-
ECH83	7/6
ECL80	6/-
ECL82	7/6
ECL83	10/-
ECL86	10/-
EF36	3/4
EF37A	7/-
EF40	8/-
EF50	2/6
EF52	6/-
EF53	4/6
EF55	8/-
EF71	7/6
EF72	5/-
EF73	5/-
EF74	4/-
EF80	5/-
EF81	6/-
EF85	4/6
EF86	6/6
EF89	5/-
EF91	2/9
EF92	2/-
EF95	5/-
EF183	8/-
EF184	8/-
EHT1	300/-
EL32	3/9
EL34	10/-
EL36	5/-
EL38	17/6
EL41	7/-
EL42	8/-
L50	8/-
EL81	8/-
EL83	6/3
EL84	5/-
EL85	8/-
EL91	4/6
EL95	5/-
EL360	20/-
EM80	6/-
EM81	7/6
EM84	6/3
EN31	10/-
ESU74	80/-
ESU208	6/-
EY51	5/6
EY86	6/6
EY91	3/-
EZ40	6/6
EZ41	6/6
EZ80	5/6
EZ81	3/6
F/6057	5/-
F/6061	5/-
F/6063	4/-
FW4/500	6/6
FW4/800	8/6
G1/236G	9/-
G1/370K	20/-
G50/2G	5/-
G180/2M	15/-
GM4	45/-
GZ32	10/-
GZ34	10/-
H63	7/-
HK54	22/6
HL2K	2/6
HL23	6/-
HL23DD	5/-
HL41	4/-
HVR2	9/-
K3A	30/-
KT8C	22/-
KT32	8/-
KT33C	6/-
KT44	5/9
KT63	4/-
KT66	16/-
KT67	15/-
KY76	8/6
KT88	22/-
KTW61	4/6
KTW63	2/-
KTZ41	6/-
KTZ63	5/-
M8100	9/-
M8141	12/-
M8161	7/-
MH4	5/-
MHLD6	10/-
ML6	6/-
N78	15/-
NE17	7/-
OA2	6/-
OB2	6/-
OB3	7/-
OC3	5/-
OD3	5/-
OZ4A	5/-
PCC84	5/-
PCC89	10/-
PCF80	6/6
PCF82	6/6
PCF84	6/-
PCL81	9/-
PCL82	7/-
PCL83	8/3
PCL84	7/-
PCL85	8/6
PCL86	9/-
PEN25	4/6
PEN46	3/-
PEN200A	8/-
PFL200	17/6
PL36	7/6
PL38	16/-
PL81	7/-
PL82	5/-
PL83	6/-
PL84	6/6
PL500	15/-
PM24A	5/-
PT15	10/-
PT25H	7/6
PT25M	7/6
PX4	14/-
PX25	9/-
PY33	8/6
PY80	5/6
PY81	5/6
PY82	5/-
PY83	6/-
PY800	6/6
PZ1-35	9/-
PZ1-75	12/-
QP21	6/-
QP25	5/-
QP230	5/-
QS95/10	5/6
QS150/15	10/-
QS1202	8/-
QV04/7	8/2
R3	8/-
RG4/1250	60/-
RK72	6/-
SL30P	15/-
SL30	12/6
SP2	8/6
SP41	1/6
SP61	1/6
SP210	8/6
STV280/40	12/6
SU2150A	10/-
S11G12	10/-
T41	6/6
TDOX-20	70/-
TP22	5/-
TP25	15/-
TT11	5/-
TT15	35/-
TTR31	45/-
TZ0520	4/-
TZ20	16/-
U81	30/-
U12/4	8/-
U17	5/-
U18	6/-
U25	11/-
U26	11/-
U27	8/-
U50	4/6
U52	4/6
U191	11/6
U801	18/-
UABC80	6/-
UAF42	9/-
UBC41	6/-
UBF80	5/6
UBF89	6/6
UBL21	11/-
UCC85	6/6
UCH42	8/-
UCH81	6/-
UCL82	8/-
UCL83	10/-
UF41	7/-
UF89	6/-
UL41	7/6
UL84	5/6
UU5	7/-
UU9	8/6
UY21	7/6
UY85	5/-
V1120	4/-
V1307	5/-
V1924	20/-
VMP43	12/-
VP23	3/-
VP138	9/-
VR99	8/-
VR105/30	5/-
VR150/30	5/-
VU33A	4/-
VU39	6/-
VX3256	4/-
VX8122	5/-
VX8124	5/-
W21	5/-
W118	8/-
W119	8/-
X66	7/6
X119	8/-
X145	8/-
Y63	5/-
Y65	4/-
Y66	8/-
YF	1/-
Z800U	20/-
Z801U	10/-
1A3	8/-
1A5GT	5/-
1B22	30/-
1C5GT	6/-
1D8GT	6/-
1E7G	7/6
1F2	3/-
1G6GT	6/-
1L4	2/6
1LA6	6/-
1LC6	7/-
1LH4	4/-
1N21B	4/-
1N43	4/-
1N70	4/-
1R4	5/-
1R5	3/6
1S4	5/-
1S5	4/6
1T4	2/-
2A3	5/-
2B26	8/-
2C26	7/-
2C26A	3/-
2C34	2/6
2C45	22/6
2C46	30/-
2C51	12/-
2D21	5/-
3A4	4/-
3A/108A	20/-
3A/46J	35/-
3A/167/M	25/-
3B7	5/-
3B24	5/-
3D6	4/-
3E29	50/-
3Q4	6/-
3Q5GT	7/-
3S4	4/-
3V4	5/9
3X2	3/-
4C27	35/-
4D1	4/-
5A173G	5/-
5A174G	5/-
5B251M	25/-
5B/253M	15/-
5B254M	40/-
5B255M	35/-
5R4GY	9/-
5T4	7/-
5U4G	4/6
5V4G	8/-
5X4G	8/6
5Y3G	4/-
5Y3GT	5/-
5Y3WGTB	9/-
5Z4G	6/6
5Z4GT	8/-
6AB6	4/-
6AC7	2/-
6AG5	2/6
6AG7	6/-
6AH6	10/-
6AJ7	2/-
6AK5	5/-
6AK7	6/-
6AL5	3/-
6AL5W	7/-
6AM5	2/6
6AM6	4/-
6AQ5	7/-
6AQ5W	9/-
6AS6	4/-
6AS6W	9/-
6AS7G	20/-
6AT6	3/6
6AU6	7/-
6AX4	8/-
6B7	6/-
6B8G	2/6
6BA6	4/-
6BA7	5/-
6BE6	4/3
6BJ7	7/-
6BQ7A	8/-
6BR7	9/-
6BW6	9/-
6C4	2/-
6C5G	2/6
6C5GT	6/-
6C6	4/-
6C6G	3/-
6C8G	3/-
6CH6	4/6
6C21	30/-
6CL6	9/-
6D6	3/-
6E5	6/-
6F5G	5/3
6F5GT	5/9
6F6G	4/-
6F7	6/-
6F8G	6/6
6F12	4/6
6F13	5/-
6F14	5/-
6F32	4/-
6F33	3/-
6G6G	2/6
6H6M	1/6
6J4WA	10/-
6J5	6/-
6J5G	2/-
6J6	3/6
6J6W	6/-
6J7G	5/-
6J7M	8/-
6K6GT	5/6
6K7G	2/-
6K7GT	4/9
6K8G	3/-
6K8GT	8/3
6K8M	6/6
6L5G	6/-
6L6GA	7/6
6L6M	11/-
6L7G	4/-
6L34	4/6
6LD20	5/9
6N7	6/-
6N7G	5/9
6P25	12/6
6Q7G	6/-
6R7	5/6
6SA7	7/-
6SA7GT	6/6
6SK7GT	4/-
6SC7	7/-
6SC7GT	5/-
6SFGT	5/6
6SH7	3/-
6SJ7	5/-
6SJ7G	6/6
6SK7	4/6
6SL7GT	5/6
6SN7	3/6
6SQ7GT	6/-
6SS7	2/-
6U4GT	9/6
6V6G	5/-
6Y6GT	7/6
6V6M	8/-
6X4	3/6
6X5G	5/-
6Z5GT	5/3
6Y6G	6/-
6-30L2	10/-
6Z4	5/-
7B7	7/6
7C5	10/-
7C6	7/-
7C7	6/-
7H7	7/8
7Q7	7/-
7V7	5/-
7Z4	4/6
8D2	2/6
9D2	3/-
9D6	3/6
10F9	9/-
12A6	3/6
12AH7	5/-
12AH8	11/-
12AT7	4/-
12AU7	5/-
12AX7	6/-
12AY7	10/-
12BA6	5/-
12BE6	7/-
12BH7	7/-
12C8	3/-
12H6	2/-
12J5GT	2/6
12J7GT	6/6
12K7GT	2/-
12K8M	10/-
12Q7GT	3/3
12SA7	7/-
12SC7	4/-
12SG7	3/-
12SH7	3/-
12SJ7	5/-
12SK7GT	3/-
12SN7GT	6/9
12SR7	5/-
12Y4	2/-
12L7	7/-
15D2	6/-
19E2	15/-
19G3	10/-
19G7	5/-
19H1	6/-
19M1	5/-
20P4	13/-
21B6	9/-
25L6GT	5/-
25Y5	6/-
25Z4G	6/6
25Z5	7/6
25Z6GT	8/6
25D7	6/-
30	5/-
30C15	9/6
30F5	8/6
30FL1	10/6
30P12	10/-
30P19	15/-
30PL1	8/-
3516GT	7/-
35T	17/6
35W4	5/-
35Z3	8/-
35Z4GT	6/-
35Z5GT	6/-
37	4/-
38	4/-
44A/160N	30/-
2158G	6/-
50L6GT	8/-
53A	7/6
57	6/-
58	6/-
59	6/-
75	5/6
76	5/-
77	6/6
78	5/-
80	5/6
81	9/-
82	8/-
84	8/-
85A2	8/-
210VPT	
7-pin	2/6
220PA	7/-
220TH	4/-
225DU	9/-
307A	5/6
310C	25/-
350B	8/-
357A	7/-
368A	5/-
393A	15/-
446A	8/-
703A	30/-
705A	10/-
715B	60/-
717A	3/-
724A	15/-
801	6/-
803	22/6
807	8/-
808	8/-
811	17/6
813	60/-
815	35/-
829B	50/-
830B	4/-
832A	45/-
832	15/-
843	5/-
866A	14/-
884	10/-
954	4/6
955	2/6
956	2/-
957	5/-
958A	4/-
1612	5/-
1616	3/-
1319	5/-
1625	6/-
1626	3/-
1629	4/6
2051	5/-
4043C	13/6
4063	8/-
7313C	30/-
5704	9/-
5726	6/-
6060	5/-
6064	7/-
6065	6/-
6080	22/-
7193	1/9
7475	3/-
8013A	25/-
8020	8/-
9001	3/-
9002	4/6
9003	6/-
9004	2/6
9006	2/6
C.R. Tubes	
CV1596 (09J)	55/-
E4504/B/16	28/-
VCR97	28/-
VCR138	30/-
VCR138A	40/-
VCR139A	35/-
VCR517	35/-
VCR517B	40/-
VCR517C	40/-
3FP7	45/-
3EG1	40/-
5PC1	30/-
5FP7	12/6
88D	44/-
Photo Tubes	
GS16	12/6
931A	55/-
6097	350/-
Special Valves	
ACT6	£8
K301	£4
KRN2A	£3.10.0
1B24	25/-
2J22	£2.10.0
2J54	£8
417A	30/-
3J/92/E	£37.10.0
714AY	£4
725A	30/-
726A	19/-
Transistors	
OC16	20/-
OC22	23/-
OC25	12/-
OC44	6/-
OC45	5/-
OC71	4/6
OC72	6/-
OC73	10/-
OC81M	7/-
OC82	10/-
OC122	16/-
OC200	10/6
XC141	10/-
XC142	15/-
XC155	30/-
XC156	22/6
2N502	47/-
2N247	9/6
2N585	10/6
2N1090	20/6
2N1091	29/-

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

MARCONI COMMUNICATION RECEIVERS CR. 150. Frequency coverage 2-60 Mc/s in 5 bands. Two Ifs 1st 1,600 kc's, 2nd 463 kc/s. Image signal protecting over 40 dB up to 30 Mc/s and 20-40 dB from 30-60 Mc/s. Self-checking calibration (built-in calibrator). Stabilisation of supply and temperature compensation. Electrical and mechanical indicator Bandpass from 100 c/s to 10 kc/s bandspread. Metering and visual tuning in 5 stages. Acoustic filter associated with 100 c/s. Bandpass position for CW reception. Facilities for diversity reception. Excellent checked condition, £39. Mains P.S.U. by P.C. Radio £4.10.0. Carriage 30/-.

CR.150/2. Frequency coverage 1.5-22 Mc/s in 4 bands, all other features as in CR.150. Price £31. Carriage 30/-.

P.C. RADIO'S mains P.S.U. for above, 90/-.

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

MARCONI TF 868 UNIVERSAL BRIDGE. Capitance 1pS to 100µS, inductance 1µH to 100H, resistance .1ohm to 10m ohms. Q .1 to 10. Power supply 115/230v A.C. In new condition with instruction book, £65. Carriage 30/-.

VERY HIGH CLASS COMMUNICATION RECEIVER TYPE BRT 402E. 150kc/s-385 kc/s., 510 kc/s-30 mc/s. Fully tested £60. Carriage 30/-.

EVERSHED MEGGER CIRCUIT TESTER. 2 ranges 0 to 1,000Ω, 100Ω to 200,000Ω. With test leads, leather carrying case. Tested £4.19.6. P. & P. 3/6.

PANEL METERS (round)

500mV	3½"	DC	32/6
500mV*	3½"	DC	35/-
500mA*	2½"	DC	22/6
500 microamp	3½"	AC	22/6
500 microamp*	2"	DC	19/-
0-500 microamp	2½"	DC	22/6
25-0-25mA	2½"	DC	45/-
150-0-1500mA	3"	DC	29/-
0-500mV	3½"	DC	32/6
0-15V	2"	AC	17/6
0-50V	2½"	DC	28/-
0-150V	2½"	AC	24/-

*Projection type.

MARCONI SIGNAL GENERATOR TYPE TF 801B/3/S. Frequency range 12-485 mc's in five ranges. Directly calibrated frequency dial. Output waveform: CW 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 0.1µV–0.5v. b. high; up to 1v. modulated or 2v. 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. Carriage 30/-.

P.C. RADIO LTD

170 GOLDHAWK ROAD, W.12.
Shepherd's Bush 4946
Open 9-5.30 p.m. *Thursday* 9-1 p.m.

THERMAL PLUS MECHANICAL CIRCUIT BREAKER FOR A.C. & D.C. Current 1 amp. Protects against shorts (instantaneous cut-out at approximately 8 amps) and against overloads: 1.8 amp 30 second, 2.1 amp 15 seconds, 2.5 amp 8 seconds. Delayed cut-off may be adjusted to different currents and times. Separate pair of contacts to indicating device. Dimensions 3½ x 1⅝ x $\frac{7}{16}$ in. Price 12/6. P. & P. 2/6.

SEMI-AUTOMATIC BATTERY CHARGER "Baby Esstron". Initial charging rate 3.5 amps DC automatically reducing to 1.5 or lower (depending on specific gravity of battery acid). As the battery receives the charge indication lights indicate visually the high current or when incorrectly connected. Meter incorporated. For 6 or 12v. batteries. Mains voltage 200/240v. AC. Price £3. P. & P. 4/6.

AR88D RECEIVERS Fully reconditioned, £55, rebuilt models £85. Carriage paid U.K.

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

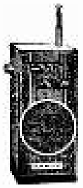
WIRELESS SET No. 52 (CANADIAN) Complete station consisting of Transmitter. Receiver, supply unit for 12v. All contained in special carrier, 1.75-16 mc/s in 3 bands. 813 as output valve. 45-75w. phone and MCW, 70-100 watt CW, M.O. or crystal. Receiver includes crystal calibrator. Tx. can be exactly tuned to Rx. frequency. Noise limiter. Sidetone. Loudspeaker on receiver with on/off switch. All brand new with accessories. Export. Price on application.

Ditto, but Receiver only (without cabinet), £8.10.0. Carriage 20/-.

ELECTRAMA

WINDMILL HILL · HAILSHAM · SUSSEX

The LAMIE TRANSCEIVER



The latest craze! Push-button operation; crystal control. Fully transistorised (3-transistor circuit) for perfect reception. Tremendous commercial scope. Complete with case, battery and 8-section antenna. Uses 9v. PP3 battery and operates up to half mile in open country. Measures 5½in. x 2½in. x 1½in. Frequency 27.125 Mc/s.

ONLY £7.19.6. Pair.
(Post and insurance 4/6)

PONY MODEL CB-16

A powerful unit which will operate over a range up to 4/5 miles in open country. 9-transistor, crystal-controlled circuit. Complete with personal earphone and carrying handle, etc.

£28 pr (Post and insurance 4/-)

The ONKIO 15 TRANSISTOR POWER TRANSCEIVER

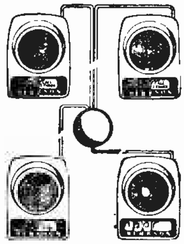
Most powerful model available at present. Designed to work over long distances. Expensive but excellent. Range up to 25 miles at sea.

£120 pr (post free)

GPO transmission licences are required if these sets are used in U.K.

MINI DRILL

Powerful precision-made drill for electronic engineers/model makers. Ideal printed circuit work. Complete with drill, buffer, polisher. 5000 rpm from U2 batteries. 49/6
(Post and insurance 3/6)



Bargain of the Month
Save £7 ! !

BENKSON 4-way INTERCOM

Bulk purchase has cut retail price by half! A top quality, fully transistorised system designed for hard office and professional use. Consists of one master unit and three sub-stations with built-in call system. Absolute privacy to each extension. Push-button control. Crystal clear reproduction through 3in. speakers. Suitable desk or wall mounting (size 6 x 4in.). Supplied complete with 50 yards cable, junction box, instructions, etc.

£7.10.0 (Post and insurance 5/-)

STEREO CABINETS

Includes auto-changer cabinets 15 x 15 x 7½in. with hinged lid. Two extension speaker boxes 15 x 7½ x 3½in.. chrome speaker frets. Cost £7 to manufacture. £3.10.0. (Post and insurance 5/-)

AMPLIFIERS

Two Valve Amplifier for portable gram' units. Specification includes volume and tone control with 2-watt undistorted output.

£3.19.6
(Post and insurance 3/6)

Linear L 45A, 3-valve amplifier with treble bass control. Quality reproduction at a realistic price.

£6.10.0
(Post and insurance 5/6)

Stereo 2-valve amplifier using 2—UCL82 valves. Mono/stereo control switch with tone control etc. Absolute snip.

£6.12.6
(Post and insurance 5/6)

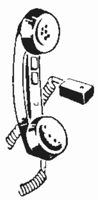
50% SAVING!
AUTO RECORD DECKS

Latest Garrard and B.S.R., speeds 78, 45, 33 and 16, 200-250v. A.C. Adjustable stylus pressure. Take mixed record selection. Mono-head —wired stereo. Limited number.

GARRARD AUTO-SLIM	£5.19.6
GARRARD AT5	£6.15.0
B.S.R. UA14	£5.10.0

(Post and insurance 5/- on ea. item)

AMPLIPHONE (Handset Intercom)



New from Japan. Beautifully made 2-way transistor telephone handset with wall brackets. Built-in call system with crystal clear amplification. Works over amazingly long distances. Two wire connection. Complete with two U7 batteries.

7 Gns. Pair
(Post and insurance 5/-)

NICKEL CADMIUM RECHARGEABLE CELLS

(No corrosion, no gassing, no maintenance).

Why keep buying batteries when you can purchase one of the new rechargeable nickel-cadmium cells. Pays for itself over and over again.

Equiv. PP3, 9 volt (Post and insurance 2/-)	37/-
Equiv. U7, 1.25 volt (Post and insurance 1/6)	6/6

OTHER TYPES AVAILABLE
SEND FOR OUR LIST

CHARGING UNITS for above

Simply plug into mains.

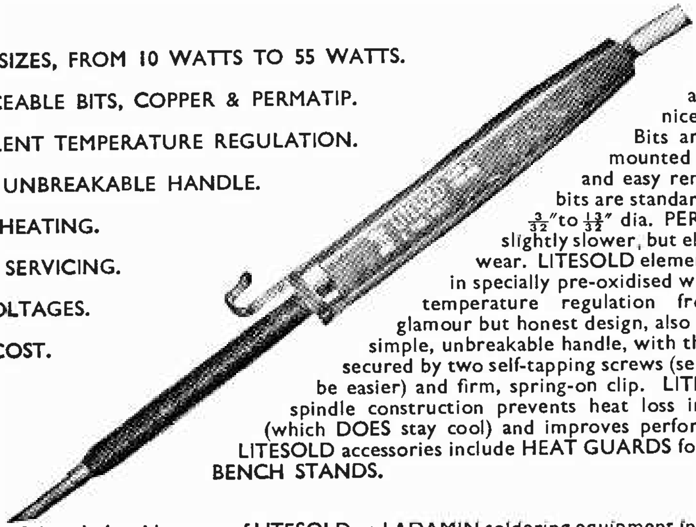
KIT FORM 25/-
READY BUILT 32/6 } Post & ins. 1/6

AUTOLUX CAR RADIO

Fully transistorised. 6in. x 8in. speaker. All accessories.

£8.19.6 (Post and insurance 3/6)

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 $\frac{13}{32}$" 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.*

SOME FURTHER NOTES ON THE

Miniature POWER Amplifier

by J. Harrison

THE miniature power amplifier described in the October, 1964, issue has attracted the attention of quite a number of readers of PRACTICAL WIRELESS who have since wrote and queried using the amplifier for record reproduction.

This small unit has proved excellent for this purpose and provides smooth music reproduction far above the standard provided by normal commercial record-player amplifiers.

Examining a volume containing servicing data and circuits for current commercial record players provided the following statistics.

Of valve-driven gramophones 85% use only one valve usually a single high sensitivity output pentode type UL84; 10% use one double valve of the UCL82 variety and the remainder are expensive models which have amplifiers with two or more valves and give reasonable fidelity. Transistor versions are usually equipped with three or four transistor amplifiers with class "B" output which produces peculiar distortions which make the sound quality unpleasant to the ear and soon brings about "listener fatigue". After listening with dismay to many new models and reviewing their circuits the miniature power amplifier was designed. The following notes will help constructors to get the best out of this and other small amplifiers.

Suitable Pick-ups and Controls

The amplifier requires 250mV r.m.s. input signal for full output. This is just right for medium to high-output crystal or ceramic pick-ups. For mono any of the Acos GP19 and HGP39 series are excellent, giving good quality with negligible record wear. For stereo working the superb Decca Deram gives just the right output and the BSRC1 at half the cost is good and gives double the output of the Decca.

Pick-up manufacturers' data-sheets usually quote the sensitivity of their products in millivolts per centimeter per second, which simply means the output signal is directly related to the velocity of movement of the stylus in the record groove. To enable constructors to estimate the output of a particular pick-up from the mv/cm/sec figure the following is a good guide:

Take the mv/cm/sec figure quoted by manufacturer and multiply it by the following factors:

For classical music recordings X5.

For EP's and "pop" discs X8.

This difference in output is because with "pop" discs the effective recorded velocity is much higher. Ceramic element pick-ups (Deram and BSRC1) require high value volume controls, 2MΩ being recommended. For others 1MΩ is satisfactory but to combat rumble from inexpensive turn tables a lower value can be tried.

Power Levels for Domestic Listening

This has been a subject for much discussion over the years and the recommendations of experts have varied between $\frac{1}{10}$W and 100W! The main factors affecting power requirements are:

1. Loudspeaker efficiency.

—continued on page 993

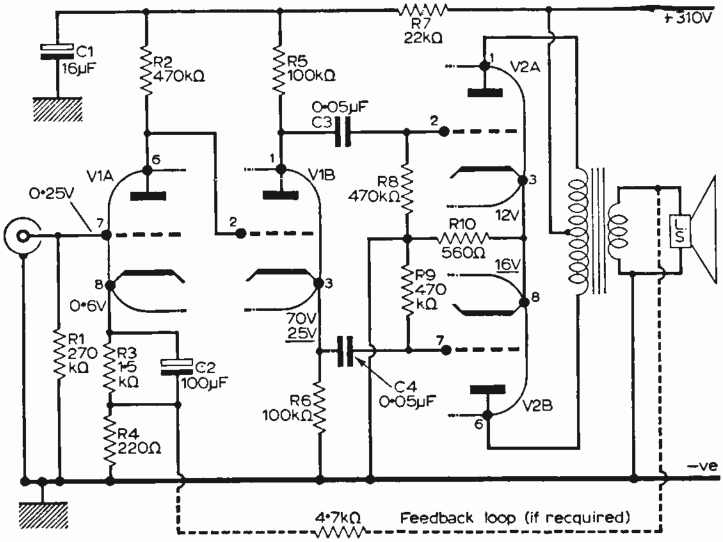


Fig. 1: The circuit. R3 is now 1·5kΩ enabling the first stages to give a larger voltage swing to the output triodes.

CLUB SPOT

No. 5

WELLINGBOROUGH RADIO CLUB

ALTHOUGH most people look on the meeting held in what was the Wellingborough YMCA as the original one, in fact, the nucleus of the Club members had met on the first occasion in a room at a local public house, and then in the workshop of an electrician.

However, it was September of 1952 that the inaugural meeting was held, and what a wonderful cross section of professions were there.

A police sergeant, electricians, teachers, a railwayman, and even a representative of a monumental mason! Sadly, however, virtually all the original members are no longer with us, all having left the district. However, on the brighter side their places have been filled by equally keen members.

After the inauguration a few meetings were held at the British Railways Sports Club in Wellingborough, but then in November of 1955 we were fortunate in obtaining the use of our present clubroom in Silver Street. This we obtained through one of our members who sadly passed away some years ago. With the use of the room available to us at all times we have been able to decorate it, and do alterations to the electrical side over the years, and so have made the room almost self contained. From this room all our varied projects have been thought up, talked about and brought into being, and also some of the inquests on our failures.

Throughout the Club's comparatively short history, raising funds for various local charities has always played a prominent part, and has always been a regular summer activity at local fêtes which we have attended, with the assorted electronic games devised by the members.

Perhaps the most memorable of these was the celebrated "Dam Buster". For several years this was very popular with the crowds and even today people still ask after us not by our radio title but as ". . . the dive bomber people ".

Soon after we acquired our clubroom one member barely escaped with his life when just before Christmas fire ruined his flat.

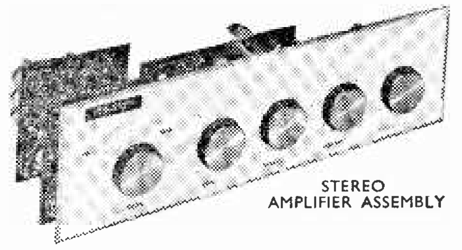
The Club immediately went into action with the result that on Christmas Eve the Club Treasurer was able to hand over a cheque to ensure that "Reg", and his family were not without some of the trimmings of Christmas.

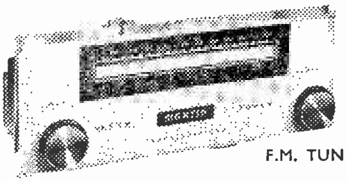
For some years the Club's transmitter G3KSX was to be heard frequently on the air from the clubroom. Sadly to relate, in the last two years interest in operating has virtually disappeared and the Club callsign has been put into abeyance, but at the time of writing there are not only plans afoot to get the Club's transmitter on the air again, but there is sufficient interest being shown to warrant the starting up of a Morse class. With the arrival of the "overspill population" into the town more new members are appearing, and a confident atmosphere pervades the air as the future programme is planned.

Apart from the talks and lectures to be given, a Club project is to be initiated which will enable members to actively participate in its construction. Over the years the Club has become quite well equipped—in fact at the time of writing members are busy reseating the Club's chairs. Amongst the Club's possessions is a 16mm. projector, something we imagine few clubs possess. This enables

—continued on page 993

Members discuss a c.r.t. that has a modified electron gun for an Electron Diffraction experiment.


STEREO AMPLIFIER ASSEMBLY


F.M. TUNER

KITS WITH A FUTURE

The Martin Audiokit assembly you own today can become part of an even better hi-fi system tomorrow. No other system allows you to enlarge your installation stage by stage in the way Audiokits do. They comprise a wide range of very well made prefabricated units in which the connections are standardised throughout. Each is rigorously tested to stated specification before despatch. NEW KITS FOR ADDING ON ARE IN COURSE OF PREPARATION NOW—so by starting with Martin today, you insure yourself for still better listening tomorrow.

Choose Martin for quality

- Build for 3 or 15 ohm system
- Start with Mono and add Stereo or start completely with Stereo
- Power packs available
- Professionally styled escutcheon plates
- Assembly is easy by following the well presented instructions

● 5 stage input Selector	**£2.7.6**
● Pre-amp. and vol. control	**£1.17.6**
● Pre-amp. with 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**

Send for leaflet describing entire range

MARTIN Audiokits

Martin Audiokits and Recordakits are obtainable from good stockists everywhere. In cases of difficulty please write direct.

MARTIN ELECTRONICS LTD., 154/155 HIGH ST., BRENTFORD, M'SEX
Phone: ISLeworth 1161/2

MARTIN ELECTRONICS LTD. 154-155 High Street
Brentford Middlesex
Full details of Martin Audiokits please

NAME ....

ADDRESS ....

....
(Block letters) PW.3

UNDOUBTEDLY THE FINEST RANGE OF TAPE RECORDER EQUIPMENT ON THE MARKET TODAY

TAPE PRE-AMP SSTR/7

All silicon transistor. Zero hum. High gain and equalised at 7½" per sec. to give flat response output. Simple mod. described in accompanying instructions allows equalisation at all speeds. Suitable for all medium impedance heads.

ASSEMBLED **29/6**

MINICLASSIC PRE-AMP SSPA/49

Tone controlled high gain preamplifier designed specially for application with the SS3/9. All silicon transistor. Zero hum requires 18 volt + H.T. Separate inputs for crystal ceramic cartridge and radio.

ASSEMBLED **39/-**

MINICLASSIC SS3/9

High fidelity 4 watt main amplifier: ideal for use with SSTR/7 and makes complete tape amplifier. 16 c/s to 30 kc/s. Requires 18 volt +HT and will operate directly from crystal pickup. 6 transistors and two diodes all mounted on precision printed circuit board. Max. music power 6 watts into 3 ohm speaker

ASSEMBLED **69/-**

TAPE OSCILLATOR SS012

Complete unit incorporating push pull transistor oscillator giving adequate erase power and recording bias. The only unit on the market at such an economical price.

COMPLETE. **49/6**

RECORD AMPLIFIER SSH9/3

Fully transistorised. High voltage H.T. rail derived from oscillator. Provides substantially constant current record signal. 1 volt input sensitivity.

ASSEMBLED **45/-**

KEDOCO ELECTRONICS also manufacture ★ SS20/7 20 watt Hi Fi amplifier **£9.19.6.** ★ TV/FM Booster Bands 1 and 2. **32/3.** ★ Miniature Transmitter SS7 **189/6.** ★ 30 volt, 3 amp Power Supply **69/6.** ★ A range of Silicon planar epitaxial transistors. ★ Zener Diodes.

See Practical Electronics for further details or write to us for descriptive leaflets.

REMEMBER IF ITS KEDOCO ITS O.K.

ORDER FORM : To KEDOCO ELECTRONICS, BEVERSTONE WORKS, TETBURY, GLOS

Please supply ....
....
....
....

Address ....
....
....
....

Enclose Cheque/P.O. for...........Postage 2/6 extra for all orders under £1.

THE WORD MAXI-Q REGD. IS THE REGISTERED TRADE MARK
OF DENCO (CLACTON) LIMITED
IT IS ALSO A GUARANTEE OF
WORKMANSHIP AND
TECHNICAL PERFORMANCE

OUR RANGE OF PRODUCTS IS SO GREAT THAT WE NOW HAVE TO REQUEST THE AMOUNT OF 2s. 0d. FOR OUR GENERAL CATALOGUE AND TO SAVE YOU POSTAL ORDER POUNDAGE CHARGE WE REQUEST SEND 2s. 0d. IN STAMPS.

IN RESPONSE TO CONTINUOUS DEMAND WE HAVE COMMENCED PRODUCTION of self-contained Multiplex Decoder Unit, aligned ready for immediate use, that will convert your two receivers—tuner and two amplifiers—tuner and stereo amplifier or stereo receiver without Multiplex provision to a complete B.B.C. Stereo Broadcast Reception Unit. Price £8.0.0 post paid. Technical Publication MD.1. 4s. 0d. post paid.

IFT.11/465 kc/s centre tapped transformer for use in crystal filter circuits, 1-7/8" x 13/16" square. 10s. 6d. plus 8d. post.

IFT.18/465 kc/s and 1.6 Mc/s Double Tuned transistor IF transformer, 1½" x ½" square. 10s. 6d. plus 8d. post.

General Catalogue 2s. 0d. post paid. S.A.E. all enquiries please.

DENCO (CLACTON) LTD.

(Dept. P.W.)
357/9 OLD ROAD, CLACTON-ON-SEA, ESSEX

RADIO CLEARANCE LTD.

27 TOTTENHAM COURT ROAD, LONDON W.1. Telephone: MUSeum 9188
Bulk enquiries invited. *The oldest component specialists in the trade.* Est. 35 yrs.

LOUDSPEAKER BARGAINS STILL AVAILABLE

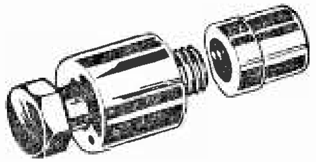
Enormous purchases of Brand New and Guaranteed Plessey loudspeakers enable us to offer these units at THE LOWEST PRICES EVER! Don't miss this golden opportunity to obtain a first-grade permanent-magnet LOUDSPEAKER off the production line at LESS THAN THE MANUFACTURER'S COST! Read carefully the prepared list below and choose just the right speaker for the job—COMPARE THE PRICES ANYWHERE! SELLING FAST—STOCKS CHANGING RAPIDLY.

Size in inches	*Gauss in lines*	*Imped. in ohms*	*Price*	*Size in inches*	*Gauss in lines*	*Imped. in ohms*	*Price*	*Size in inches*	*Gauss in lines*	*Imped. in ohms*	*Price*
2	7000	80	8/-	3½	9500	3	10/6	4	9500	25	11/6
2¼	7000	35	8/6	3½	7000	35	8/6	5	7000	3	8/6
2¾	7000	50	8/6	3¾	9500	50	10/6	5	7500	3	9/-
2½	7000	80	8/-	4	6000	35	10/6	5	9500	3	10/6
3	8500	3	10/-	4	7000	35	11/-	5	9500	15	12/6
3	7000	5	9/-	4	7500	5	9/6	5	8500	25	10/6
3	7000	35	9/-	4	9000	50	11/6	6½	7000	3	11/-
3	6500	80	9/6	4	9500	35	11/6				
3¼	6000	15	10/-	4	9500	15	12/-				
3½	7000	3	9/6								
5 × 3	9000	35	12/-	7 × 3¾	7000	3	9/6	8 × 2¾	6000	3	3/6
5 × 3	7000	3	8/-	7 × 3¾	9500	3	10/6	8 × 2¾	7000	5	9/-
5 × 3	9000	3	8/6	7 × 3⅝	9500	8	11/6	8 × 2¾	9500	3	10/-
5 × 3	9500	3	9/-	7 × 4	9500	3	11/-	10 × 6	11000	3	22/6
6 × 4	8500	3	9/6	7 × 4	9500	30	12/6	10 × 6	11000	5	22/6
6 × 4	9500	3	10/-	7 × 4	10000	3	12/6	10 × 6	11000	25	23/6
6 × 4	9500	35	12/-	7 × 4	12000	3	15/6				

ALLOW 2/6 each Speaker for postage and packing and handling charge and please specify the exact requirements—the nearest available will be sent.

SELECTED BARGAINS

Beautifully geared AM/FM 2-gang Condensers, 4/6: AM/FM IFT'S 465 kc/s and 10.7 Mc/s 4/6 pair: Magnavox Crystal Tape Recorder Mikes, 12/6: 3 watt Stereo Amplifiers complete, ready to switch on, 79/6: Sentercell rectifiers R3/2D-D3-2-1-Y, 2/6 each. **DIODES**—OA79, OA90, CG46H, GD10, 2/- each. **TRANSISTORS:** OC45 4/6, PXA101, 3/9, AF115, 4/6. Sub min. Germanium diode 1/3. M1 diode 6d. each. Silicon diodes, 400 p.i.v., 330mA, 2/6 each. please send STAMPED and ADDRESSED envelope with any enquiry. We regret no catalogue—our stocks move too quickly! Kindly make provision for additional postage and package charge to avoid delay. **Terms: Cash With Order or C.O.D. on Orders over 10/-.**



The PUNCH you need!

HOLE PUNCHES

Instant Type		
⅜" diameter	... ...	6/10 ea
Screw-up Type		
13/32" diameter Toggle switch	...	8/6 ,,
½" ,,	... ...	8/6 ,,
⅝" ,, B7G	... ...	9/- ,,
¾" ,, B8A, B9A	...	9/6 ,,
11/16" ,,	... ...	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

the Club to include quite a few technical films in its programmes.

So I think that the Wellingborough Radio Club, to which, incidentally, it changed to from its more lengthy title of Wellingborough and District Radio and Television Society some years ago, can look forward to a happy future.

Admittedly the last few years have been lean ones but there is no doubt that things are on the up and up. One has only to see the new faces in the clubroom on Thursday evenings, to which anyone who is interested in ANY aspect of electronic or electrical work is most heartily welcome.

Do you live in the Wellingborough district? The fact that you read this magazine proves that you are interested, so why not pop in to see us or drop our secretary a line? We shall be very pleased to see you or to hear from you.

Meetings are held every Thursday evening at 7.45 p.m. in the clubroom, situated above the W.I.C.S. fruit shop in Silver Street, Wellingborough. The hon. secretary is Mr. J. Baker, 34 Essex Road, Rushden, Northants. ■

SWITCH-TUNED SUPERHET

—continued from page 967

meter is available, check the voltages as indicated on the circuit diagram of Fig. 1. Note that these voltages are obtained with an h.t. of 250 volts; the h.t. can be reduced to this level by loading the supply with a suitable resistor, although such accuracy is not strictly necessary.

The circuit can be given a functional check as an a.f. amplifier in a number of ways. Three of these are as follows:—

(a) Feed the output of a transistor or valve radio directly between the loose end of C10 and chassis.

(b) Connect microphone between C10 and chassis.

(c) If a spare speaker and output transformer are available, connect the spare speaker to the transformer secondary, and the primary between C10 and chassis. The arrangement will now act as a microphone.

In the case of both (b) and (c) it will be found that if a "microphone" is placed within the vicinity of the receiver speaker, "howling" will take place due to feedback; howling may take place at ranges up to several feet.

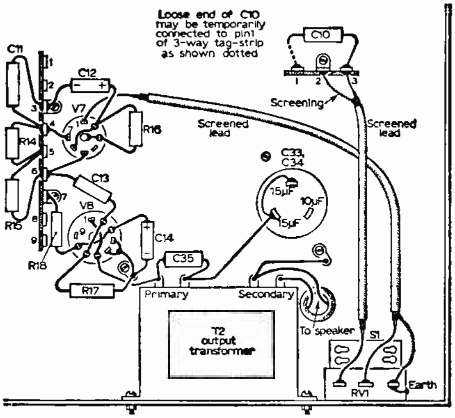


Fig. 4: Wiring details of the A.F. section.

A maximum output of about half a watt, with little distortion, should be available.

TO BE CONTINUED

MINIATURE POWER AMPLIFIER—*continued from page 989*

2. Size of room and furnishings.
3. Preferred listening level.

As a guide to the home constructor a test was made with a calibrated oscilloscope across the terminals of an 8in. speaker with 12,000-line magnet in a small cabinet in a well-furnished room of 2,000 cu. ft volume. The electrical power needed to generate more than adequate level of sound was as follows:

Average volume level power to speaker 0·085W.
Peak volume level power to speaker 0·48W.

Static and Dynamic Tests

Testing and evaluating the performance of a finished project can be both interesting and instructive and it is always satisfying to know a piece of equipment is working correctly. Static (d.c.) and dynamic (a.c.) voltages are indicated in the circuit diagram. For constructors with limited test equipment measurement of the d.c. volts at V1 cathode and the junction of the output valves' cathodes gives a reliable indication that the amplifier is working correctly.

Circuit Improvement

Only one slight component change has been found to improve on the original circuit and that is reducing R3 to 1·5kΩ. This enables the first stages to give a larger voltage swing to the output triodes. Changing this resistor alters the static voltages applied to the anodes and cathodes of the voltage amplifier and phase-splitter. These voltages are shown on the circuit diagram; full-power signal voltages are underlined.

R10 was given as 270Ω in the original circuit. This was incorrect and should have been 560Ω.

Because of the small anode currents (9mA) and balanced working of the output valves a small transformer can give good response and the Elstone MR/T is recommended for 3Ω speakers.

Reliability Test

A 250-hour reliability test was given to one of the small amplifiers. It was driven continuously at full output at 1,500c/s and at the end of the test all resistors were found to be working well within their rated power and there was no measurable change in valve performance. ■

R.S.T. VALVE MAIL ORDER CO.

All valves brand new and boxed

Mon.—Sat. 9 a.m. —5.45 p.m.
No Early Closing
Open Daily to Callers

211a STREATHAM ROAD, MITCHAM, SURREY

Tel. MITcham 6202

OA2	5/3
OC3	5/-
1A7	7/9
1D5	6/-
1H5	7/6
1LD5	5/-
1N5GT	8/-
1R5	5/-
1S4	5/-
1S5	3/3
1T4	2/6
3A4	3/6
3Q4	6/6
3Q5	6/6
3S4	4/9
3V4	6/-
5R4G	8/-
5U4G	4/-
5V4G	8/-
5Y3GT	4/6
5Z4GT	8/-
6/30L2	10/-
6A7	15/-
6A8G	12/6
6AC7	3/-
6AK5	4/6
6AL5	3/-
6AM5	2/6
6AM6	2/9
6AQ5	6/-
6AS7	22/6
6AT6	3/6
6AU6	6/-
6B8G	2/-
6BA6	4/9
6BE6	4/9
6BH6	7/-
6BJ6	6/6
6BQ7A	7/6
6BR7	10/6
6BR8	7/6
6BS7	15/-
6BW6	8/6
6BW7	8/6
6C4	1/9
6C5G	4/-
6C6	3/9
6C8G	6/-
6CD6G	22/6
6CH6	3/-
6CW4	14/-
6D6	2/9
6E5	5/9
6F1	9/-
6F5G	5/-
6F6G	4/-
6F8G	4/6
6F11	12/6
6F13	5/-
6F14	12/6
6F23	9/6
6G6	2/6
6H6	1/3
6J5M	6/6
6J5G	2/6
6J5GT	4/6
6J6	3/-
6J7M	8/6
6J7G	4/3
6J7GT	8/6
6K6GT	5/-
6K7M	5/-
6K7G	1/8
6K7GT	4/6
6K8M	8/6
6K8G	3/-
6K8GT	3/3
6K25	20/-
6L1	9/6
6L6G	7/-
6L18	7/6
6Q7G	5/6
6Q7GT	9/-
6SA7	7/-
6SC7	6/6
6SG7	4/-
6SH7	2/6
6SJ7	5/-
6SK7GT	4/9
6SL7GT	4/9
6SN7GT	4/-
6SQ7	6/-
6U4GT	10/-
6U5G	7/6
6V6M	8/-
6V6G	6/6
6V6GT	7/-
6X4	3/6
6X5G	4/9
6X5GT	7/6
7B6	11/-
7B7	7/-
7C5	10/-
7C6	6/-
7D5	8/-
7H7	5/-
7R7	12/-
7S7	18/6
7Y4	5/-
9BW6	8/-
10C1	12/6
10C2	12/-
10F1	12/6
10F3	12/-
10F9	9/9
10F18	9/-
10L1	10/-
10LD11	10/-
10P13	12/6
12AH8	20/-
12AT6	4/6
12AT7	3/3
12AU6	5/9
12AU7	5/-
12AX7	4/6
12BA6	6/-
12BE	4/9
12BH7	5/9
12C8GT	7/6
12E1	19/6
12J5GT	2/3
12J7GT	7/3
12K7GT	3/-
12K8GT	8/3
12Q7GT	3/-
12SA7	6/6
12SG7	3/6
12SH7	2/9
12SJ7	3/9
12SK7	2/9
12SR7	5/-
12S7	20/-
19AQ5	7/6
20D1	10/-
20F2	11/-
20L1	15/-
20P4	14/-
20P5	12/-
25A6	6/6
25L6GT	4/6
25Y5	6/-
25Z4	6/3
25Z5	7/-
25Z6	8/6
28D7	5/-
30C1	6/6
30C15	9/6
30C17	12/-
30F5	9/-
30FL1	10/6
30L15	12/-
30L17	12/6
30P12	10/-
30P19	14/-
30PL1	11/-
30PL13	12/6
30PL14	12/6
35A5	17/-
35L6	5/9
35W4	4/9
35Z3	10/-
35Z4GT	3/9
35Z5	5/6
37	5/-
42	4/6
50B5	6/6
50C5	6/3
50CD6G	24/9
50L6GT	6/-
75	5/-
78	4/6
80	5/-
85A2	8/6
150B2	14/6
150C4	12/6
801	5/-
807	7/9
813	80/-
866	10/-
954	4/-
1625	5/-
4022AR	15/-
5763	10/6
7193	1/6
7475	2/6
ATP4	1/9
ATP5	7/-
ATP7	4/6
AU2	30/-
AU5	6/-
AZ1	8/9
AZ31	7/9
CBL31	28/6
CK502	5/-
CL33	12/6
CY31	10/-
DAC32	7/6
DAF91	3/3
DAF96	6/-
DCC90	8/-
DF33	8/-
DF70	5/-
DF91	2/6
DF92	2/6
DF96	28/-
DH77	3/6
DK32	7/9
DK91	5/-
DK92	7/9
DK96	6/6
DL70	7/-
DL92	4/9
DL93	3/6
DL94	6/-
DL95	6/6
DL96	6/-
DM70	5/-
DY86	7/-
DY87	7/9
E88CC	14/-
EA50	2/-
EABC80	5/6
EAF42	7/6
EB41	4/6
EB91	8/-
EBC33	6/-
EBC41	6/6
EBC90	3/6
EBF80	5/-
EBF83	7/3
EBF89	5/9
EBL1	17/6
EBL21	10/6
EBL31	27/6
ECC81	3/3
ECC82	5/-
ECC83	4/6
ECC84	5/6
ECC85	5/9
ECC88	8/9
ECF80	6/6
ECF82	6/-
ECH21	19/-
ECH35	13/-
ECH42	8/-
ECH81	5/6
ECH83	6/6
ECL80	6/-
ECL82	6/6
ECL83	9/-
ECL86	8/6
EF9	20/-
EF36	3/-
EF37A	9/6
EF39	5/-
EF41	6/6
EF50	2/-
EF80	4/6
EF85	4/6
EF86	6/6
EF89	4/-
EF91	2/9
EF92	2/6
EF98	10/-
EF183	6/6
EF184	6/6
EL32	3/-
EL33	17/6
EL34	9/6
EL41	7/3
EL42	7/6
EL84	4/6
EL90	6/-
EL95	6/-
EM34	9/-
EM80	6/-
EM81	7/-
EM84	6/-
ESU150	27/6
EY51	6/6
EY86	5/3
EZ35	4/9
EZ40	5/6
EZ41	6/-
EZ80	5/6
EZ81	3/6
GZ30	8/6
GZ32	9/-
GZ34	9/9
KT36	22/6
KT61	17/6
KT66	12/-
KT81	10/-
KT88	28/-
KTW61	4/3
KTZ41	8/-
ML4	17/6
ML6	12/6
MSP4	12/6
MU14	4/-
MX40	12/6
N37	10/-
N78	15/-
N108	15/-
NGT1	8/-
NGT7	25/-
OZ4	4/-
PC86	10/-
PC88	9/3
PC97	7/-
PCC84	5/6
PCC89	8/6
PCC189	10/-
PCF80	6/6
PCF82	6/-
PCF84	8/-
PCF86	8/6
PCF801	9/9
PCF802	9/9
PCF805	10/6
PCF806	12/-
PCF808	12/6
PCL82	6/6
PCL83	8/-
PCL84	7/-
PCL85	7/3
PCL86	8/9
PENA4	20/-
PENB4	20/-
PEN45	6/-
PEN46	2/9
PL36	9/6
PL81	7/-
PL82	5/-
PL83	6/-
PL84	6/3
PL500	14/6
PX4	18/6
PY33	8/6
PY81	5/6
PY82	5/6
PY88	6/-
PY800	5/9
PY801	6/3
R2	4/-
R19	7/-
RG5/500	59/-
S130	10/-
SP4	9/-
SP41	1/6
SP61	1/-
SU25	19/6
SU2150	12/6
T41	9/-
TDD4	7/-
TH41	20/-
U10	7/-
U14	7/-
U19	30/-
U25	10/-
U26	10/-
U78	3/6
U191	11/-
U251	11/6
U301	12/-
U403	6/6
U801	18/6
UABC80	5/6
UAF42	7/-
UBC41	6/6
UBC81	7/-
UBF80	5/9
UBF89	6/3
UCC84	8/6
UCC85	6/6
UCF80	8/6
UCH42	7/-
UCH81	6/3
UCL82	7/9
UCL83	8/9
UF41	7/-
UF89	6/-
UL41	6/9
UL84	5/6
UM80	7/-
UU6	13/6
UU7	10/6
UU9	8/-
UY21	7/6
UY41	4/6
UY85	4/9
VCR97	27/6
VCR517B	30/-
VCR517C	30/-
VMP4G	17/-
VP4B	12/6
VR105/30	5/-
VR150/30	5/-
VT25	29/-
VT31	59/-
VU111	6/-
VU120	9/-
VU508	25/-
W81M	5/-
X78	26/6
X79	41/-
XH1-5	5/-
XP1-5	5/-
XSG1-5	10/-
Y63	7/6
3EG1	40/-
3FP7	12/6
5CP1	30/-
CV1526	40/-
ACR13	£3.0.0

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

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

OC35	9/6	OC72	6/-	OC81D	4/-
OC44	4/6	OC81	4/-	OC82	6/-
OC45	3/6	OC81m/pr	12/6	OC82D	6/-
OC71	4/6				

HOME RADIO LTD. 187 LONDON RD., MITCHAM, SURREY *'Phone MIT 3282*

Not only all the big names in electronics, but also many very interesting lesser known names are listed in the famous Home Radio Catalogue.

Armstrong
JACKSON BROS.
WEYRAD (ELECTRONICS)
PHILIPS
AVO LTD
ADCOLA
TCC
Eddystone Radio Limited
SALFORD ELECTRICAL INSTRUMENTS LIMITED
NOMBREX LTD.
ILIFFE Books Ltd.
DUBILIER
WB
Goldring
Heathkit DAYSTROM
Q-MAX
IGRANIC
Weller
Mullard
AEI
LUSTRAPHONE
GOODMANS INDUSTRIES
RADIONIC PRODUCTS
THE HOUSE OF BULGIN
LIGHT SOLDERING DEVELOPMENTS LTD.
ANTEX PRECISION SOLDERING IRONS
BELLING-LEE
Brenell

These are just a few from over 150 names listed! Are you interested? Good! Then send right away for this super catalogue . . . 210 pages, *plus* a 21-page supplement, *plus* a semi-conductor brochure, *plus* a bargain list! All for 7/6 plus 1/6 postage and packing. And remember—every catalogue contains 5 coupons, each worth 1/- when used as directed. Fill in the coupon and send now, with a 9/- cheque or postal order.

Please write your name and address in block capitals

NAME ....

ADDRESS ....

....

....

HOME RADIO LTD, Dept. PW, 187 LONDON RD., MITCHAM, SURREY

SINCLAIR MICRO-6

— the smallest set in the world

TAKE IT
WITH YOU
EVERYWHERE

Build it in an evening!

This wonderful set is proving more and more the modern, personal way to listen to radio. It takes less space in your pocket than a box of matches, and has impressive power and selectivity. While you are enjoying using it, your MICRO-6 will never interfere with the privacy of other people. Often you will find it giving satisfaction where no other sets can be used at all. Yet building this superb receiver is so easy. By following the well prepared instructions manual, success is assured even if you have never put a transistor set together in your life. So start yours today and have it for outdoor days to come.

FULL SERVICE FACILITIES AVAILABLE

SIX STAGE POWER AND SELECTIVITY

Three Sinclair Micro-Alloy Transistors are used in a unique 6-stage circuit as follows: Two stages of RF amplification are followed by an efficient double-diode detector which drives a high-gain 3-stage AF Amplifier. Powerful A.G.C. ensures fade-free reception from the most distant stations tuned in on the medium waveband. Everything including ferrite rod aerial and pill-size batteries are contained within the elegant tiny white, gold and black case. Inserting the earpiece plug switches the set on.

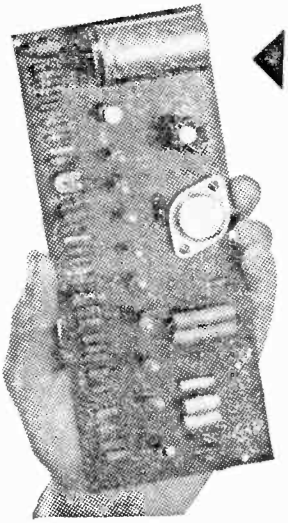
- **SIZE $1\frac{4}{5} \times 1\frac{3}{10} \times \frac{1}{2}$in.**
- **WEIGHT — 1 oz.**
- **SELF-CONTAINED**
- **PLAYS ANYWHERE**
- **ANYONE CAN BUILD IT**
- **GUARANTEED**
- **BANDSPREAD FOR LUXEMBOURG, ETC.**

★Wonderful value for money, too !

The Micro-6 kit includes special ferrite rod aerial, ready wound, transistors, printed circuit board, case, vernier dial and front panel lightweight earpiece, all components and instruction manual complete for

59/6

MALLORY MERCURY CELL ZM.312 (2 needed), ca. 1/11. Pack of 6 cells, 10/6



UNIQUE AMONG THE WORLD'S BEST HI-FI AMPLIFIER SYSTEMS

- **20 WATTS R.M.S. OUTPUT**
- COMPLETE with PRE-AMP
- USES P.W.M.
- SIZE $8\frac{1}{4} \times 3\frac{1}{4} \times 1$in.

SINCLAIR X-20

Imagine an amplifier system small enough to go into a foolscap envelope yet which will give you more power and better quality than anything within £30 of its price, and you have the Sinclair X-20. It has special circuitry developed by Sinclair Radionics using Pulse Width Modulation that puts it years ahead in design and performance. When you have built it, you use the X-20 as you would any other conventional high fidelity system. The X-20 manual included shows how any type of input can be matched to the input for mono and stereo. You can build the X-20 in an evening!

BRIEF TECHNICAL SPECIFICATION

- 12 Transistors inc. silicon epitaxial planars
- Constant square wave amplitude
- Frequency response—20 to 20,000 c/s ±1dB
- 0.1% distortion at 10w. R.M.S.
- Input sensitivity—1mV into 5k Ω
- Signal to noise ratio—better than 70dB
- Output into 7.5 ohms—
  - 20 watts R.M.S. music power
  - 15 watts R.M.S. continuous
- Output into 15 ohms—
  - 15 watts R.M.S. music power
  - 10 watts R.M.S. continuous
- Wide tolerance to load at output

Complete kit of parts and X-20 manual **£7.19.6**

Ready built **£9.19.6**

Mains power unit to give 36V. d.c. **£4.19.6**

sinclair

SINCLAIR RADIONICS LTD.
COMBERTON, CAMBRIDGE
Telephone COMBERTON 682

YOU ARE ALWAYS AHEAD

The world's only pocket-size FM Tuner/Receiver

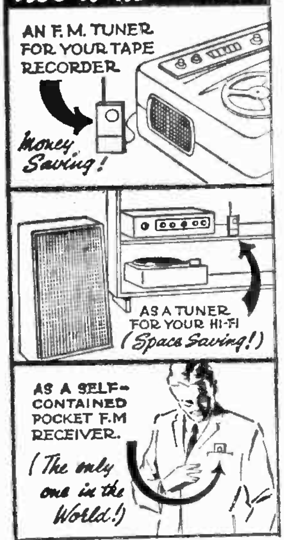
ALL YOU WANT IN FM RECEPTION

Once again Sinclair Radionics prove to constructors that very high standards of efficiency can be successfully combined with micro-techniques. The Sinclair Micro FM is an outstanding example. This tiny, professionally elegant set incorporates a number of advances over conventional practice to achieve amazing standards of performance. Despite its amazingly small size, this is a fully fledged 7-transistor 2 diode FM superhet which has two outlets to enable it to be used both as a tuner for hi-fi or tape recorder and as an independent pocket receiver for personal listening. These are features to be found in no other set in the world. Pulse counting detection assures improved linearity and therefore better audio quality; low I.F. does away with alignment problems. Such is the sensitivity of this tuner that the telescopic aerial is sufficient for good reception almost everywhere. In styling, the Sinclair Micro FM is the most elegant, professional looking design ever offered to constructors, yet with all these plus features, this set costs pounds less, so that anyone can enjoy the advantages of FM to the full today.

Hi-fi quality at a quarter the price!

A GUARANTEED SINCLAIR DESIGN

Use it as—



FULL SERVICE FACILITIES AVAILABLE TO ALL SINCLAIR CUSTOMERS

SINCLAIR MICRO FM

7 TRANSISTOR SUPERHET FM TUNER/RECEIVER

★ TECHNICAL DESCRIPTION

Seven transistor, two diode F.M. superhet. The telescopic aerial is coupled to an R.F. amplifier followed by a self-oscillating mixer. Low I.F. dispenses with the need for alignment, thereby enabling the constructor to use the set as soon as building is finished. A three stage I.F. amplifier amplifies and limits the signals to produce a square wave of constant voltage which is fed into the pulse counting discriminator. This is converted to uniform pulses, the average output from which is directly proportional to the signal frequency, so that the original modulation is reproduced exactly ensuring highest possible audio standards. The signal is fed to the audio output socket for use with an amplifier or recorder and also the receiver's own audio amplifying stage for the Micro FM to be used as an independent self-contained receiver. A.F.C., which "locks" automatically on to the station tuned in, makes tuning simple. THE SINCLAIR MICRO FM is housed in a neat plastic case faced by an elegant front panel of brushed and polished aluminium with spun aluminium vernier type tuning dial to match.

★ NO OTHER SET IN THE WORLD HAS ALL THESE FEATURES . . .

- **Size—2$\frac{13}{16}$ x 1$\frac{11}{16}$ x $\frac{3}{4}$in. plus aerial.**
- **Tunes from 88 to 108 Mcs.**
- **One output for amplifier, recorder, etc., and one for personal listening.**
- **In neat black case with polished and brushed aluminium escutcheon and matching tuning control.**
- **No alignment problems when built.**
- **SUPPLY VOLTAGE—9V from self-contained standard battery.**
- **CONSUMPTION—5mA.**
- **SENSITIVITY—Typically 3 microvolts.**
- **SIGNAL TO NOISE RATIO—30dB at 30 microvolts.**
- **AUDIO FREQUENCY RESPONSE—10 to 20,000 c/s ± 1dB.**
- **A GUARANTEED SINCLAIR PRODUCT**

COMPLETE KIT OF PARTS AND INSTRUCTIONS

£5.19.6

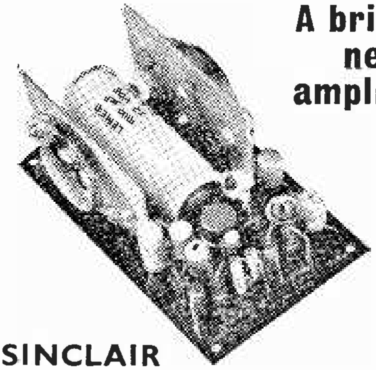
> ***"Superb tone and performance"***
>
> *"I am writing to say just how pleased I am with the superb tone and performance of my Micro F.M. It looks really professional."*
>
> *(Signed) D.C.S., New Milton, Hants.*

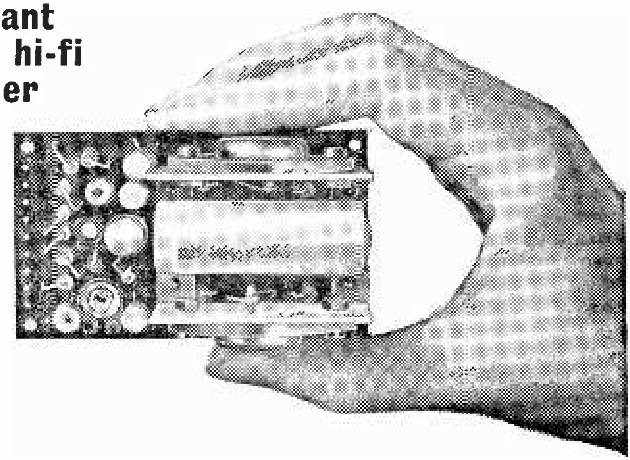
sinclair

SINCLAIR RADIONICS LTD.
COMBERTON, CAMBRIDGE
Telephone:
COMBERTON 682

WITH A SINCLAIR DESIGN

A brilliant new hi-fi amplifier





SINCLAIR

Z.12

8 TRANSISTOR COMBINED AMPLIFIER AND PRE-AMP

The smallest, most powerful yet

Here is the hi-fi amplifier every constructor wants—very small, very powerful and of the highest possible quality. The Sinclair Z.12 meets all these requirements AND MORE to give you the most versatile, compact and dependable amplifier system ever. As only with Sinclair designs, the Z.12 incorporates its own special pre-amplifier to which you add whichever tone and volume control circuit suits you best. These are all shown in the manual included with every Z.12. The Z.12 achieves even greater versatility, since it operates efficiently from any power supply between 6 and 20 volts, D.C. This makes it as attractive for use in car radios, guitars, P.A. systems, etc. as for the very best hi-fi it is designed for. In fact, the Z.12 is the ideal amplifier wherever the need is for great power and quality from the smallest possible unit. The Sinclair Z.12 comes to you ready built, tested and guaranteed.

89/6

Ready built and tested.

Sinclair Power pack for Z.12 **£2.14.0**

USE THE Z.12

- In a hi-fi system, mono or stereo
- With the Micro-6 for a car or portable radio
- With the Micro FM for high quality radio
- In a guitar
- For P.A., intercom, etc.

A SUPERB SPECIFICATION !

8 Transistor high fidelity amplifier with pre-amp and ultra-linear class B output. Special H.F. transistors are used in orginal circuitry to achieve laboratory standards of performance. Generous negative feedback ensures extra good quality.

- **Frequency Response**—15 to 50,000 c/s ±1dB
- **Output into 3 ohms**—12 watts RMS continuous sine wave (24 watts peak); 15 watts RMS music power (30 watts peak).
- **Output Impedance**—suitable for 3, 7.5 and 15 ohms speakers. Two 3 ohm speakers may be used in parallel.
- **Input**—2mV into 2K ohms
- **Signal to Noise Ratio**—better than 60dB
- **Quiescent Current Consumption**—15mA
- **Power Supply**—6 to 20V d.c. from power unit available or batteries.
- Ideal for 12V battery operation.

THIS UNIQUE GUARANTEE COVERS ALL SINCLAIR PRODUCTS

All purchases from Sinclair Radionics Ltd., Comberton. Cambridge, are covered by this simple, straightforward 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.

Power! **12 WATTS R.M.S. 24 WATTS PEAK**

Compactness! **3" x 1¾" x 1⅛"**

Convenience! **WEIGHT 3oz.**

Quality! **ULTRA-LINEAR CLASS B OUTPUT**

GUARANTEE ORDER FORM

To **SINCLAIR RADIONICS LTD.**
COMBERTON, CAMBRIDGE

Please send me

....

....

....

for which I enclose Cash/Cheque/Money Order

value £..................s......................d

NAME ....

ADDRESS ....

....

....

PW 3-66

USE THIS ORDER FORM FOR ALL YOUR SINCLAIR REQUIREMENTS

TAPE RECORDERS, TAPES, ETC.

TAPE TO DISC Transfer, 45 rpm, 18/-; 10in LP, 42/-. S.A.E. leaflet. DEROY, 52 Hest Bank Lane, Hest Bank, Lancaster.

SERVICE SHEETS

SERVICE SHEETS for all makes of Radio and TV. 1925-1966. Prices from 1/- with free fault-finding guide. S.A.E. inquiries. Catalogue of 6,000 models 1/6. Valves, modern and obsolete, Radio/TV Books. S.A.E. lists. HAMILTON RADIO, Western Road, St. Leonards, Sussex.

SERVICE SHEETS, Radio and Television, 4/-, post paid. VEST AND EMERY, 17 Hallgarth St., 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/- ea., plus postage

We have the largest display of Service Sheets for all makes and types of Radios, Televisions, Tape Recorders, 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 St., 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

New 1966 List Now Available

I also require list of Service Sheets at 1/6.
(please delete items not applicable)
I enclose remittance of..................

MAIL ORDERS ONLY Mar. PW

RECEIVERS & COMPONENTS

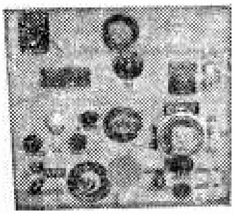
AVOMETER, Model 7, £7/10/-; D.C. Avominor, 35/-; Avo Valve Tester, £4; Runbaken Insulation Tester, £2; Decade Resist. Box, 30/-; Model-maker's Lathe, £2. 11 Cassiobury Drive, Watford.

RATES: 1/6 per word (minimum 12 words). Box No. 1/6 extra.
Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., London W.C.2.

RECEIVERS & COMPONENTS
(continued)

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.

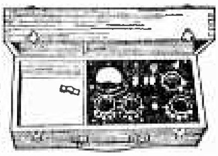
MARCONI CANADIAN RECEIVER No. 52



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. RF-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.

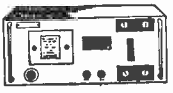
No. 52 GROUND-STATION comprising Receiver, Transmitter and 12v. D.C. Power Unit. £27.10.0. Carr. £2.10.0. (Mainland only).

WHEATSTONE BRIDGE



Centre Zero Galvanometer Scaled 20-0-20 2½in. movement. 2.5 mA. full scale deflection, 3 stud switch controls 0-10, 0-100 ohms. 0-Inf. Complete in carrying case with instructions, 45/-. Post 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 8ft 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 3¼ x 5½in. Brand new 17/6. P. & P. 5/-.

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)

"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.

19 SETS (A sets complete) with Power Packs, Control Box and all Connectors, tested and working R and T, £6/10/- plus 35/- carriage and packing. Sets only, £4, 20/- c. and p. Head Sets, £1. **46 SETS**, new, unpacked, complete with 2 Head Sets, Connectors, Haversack, £6/10/-, carriage 17/6. WALDEN, Main Road Garage, South Green, Billericay, Essex.

R & R RADIO & T V 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.

SILICON PLANAR Transistors, 18V, 200mW, 100mA max, $\beta = 150$ to 300. NPN at 5/6, PNP at 7/-. Brand new. "By Return" service. ELECTROVALUE, 6 Mansfield Place, Ascot, Berkshire.

DIRECT TV REPLACEMENTS LTD., largest stockists of TV Components in the U.K. Line Output Transformers, Frame Output Transformers, Deflector Coils for most makes. Official sole suppliers for many set makers. Same Day Dispatch Service. Terms C.O.D. or C.W.O. Send S.A.E. for quotes. Day and Night Telephone GIPsy Hill 6166. 126 Hamilton Road, West Norwood, S.E. 27.

6 TRANSISTOR PRINTED CIRCUIT RADIO

Components for the above as follows:—
6 transistor printed circuit 1/9. 2½in. speaker 6/6. Ferrite block 1/-. Edge volume control D.P.5K. 1/8. IF. and Osc. coils (set of 4) 6/8 set. Slide switch D.P.D.T. 1/-. Ganged condenser 5/-. P.P. output transformer 7/6. Driver transformer 7/6. Circuit 1/6.

37/6 All the above made specially and ready for assembly. Any item supplied separately. Add 1/6 P. & P. when order less than 10/-.

CLEVELEYS ELECTRICAL ENGINEERING Co.
Holmefield Av., Cleveleys, Nr. Blackpool

RECEIVERS & COMPONENTS
(continued)

SPEAKER REPAIRS, cones fitted. Satisfaction guaranteed. L. S. REPAIRS, Pluckley, Ashford, Kent.

GWM RADIO LTD

CANADIAN MARCONI 52 RECEIVERS 1.75 to 16 Mc/s as previous adverts, **£10.10.0** or with ZE12 Power unit for 230v. A.C. **£13.10.0**, both carriage paid. Handbooks with circuit, 5/-, leaflet S.A.E.

LOUDSPEAKERS 10in. 3 ohm in wood case. Case soiled, 600 ohm Line Transformer, **25/-** carriage paid.

RELAYS 100 volts D.C. Coil, S/P 5 amp contacts, normally closed, **5/-** post paid.

POCKET WATCHES Ex-Government 15 Jewel Swiss movements, **50/-** plus Reg'd. Post, 2/6.

(Carriage charges apply to England and Wales only).

Telephone: **Worthing 9097**

40/42 PORTLAND ROAD, WORTHING

A.1 POST FREE BARGAINS

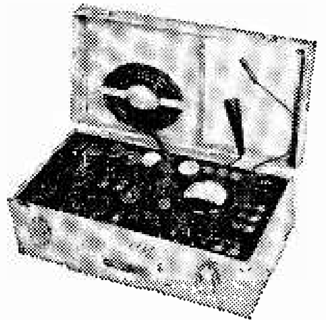
Stock clearance of reclaimed valves

B36	3/-	PCL82	4/-	UF42	1/9	10C1	7/-
EB41	1/9	PCL83	3/3	UCH42	5/-	10C2	3/9
EB91	9d.	PEN46	1/9	UL46	5/6	10P13	3/9
EBF80	3/6	PL33	2/6	Z63	3/-	10P14	3/9
ECC82	2/9	PL82	2/-	Z66	3/6	12AU7	5/-
ECF80	4/3	PL83	2/-	6F1	1/-	20D1	1/9
ECL80	1/6	PY31	1/3	6F13	2/9	20F2	4/3
EF42	2/9	PY32	4/6	6F14	2/9	20P1	2/6
EF80	9d.	PY80	1/6	6F15	3/-	20P3	3/-
EF85	4/6	PY81	1/9	6L1	3/9	30F5	4/6
EL42	4/3	PY82	1/6	6L18	3/-	30FL1	3/9
KT33C	2/3	PZ30	1/9	6L19	12/6	30PL1	3/9
KT36	3/3	T41	4/6	6LD20	4/3	30P12	3/9
KT61	2/9	U31	2/3	6N7	7/-	185BT	7/6
L63	1/6	U281	3/9	6P25	2/9	PCC84	4/-
N37	3/-	U329	3/6	6P28	4/6	KTW63	2/-
PCF80	2/-	UB41	3/6	6/30L2	2/9	KTZ63	3/6

EF80	5/- doz.	ECL80	12/- doz.	PCF80	18/- doz.
EB91	5/- doz.	PY82	12/- doz.	PL83	18/- doz

A.1 RADIO COMPONENTS

14 The Borough, Canterbury, Kent



VALVE TESTER I-177

Latest Release of this wonderfully made American Valve Tester, using a well scaled meter Reading (Red) Replace (Green) Good, also 0-3000, 0-6000, 0-15000 microhms for the measurement of Mutual Conductance of Valves, Noise Test Gas Test, a Top cap lead for the use of Testing Transmitter Valves with anode Top Caps, Test for Cathode Ray Indicator Valves LT Voltages: 1.1. 1.5 2, 2.5, 3, 4.3, 5, 6.3, 7.5, 10, 12.6, 25 35, 50, 75, 117 volts. In small case 5¾" x 15½" x 8½" with carrying handle. Circuit, Instruction Book and Valve data. In very good order **£12.10.0** post 7/6. This unit has a Supply Voltage of 110v. A.C. Therefore an Auto Transformer is required. We can supply at **10/-**.

JOHN'S RADIO
Old Co-op, Whitehall Road, Drighlington, Bradford

RECEIVERS & COMPONENTS
(continued)

SHORT OF MONEY? Turn your relays and contacts into cash. SAE for details. 112, Groby Road, Glenfield, Leicester.

FOR SALE

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 71, took only 6 WEEKS to obtain a G.P.O. Pass Certificate. 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 Ln., Purley, Surrey.

STOCK of Modern Radio Components for disposal, suitable for person opening shop/mail order business. Box No. 61

SPECIAL OFFER

1 watt S.T.C. 300 mc/s N.P.N. Silicon Planar, 100% Transistors limited stocks. £1 for 6.

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.

SUN SOLAR CELL KITS
24 page Booklet on Experiments inc. 4 Sun Solar Cells 11/- set.

G.P.O. DIAL TELEPHONES
20/- each. 35/- pair.

Send 6d. for full lists:—
inc., S.C.R., Zeners.

CURSONS

**78 BROAD STREET
CANTERBURY, KENT**

SPECIAL OFFER

GEVAERT TAPE, New, Boxed, 5¾, 600ft. with Stop and Leader Tapes, **9/-** or 6 for **50/-**.

GRUNDIG MA1 2 Transistor Pre-amps for Tape Monitoring or Microphone Boosters, **57/6**.

LIST PRICE 4 GNS.

LEE ELECTRONICS
400 Edgware Road, Paddington 5521
Send for Free Lists details of above

---

240 volt ELECTRIC POWER ANYWHERE ANYTIME! from 12 volt CAR BATTERY

WITH THE AMERICAN **DYNAMOTOR UNIT**

Input 12v. output 200/250v. at 150 to 220 watts. Perfect for TELEVISION, POWER TOOLS and all universal AC/DC ELECTRICAL EQUIPMENT, gives wonderful results. Price ONLY £11 + 20/- delivery. Send stamped envelope for full illustrated details. Dept. W SCIENTIFIC PRODUCTS, CLEVELEYS, Lancs.

HAMMERITE
HAMMER PATTERN BRUSH PAINT FOR PANELS AND BOXES

★ THE PATTERN IS IN THE TIN ★
ALL YOU DO IS BRUSH IT ON!

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 or Metallic Black.

Return of post service, Mon. to Fri.

From your component shop or direct from the manufacturer:

FINNIGAN SPECIALITY PAINTS (PW)
Mickley Square, Stocksfield, Northumberland
Phone: Stocksfield 2280

ELECTRIC SOLDERING-IRON

FANTASTIC BARGAIN OFFER

Lightweight Pistol Grip handle 40 watt. 240/250v. A.C. Solid copper bit. Detachable handle forms cover for iron when not in use. With 4½ft. Safety 3-core flex. Indispensable for every home handyman. A boon to model makers and a necessity for every wireless enthusiast. Offered to you at this new amazing price. **ONLY 9/6** P & P 1/

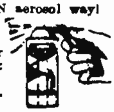
C. H. SERVICE (Dept. P.W.)
Lusted Hall Lane, Tatsfield, Kent.

METAL WORK

METAL WORK: All types cabinets, chassis racks, etc., to your specifications. PHILPOTTS METAL WORKS LTD., Chapman St., Loughborough.

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 carr. paid, per push-button self-spray can. SPECIAL OFFER: 1 can plus optional transferable snap-on-trigger handle (value 5/-) for 18/11. Choice of 13 self-spray main colours and primer (Motor car quality) also available. Please enclose cheque or P.O for total amount to:

YUKAN Dept. P.W./1 307a Edgware Rd., London, W.2. (closed Thurs. afternoon, open all day Saturdays.)

WANTED

WE BUY New Valves and Transistors. State price. A.D.A. MANUFACTURING CO., 116 Alfreton Road, Nottingham.

URGENTLY WANTED: New, Modern Valves, Transistors, Radios, Cameras, Tape Recorders and Tapes, Watches, Tools, any quantity. S. N. WILLETTS, 16 New Street, West Bromwich, Staffs. Tel. 2392.

DAMAGED AVO METERS wanted. Models 7 and 8. Any condition. Any quantity. HUGGETTS LTD., 2-4 Pawson's Road, West Croydon.

A PROMPT CASH OFFER for your surplus brand new Valves and Transistors. R.H.S., Beverley House, Mannville Terrace, Bradford 7.

WANTED: Purchase or loan Instruction Manual Erskine 13 Oscilloscope. TAYLOR, Wellwood St., Muirkirk, Ayrshire.

WANTED VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD.
103 North Street, Leeds 7

MISCELLANEOUS

CONVERT ANY TV SET into an Oscilloscope. Diagrams and instructions 12/6. REDMOND, 42 Dean Close, Portslade, Sussex.

How to use standard G.P.O. type telephones in a two way system with fully automatic ringing. May be used up to 5 miles apart requires only standard twin lead from Auto-Unit. Easy to construct. Details and circuit 6/6 inc. post.

Build a low cost three to ten line fully automatic telephone system ideal to rent or sell to schools, factories, offices etc. Uses standard G.P.O. type telephones, full details, diagrams and instructions 15/6 inc. postage.

PARTRIDGE TECHNICAL PUBLICATIONS
Dep. R, 21-25 Hart Rd., Thundersley, Essex.

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., 29 Maude Street, Darlington, Durham. Send 3d. stamp.

SITUATIONS VACANT

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.

SITUATIONS VACANT

(Continued)

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.

A FULL-TIME TECHNICAL EXPERIENCED SALESMAN required for Retail Sales. Write, giving full details of age, previous experience and salary required, to the Manager, HENRY'S RADIO LTD., 38 Edgware Road, London, W.2.

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.

EDUCATIONAL

RADIO OFFICERS' training courses. Write Principal, Newport and Monmouthshire College of Technology.

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 OFFICERS see the world! Sea-going and shore appointments. Trainee vacancies during 1966/67. Grants available. Day and Boarding students. Stamp for prospectus. Wireless College, Colwyn Bay.

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.

BOOKS & PUBLICATIONS

AUDIO, America's foremost journal. Year's subscription 43/-, specimen copy 4/-. All American radio journals supplied—list free. WILLEN (Dept. 40), 61a Broadway, London, E.15.

SURPLUS HANDBOOKS

19 set Instruction Handbook ..	3/6 P.P. 6d.
1155 Instruction Handbook ..	3/6 P.P. 6d.
C.R.100/B.28 Receiver Handbook	8/6 P.P. 9d.
52 set Instruction Handbook ..	5/- P.P. 6d.
H.R.O. Instruction Handbook ..	3/6 P.P. 6d
46 set Walkie Talkie circuit and notes	3/6 P.P. 6d.
88 set Walkie Talkie Instruction Handbook	5/- P.P. 6d.
R.107 Instruction Handbook ..	5/- P.P. 6d.
38 set Walkie Talkie Instruction Handbook	3/6 P.P. 6d.
Wavemeter Class D Instruction Handbook (all models) ..	3/6 P.P. 6d.
Frequency Meter BC221 Instruction Handbook	3/6 P.P. 6d.
18 set Circuitdetails and Notes ..	3/6 P.P. 6d.
RF unit 26 Circuit Diagram and Details	1/6 P.P. 6d.
Amplifier A1134 Circuit Diagram and Details	1/9 P.P. 6d.
Transmitter T1154 (all models) Circuit Diagram and Details ..	2/- P.P. 6d.
A.R.88D Instruction Handbook ..	15/- P.P. 1/6
Resistor Colour Code Indicator. Indicates the value of a resistor at a glance	1/6 P.P. 6d.

All mail orders to:

INSTRUCTIONAL HANDBOOK SUPPLIES
Dept. P.W.7, Talbot House, 28 Talbot Gardens, Roundhay, Leeds 8

City and County of Bristol Education Committee

BRISTOL TECHNICAL COLLEGE
CAREERS IN RADIO AND 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. Courses (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 above.

Training given on the latest types of Marine and Aircraft Equipment in the newly equipped Laboratories at

THE SCHOOL OF MARINE RADIO AND RADAR

For details write to:

THE REGISTRAR
BRISTOL TECHNICAL COLLEGE
ASHLEY DOWN, BRISTOL 7

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.

---

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

DIGITAL COMPUTER

A simple digital Adder/Subtractor using switches and lamps only. A fascinating demonstration of Binary arithmetic. Full circuit, wiring diagram and notes on the Binary system, **3/6.**

NOUGHTS AND CROSSES MACHINE Uses standard miniature switches and lamps only. This machine cannot be beaten. Full circuit, wiring diagram and instructions, **3/6.**

1% High Stability Resistors

½ watt 1%, 2/- each. Full range 10 ohms to 10 Meg. Many special values for meter multipliers etc. in stock.

1% Wirewound Resistors

1% 1-watt, 1 ohm to 5K, 3/-; to 20K, 4/3; ½% add 3d. Your value wound to order. Shunts down to 0.1 ohm.

High Resistance Phones, 10/-, post 1/-.
100 Resistors, 1, 2 and 5% assorted, 9/6.
Signal Injector Kit, 10/-, post 1/-.

PLANET INSTRUMENT CO.
25 (W) DOMINION AVENUE, LEEDS 7

PADGETTS RADIO STORE

OLD TOWN HALL
LIVERSEDGE, YORKS.
Telephone: Cleckheaton 2866

Mark 3 18 Set Receiver. 4 valve battery Superhet, 6-9 Mc/s, clean condition, **12/6**, P. & P. 5/-.

New Boxed Tube Unit CR100. Complete with two small CRT tubes VCRX393 and VCRX298, plus 21 small valves and 0-1 meter. Relays removed, **57/-**, carriage 10/-.

Meters removed from 18 Set TX, perfect 0-500, microamp, **8/6**, P. & P. 1/3.

Bush 12in. TV24C. 13 channel. Complete and tested with good tube, only wants cleaning, **55/-**, carriage 10/-, G.B.

17in. 13 channel TV Sets. Untested but complete, **50/-**, carriage 12/-.

Reclaimed Tubes. Six months' guarantee. AW43/80, **30/-**; MW43/80, **30/-**; MW43/69, **30/-**; CRM172, **30/-**; CRM142, **17/-**; 12in. tubes, **10/-**; 17in. tubes perfect but without guarantee, **17/-** each. Carriage on any tube in G.B., 10/-.

Scope Tube removed from units, DG7-5 2.5in., perfect condition, **30/-**. Post 4/6.

New JAP earpieces complete with lead and plug, 3 or 5mm., **1/11** post paid or **20/-** per dozen.

New 12in. Speakers with built-in Tweeter, 3 or 15 ohm, **28/6**, post paid.

Perfect Speakers, Ex-TV Sets. 8in. round **6/-**, post 3/-; 7 x 4 Goodman and R/A, **5/-**, post 2/9; Rola 6 x 4, **3/-**, post 2/9; 6in. round and 5in. round, **3/-** each, post 2/9 or 6 for **20/-**, post paid.

VALVE LIST
Ex equipment, 3 months' guarantee

EL91	1/6	20P1	4/-	PCC84	4/-
EL80	2/-	20P4	8/6	PCL82	5/-
EL84	5/-	U801	8/6	PCL85	5/-
ECC81	3/-	U281	5/-	PL36	4/-
ECC82	3/-	U282	5/-	12AT7	3/-
EY51	2/6	U329	5/-	6CH6	1/6
EY86	5/-	KT36	5/-	R18	3/6
EBF80	4/6	6V6GT	4/-	ARP12	1/6
EB91	9d.	6B3	1/6		50 for £1
ECC83	4/-	6K25	5/-	807	5/-
EL38	5/-	6P25	3/6	EF50	1/-
EF91	9d.	6U4	5/-	Doz.	6/-
6F1	1/-	PY33	4/-	EF80	1/6
6F14	5/-	PY80	3/-	Doz.	10/-
6F15	5/-	PY81	3/-	6K7	1/3
10O2	5/-	PL38	8/6	Doz.	10/-
10F1	1/-	PL81	4/-	6V6	1/9
10P13	5/-	PL82	3/-	Doz.	18/-
10P14	5/-	PL83	3/-	6K8	1/9
20D1	2/-	PY82	3/-	Doz.	18/-
20L1	5/-	PCF80	4/-	U25	5/-
20P3	4/-	PZ30	5/-		

All valves post paid

New Valves. Cartons damaged by fire and water: PY33, **6/-**; PL36, **6/-**; PCC84, **5/6**; PCF80, **5/6**; ECL80, **3/6**; ECC82, **4/3**; ECC83, **5/-**.

INCREASE YOUR EARNING POWER AND JOB SECURITY WITH ONE OF THESE LOW COST COURSES

NEW. No. 500 RADIO AND TELEVISION COURSE 75/-

Here at last is your opportunity to own a most complete course at a very modest cost! This expanded course which now includes television as well as radio repair training could get you started on a whole new career!

The Radio Section of the course was ORIGINALLY DEVELOPED BY THE RADIO TECHNICAL INSTITUTE, while the Television Sevicing Course has formed the basis of instruction provided by one of the world's largest television and electronic firms!

Compares lesson by lesson with some courses costing ten times as much! You save because you receive all the lessons at one time and are not required to purchase equipment you may not need.

The lessons are crystal clear, practical, easy to master and use. Early lessons make fundamentals clear even to the beginner, while other lessons will give you the practical know-how o an expert!

The new 500 Radio & Television Course consists of 352 large quarto size pages of instruction, hundreds of illustrations. We positively guarantee that you will be delighted or your money refunded!

NEW. No. 600 RADIO-TELEVISION ELECTRONICS COURSE 85/-

This is really big value in home training. Similar in details to the above courses excepting that you get an extra 56 pages of instruction making a total of 408 quarto size pages. Hundreds of illustrations. Includes all the usual subjects plus Radio Transmitter Circuits, Electronic Test Equipment, Thyratron Tubes, Inter-Communicators, Sound Level Meters, Servicing Printed Circuits and many more similar items. This course could be your first step into the fascinating world of electronics!

No. 400. ELECTRONICS COURSE 45/-

A complete home-study course of 35 lessons. Consists of 216 large quarto size pages of instruction. Comes complete with instructor's notes and test questions. This is a modern course that teaches without resorting to comic strip methods . . . Thousands of readers of this magazine have taken this course and enjoyed every minute of it . . . Why not you? Clip this coupon for your free trial offer now!

UNCONDITIONALLY GUARANTEED TO GIVE COMPLETE SATISFACTION

Any course not satisfactory may be returned within 10 days post-paid for full refund or credit of the purchase price.

IF YOU SEND CASH WITH ORDER WE WILL INCLUDE A FREE BOOK worth 4/6 to 5/- if bought separately. By sending cash you reduce book-keeping and other costs which we pass back to you. But you must include cash at the time of order to get this special offer!

*** * * * FREE TRIAL OFFER * * * ***

PAY ONLY 5/- per week if you wish.

To: **SIM-TECH TECHNICAL BOOKS DEPT. G.4 Gater's Mill, West End, Southampton, Hants.**

☐ Please send the courses I have circled

No. 500 No. 600 No. 400

If not delighted I may return any book post-paid without further obligation on my part. Otherwise I will pay cash price or 5/- weekly (10/- fortnightly) commencing not later than 10 days after delivery. I am over 21 years of age. (If under 21 parents should place order.)

☐ I enclose cash to the sum of £

I understand you will refund this money if I am not 100% satisfied and I return the book within 10 days.

Please send me the free book(s) I have ticked
☐ Oscilloscope Book ☐ Electronic Gadgets Book
☐ Transistor Book ☐ Radio Instrument Book

Name ....

Address ....

....

EXPRESS ELECTRONICS

32 SOUTH END
CROYDON, SURREY
Tel: Croydon 9186

FOR THE FOLLOWING BRAND NEW UNITS

AMPLIFIERS AND TUNERS		
TRIPLETONE HI-FI MAJOR	12 watt	£15.18.6
TRIPLETONE CONVERTIBLE	5 watt	£6.19.6
TRIPLETONE GEMINI STEREO	5 watt	£15.15.0
TRIPLETONE FM TUNER		£15.14.6
LINEAR	3 watt	£6. 6.0
LINEAR DIATONIC	12 watt	£12.12.0
LINEAR CONCHORD	30 watt	£16.16.0
LEAK TL12	14 watt	£18.13.0
LEAK VARISLOPE PRE-AMP		£15.15.0
LEAK TL50	50 watt	£33.12.0
LEAK TROUGH LINE 3 FM TUNER		£31.14.6
QUAD	15 watt	£22. 1.0
QUAD STEREO/MONO PRE-AMP		£25. 0.0
LOUDSPEAKERS		
GOODMANS AXIETTE 8in.	6 watt	£5. 5.0
GOODMANS AXIOM 10in.	10 watt	£6. 6.0
GOODMANS AXIOM 201	15 watt	£10.15.0
BAKERS 'SELHURST' 3 or 15 ohm		
STALWART 12in.	15 watt	£5. 5.0
BASS GUITAR 12in. 'Group 25'	25 watt	£5. 5.0
BASS GUITAR 'Group 35'	35 watt	£8.18.6
BASS GUITAR 'Group 50'	50 watt	£18.18.0
STANDARD Heavy Duty 12in.	20 watt	£7. 7.0
BASS Heavy Duty 12in.	25 watt	£12.12.0
AUDITORIUM 15	35 watt	£18.18.0
RECORD PLAYERS		
GARRARD MODEL 1000 4-speed MONO		£6.19.6
GARRARD MODEL 2000 MONO		£7.15.0
GARRARD MODEL 3000 STEREO		£10.10.0
GARRARD MODEL 401		£29.10.0
GARRARD MODEL LAB80		£24.10.0
GARRARD AT6 TRANSCRIPTION MONO		£9.17.6
GARRARD MODEL AT60		£11.15.0
GARRARD MODEL A70		£19.10.0
GARRARD SRP 10		£4.19.6

Delivered free U.K. S.A.E. enquiries

BARGAIN OFFER CORNER

MAINS TRANSFORMERS

Semi-shrouded drop thro' type. Pri. 200. 220, 240v. Sec. 250v. ½ wave at 70mA and 6.3v. at 2 amp. c/t.
Stack size 3 x 2¼ x 1½in. PRICE **11/-** P. & P. 3/-.

PRECISION 6-MINUTE DELAY ACTION SWITCH Clockwork actuated. Made by Smiths. Separate switching actions at intervals up to 6 mins. Each switch action designed for current loading up to 15 amps. at 250 volts. Suitable for photographic timer, sequence switching operations, etc. etc. Brand new and unused units offered at a fraction of their true value. OUR PRICE ONLY 10/- each. P. & P. 1/6. (3 or more post free). Special quotations for quantity.

HEAVY DUTY NON-INDUCTIVE D/P MICRO SWITCH. Conservatively rated 10 amps at 250v. Standard one-hole fixing. Body size 1⅛ x ⅝ x 1in. deep inc. terminals 3/- each. P. & P. 1/- (6 or more post free).

NEON A.C. MAINS INDICATOR. For panel mounting, cut out size 1⅛ x ⅝ x ¾in. deep inc. terminal. White case with lens giving brighter light. For mains 200/250v. 2/6 each P.P. 6d. (6 or more post free).

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

ACOS CRYSTAL MIKES. High imp. For desk or hand use. High sensitivity 18/6. P. & P. 1/6.

TSL CRYSTAL STICK MIKE Listed at 45/-, OUR PRICE 18/6. P. & P. 1/6.

T.C.C. SUPPRESSOR CONDENSERS. 250v. A.C. .005 + .005 x .1 In tubular can ⅞in. long x ⅝in. dia. 2 for 3/-, post free.

TRANSISTOR DRIVER and O/P TRANSFORMERS. (Tapped 3 ohm and 15 ohm output). Plus 4 suitable Transistors giving approx. 1 watt output 25/-. P. & P. 2/6.

2-GANG .0005 TUNING CONDENSERS. 2⅝in. h. x 2⅛in. d. x 1⅝in. w. with built-in trimmer, 4/6, P. & P. 2/-.

MATCHED PAIR OF 2½ WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stack size 1¾ x 1½ x ⅞in. Output trans. tapped for 3 and 15 ohm output, 10/- pair. P. & P. 2/-.

BRAND NEW PLESSEY. 12v. 4-pin non-sync. vibrators. Type 12 1.48D. ONLY 8/6, P. & P. 1/6 ea.

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

4-WAY NON-TANGLE TELEPHONE CABLE. Latest spring back coil type, extends 12in. to 5ft. Complete with rubber bushes, 4/6 each. P. & P. 1/6.

SPECIAL BRAND NEW TRANSISTOR BARGAINS

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

EDISWAN MAZDA

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

SPECIAL OFFER OF LEADING HI-FI MANUFACTURERS SURPLUS!

7-10 watt OUTPUT TRANSFORMERS to match pair of ECL86's in push-pull to 3 ohm output. ONLY 11/- P. & P. 2/6.

7-10 watt ULTRA LINEAR OUTPUT TRANSFORMERS to match pair of EC182's in push-pull to 3 ohm output. ONLY 15/-, P. & P. 2/6.

SPECIAL MAINS TRANSFORMERS to match either of the above. Tapped primary. Secondary 250v. 80mA half wave and 6.3v. 2 amps. ONLY 12/6, P. & P. 3/6.

SPECIAL HARVERSON OFFER ! ! !

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

BRAND NEW 3 OHM SPEAKERS

5in., 12/6; 6½in. 15/-; 8in., 21/-; 10in. 25/-; 12in., 27/6; (12in. 15 ohm 30/-) 10in. x 6in., 26/-. E.M.I. 13½ x 8in. with high flux ceramic magnet 42/-; 15 ohm, 45/-. P. & P. 5in., 2/-; 6½ and 8in., 2/6; 10 and 12 in, 3/6 per speaker.

4-SPEED PLAYER UNIT BARGAINS

All Brand New in Maker's Original Packing

SINGLE PLAYERS

GARRARD SP25 De Luxe....£12.10.6, Carr. 5/6
B.S.R. GU7 with unit mounted pick-up arm. £4.18.8. Carr. 5/6
E.M.I. with unit mounted pickup arm. £4. 9.6. Carr. 5/6

AUTO CHANGERS

LATEST B.S.R. UA25 Super Slim mono. £6.2.6
B.S.R. UA15, £6.19.6; B.S.R. UA16. £6.19.6
GARRARD AT6.... £9.10.0 Carr. 6/6 on each.
All the above units are complete with t/o mono head and sapphire stylii or can be supplied with compatible stereo head for 12/6 extra.

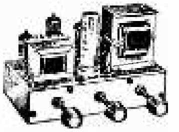
SPECIAL OFFER

of the famous **COLLARO STUDIO 4-speed Semi Transcription Auto Changer Units.** 200/250v. A.C. Really heavy duty motor and robust mechanism. Designed and built for life long service. Stereo wired. Supplied complete with mono cartridge and stylii. Offered at Bargain Price of **£5.12.6.** Carr. 7/6. Stereo version **£6.12.6. ALSO** small number of GARRARD Autoslim Changers, with plug-in head complete with Mono cartridge. To clear at **£5.10.0** each or with Stereo cartridge **12/6** extra. Carr. 6/6.

NEW CARTRIDGE BARGAINS

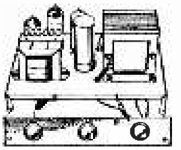
RONETTE STEREO 105 CARTRIDGE. Stereo/LP/78. Complete with two sapphires. Original list price 67/9. OUR PRICE 24/-, P. & P. 1/-.
ACOS GP67—1 Mono complete. List price £1.1.0. Our price 13/6. P. & P. 1/-.

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/-

TYPE HSL 'FOUR' AMPLIFIER KIT 3 VALVE 4 WATT USING ECC83 EL84, EZ80 VALVES
for **AC mains 200/240v.**



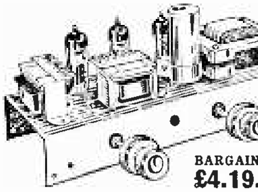
Special features included:
● Heavy duty double-wound mains transformer with electrostatic screen. ● Separate Bass, Treble and Volume controls. giving fully variable boost and cut with minimum insertion loss. ● Heavy negative feedback loop over 2 stages ensures high output at excellent quality with very low distortion factor. ● Suitable for use with guitar, microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● All this builds on to a chassis size only 7½in. wide x 4in. deep. Overall height 4¾in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves, output transformer (3 ohms only), screened lead, wire, nuts, bolts, solder etc. (No extras to buy). PRICE **79/6** P. & P. 6/-

Comprehensive circuit diagram, practical layout and parts list 2/6. (Free with Kits).

This kit although similar in appearance to HA34 it employs entirely different and advanced circuitry

STEREO AMPLIFIERS

Incorporating 2 ECL82's and 1 EZ80 heavy duty double-wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.



BARGAIN PRCE £4.19.6 P. & P. 6/6

SUPER DE LUXE version of above incorporating ECL86 valve separate bass and treble controls and full negative feedback. 8 gns., P. & P. 6/6.

QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. Size 7in. w. x 2½in. d. x 5¼in. h. This amplifier (was used in a 29 gn. record player) employs heavy duty double-wound mains transformer. ECC83. EL84 EZ80 valves. Separate bass, treble and volume controls. Complete with output transfome matched for 3 ohm speaker. Ready built and tested.

PRICE 69/6 P. & P. 4/9.

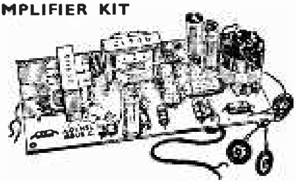
ALSO AVAILABLE Mounted on board with output transformer and 6in. speaker ready to fit into cabinet below. PRICE 89/6, P. & P. 5/9.

QUALITY PORTABLE R PLAYER 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

HIGH GAIN 4-TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT



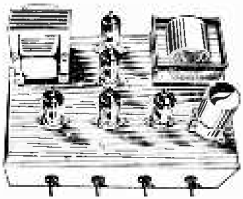
Type TA1

● Peak output in excess of 1½ watts. ● All standard British components. ● Built on printed circuit panel size 6 x 3in. ● Generous size Driver and Output Transformers. ● Output transformer tapped for 3 and 15 ohm speakers. ● Transistors (GET114) or 81 Mullard OC81D and matched pair of OC81 o/ps ● 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 TA1's are ideal for stereo.

10/14 WATT HI-FI AMPLIFIER KIT



A monaural amplifier with an output of 14 watts from 2 EL84's 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 3-15 Ω speaker and independent volume controls and separate bass and treble controls are provided, giving good lift and cut. Valve line-up 2 EL84's, ECC83 EF86 and EZ80 rectifier. Simple instruction booklet 1/6. (Free with parts).
All parts sold separately. ONLY **£6.19.6** P. & P. 8/6

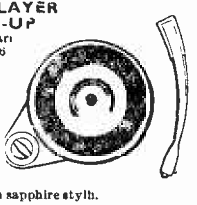
Also available ready built and tested complete with standard input sockets. £8.15.0. P. & P. 8/6.
Carrying case for above 28/6. P. & P. 7/6.

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, S.W.19 CHErrywood 3985
Open all day Saturday *Early closing Wed. 1 p.m.*
A few minutes from South Wimbledon Tube Station *(Please write clearly)*
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. OVERSEAS ORDERS CHARGED EXTRA.
SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

SEE RIGHT HAND PAGE FOR MORE ITEMS

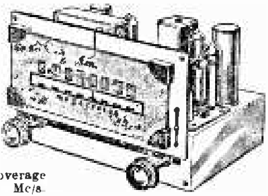
LATEST MODEL B.S.R. TU/12 4-SPEED PLAYER AND PICK-UP



ONLY **69/3** Carr 5/6

7in. metal turntable. Low flutter performance. 200/250 v. shaded pole motor with 90 v. tap for valve heaters. High gain crystal pick-up with turnover LP/78 head complete with sapphire styli.

HARVERSON'S F.M. TUNER Mk. I



● F.M. tuning head by famous maker. ● Guaranteed non-drift ● Permeability tuning ● Frequency coverage 88-100 Mc/s ● Balanced diode output. ● Two I.F. stages and discriminator. ● Attractive maroon and gold dial (7 x 3in. glass). ● Self-powered using a good quality mains transformer and valve rectifier. ● Valves used: ECC85, two EF80's and EZ80 (rectifier). ● Fully drilled chassis. ● Size of completed tuner 8 x 6 x 5½in. ● All parts sold separately. Set of parts if purchased at one time **£5.19.6**, plus 8/6 P. & P. and ins. Circuit diagram and instructions 1/6 post free. **Mark II Version as above but complete with magic eye, front panel and brackets, £6.12.6. P. & P. 8/6.**
Mark III Version as Mark I but with output stage, (ECL82) and tone control £7.7.0. P. & P. 8/6.

SPECIAL PURCHASE! TURRET TUNERS

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

GÖRLER F.M. TUNER HEAD

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

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband translstor superhet. ● Printed circuit panel (size 8¾ x 2¾in.). ● 3 prealigned IF transformers. ● High-gain Ferrite Rod Aerial. ● All First-grade transistors. ● Car aerial winding. ● Push-pull output. ● All parts supplied with simple instructions. **All parts sold separately.** Set of parts if purchased at one time ONLY **£4.5.0.** P. & P. 2/6 (Circuit diagram 2/-. Free with set of parts.)

35 OHM SPEAKERS

Suitable for use with above. 2in. Goodmans idea replacement for most pocket portables, **8/6**; 3¾in. **12/6**; 7 x 4in. **21/-**; P. & P. 2/- per speaker.

Portable CABINET

Size approx. 9¼ x 6¾ x 3½in. Suitable for above using 3¼in. speaker, **25/-**, P. & P. 2/6.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

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

QUALITY PORTABLE TAPE RECORDER CASE

Brand new and unused. Beautifully made and expensively finished in dark grey heavy grade rexine. Satin chrome metal grille front and chrome fittings. Speaker aperture 9 x 4in. Overall size 15½ w. x 15 d. x 7¼in. h. Will take any standard tape deck or single record player. Limited number only. Worth at least £5. OUR PRICE **49/6**. P. & P. 5/-.

TAPE DECKS

B.S.R. MONARDECK. Single speed, 3¾in. per sec., simple control uses 5¾in. spools. **£6.15.0**, plus 7/6 carr. and ins.

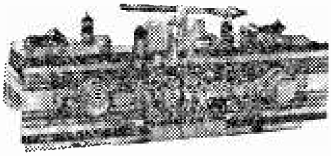
LATEST COLLARO MAGNAVOX '363' TAPE DECK DE LUXE

Three speeds, 2 track, takes up to 7in. spools **10 gns.** plus 7/6 carr. and ins. (Tapes extra on both.)

◀ Harverson Surplus Co. Ltd.

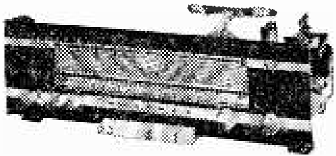
½ PRICE SPECIAL RADIO CHASSIS OFFERS

HI-FI CONTINENTAL STEREOPHONIC RADIOGRAM CHASSIS



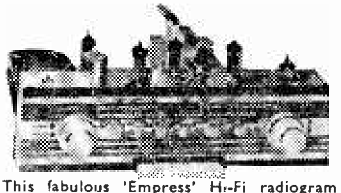
Magnificent 'Continental' Stereophonic Radiogram Chassis with piano key switches, built-in ferrite rod aerial. Complete with two 10" elliptical loudspeakers, plus a mono/stereo 4-speed autochanger. **Complete £29.19.6. Chassis only 19½ gns.**
Special terms available of £4.10.0 deposit followed by 18 monthly payments of £1.13.0 (total H.P of £34.4.0) + 15/- P. & P. ***Send £5.5.0 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. Long-Medium-Short and VHF bands. Complete with two 10" loudspeakers plus a mono-stereo 4 speed automatic record changer. **Complete 39½ gns.**
Chassis only 29½ gns.
Special terms available of £6.4.6 deposit followed by 24 monthly payments of £1.15.10 (total H.P. £49.4.6) + 17/6 P. & P.
Send £7.2.0 now.

HI-FI EMPRESS RADIOGRAM CHASSIS



This fabulous 'Empress' Hi-Fi radiogram chassis is offered complete with 10" loudspeaker plus 4 speed autochanger. At only 23 gns. this is the bargain of the year.
Chassis only 15½ gns.
Special terms available of £3.12.6 deposit followed by 18 monthly payments of £1.6.7 (total H.P. £27.11.0) + 15/- P. & P.
Send £4.7.6 now.

All Lewis Radio equipment including valves are fully guaranteed for one year. Send your cheque or P.O. today while stocks last to Dept. P.36.

LEWIS radio

LEWIS RADIO, 100 CHASE SIDE, SOUTHGATE
LONDON, N.14. Telephone: PAL 3733/9666

SWLs · SWLs · SWLs · SWLs

Hark! Hark!

-the DX is calling!

Special RX tuner
4¾" x 3½" x 3½"

JOYSTICK

Variable Frequency ANTENNA SYSTEM

This revolutionary and pat. pend aerial system possesses the unique property of an even response over all frequencies between 1·4-30 Mc/s.
Every JOYSTICK Aerial System is supplied complete with feeder and an aerial matching unit. Just connect your RX—it is ready to go and gives an unprecedented 'lift' to signal strengths especially for 'cliff' and 'cave' dwellers—EVEN FROM UNDERGROUND! Naturally the advantages of using the 'JOYSTICK' 'up-in-the-clear' are even greater!
4,000 Joystick aerials all over the world have already shown that this is the first major break-through for 20 years in the field of aerials. The performance for such a compact unit (7·6" assembled) is staggering. Even the sceptics have been convinced once they have understood the basic principles and have followed the simple 'tune-up' procedure given in the detailed instructions.

New Joystick Range

There is now a whole new range of Joystick Aerial Systems—made to match your QTH. your rig and your pocket! The SYSTEMS cover SWL, TX/RX, indoor and outdoor mobile and even a new JOYMAST! Made only in the finest materials the SYSTEMS are reliable and permanent! Read all about them in our new brochure—

GUARANTEE: Partridge operate a rigid. 100% Money Back Guarantee if you're not completely satisfied!

Read testimonials from all over the world! "Four different receivers showed improved performance over a dipole" reports the U.S.A. C.Q. Magazine.
"Excellent results, Australia, Ceylon, South Africa at good strength although lately reception conditions have been poor." W. Cummings, Lossiemouth, Scotland.

READ ALL ABOUT IT! **This ticket will bring you the new brochures by return of post!**

PARTRIDGE ELECTRONICS LTD.
Caister House, Prospect Road,
Broadstairs, Kent. **Tel. THANET 62535**

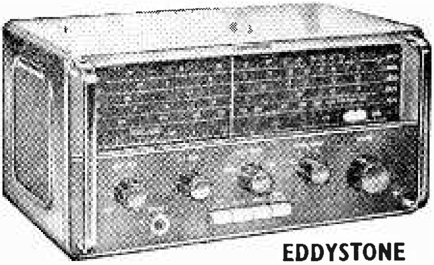
NAME ....

ADDRESS ....

.... P.W.

AMATEUR RADIO
CHAS. H. YOUNG LTD.

The Sensational
ALL-TRANSISTOR!
Communications Receiver



EDDYSTONE
EC10

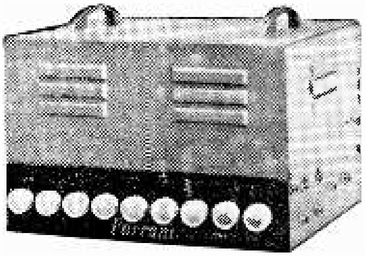
for use in the home, caravan, car or boat, H.P. facilities. **Only £48** Part exchanges.

Write for brochure

170-172 CORPORATION STREET
BIRMINGHAM 4
Telephone CEN 1635

GUITAR AMPLIFIERS *with* TREMOLO

12 months' guarantee (valves 3 months)



Five jack socket inputs with four separate mixing volume controls. High gain of 10 millivolts makes it suitable for all types of guitars and microphones. Separate Bass and Treble controls. Master gain control. Tremolo speed and depth controls. Remote tremolo switch socket. 7.5 and 15 ohms outputs. 30 and 50 watt valves ECC83, ECC83, EL34, EL34 GZ34. 15 watt valves ECC83, ECC83, EL84 EL84, EZ81. Two extra valves ECC83 used in the tremolo circuit. Tremolo operates on one input only. Black and gold front panel (fitted tremolo type only at present) Chassis finished silver grey hammer. Cover with chrome handles 35/- extra.

PRICES

50 watt with tremolo	£21.17.6
50 watt less tremolo	£19.10.0
30 watt with tremolo	£16.17.6
30 watt less tremolo	£14.10.0
15 watt with tremolo	£13.17.6
15 watt less tremolo	£11.10.0

Add carriage 10/- any amplifier. Credit terms arranged. Descriptive leaflet free, stamp appreciated. Suitable speakers, Bakers 12" Guitar L.S. 5 gns. Bakers 15" Group 50 L.S. 18 gns. Carriage free.

Cash with order only, regret no C.O.D. **"No trade or export"**

STROUD AUDIO
CASHES GREEN ROAD, STROUD, GLOS. STROUD 788.

CHEAPER BY THE DOZEN

RED SPOT TRANSISTORS 9/- Doz.
Audio Similar to OC71
or 1/- each + 4d. postage Post 6d. extra

WHITE SPOT TRANSISTORS 10/6 Doz. Post 6d.
Similar to OC45
or 1/3 each + 4d. postage.

GERMANIUM RECTIFIERS 24/- Doz. Post 1/-
GJ7M 24v. ½ Amp.
or 2/6 each + 6d. postage.

MINIATURE GERMANIUM DIODES
6/- Doz. Postage 6d.

BY100 SILICON RECTIFIERS 78/- Doz. Post 1/-
800v. P.I.V. 500mA
or 7/6 each + 4d. postage.

TANK AERIALS
6 Section. Total length 10ft. 10in. Perfect for Vertical Aerial or Fishing Rod 10/6 each. 1/6 P. & P.

VEROBOARD Now in Stock
2½ x 5in., 3/8 2½ x 3¾in., 3/-
3¾ x 5in., 5/2 3¾ x 3¾in., 3/8
Postage 6d. each extra.

MAT TRANSISTORS
MAT 100, 7/9 MAT 101, 8/6
MAT 120, 7/9 MAT 121, 8/6
Postage 4d.

PETHERICK'S RADIO SUPPLIES
Dept. P
22 HIGH STREET, BIDEFORD N. DEVON
Tel.: Bideford 3217

ABC's OF ELECTRONIC ORGANS

For everyone interested in electronic organs. Includes fundamentals of music, mechanics of organ playing, how to choose an organ ... plus electronic organ circuitry, maintenance and troubleshooting.

by N. H. Crowhurst
16/- Postage 1/-

ELECTRONIC GUITAR AMPLIFIER HANDBOOK by J. Darr, 24/-, Postage, 1/-.

UNDERSTANDING LASERS & MASERS, by S. Leinwoll, 13/6, postage, 1/-.

PRACTICAL TRANSISTOR SERVICING, by W. C. Caldwell, 24/-, Postage, 1/-.

TRANSISTOR RECEIVERS AND AMPLIFIERS, F. G. Rayer, 30/-, Postage, 1/-.

BUILDING & USING SOUND MIXERS, by R. E. Steele, 30/-, Postage, 1/-.

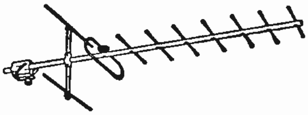
AMATEUR RADIO CALL BOOK 1966, R.S.G.B., 6/-, Postage 9d.

MOTOROLA SEMICONDUCTOR CIRCUITS MANUAL, 16/-, Postage, 1/-.

COMPLETE CATALOGUE 1/-

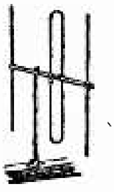
THE MODERN BOOK CO.
BRITAIN'S LARGEST STOCKISTS
British and American Technical Books
19-21 PRAED STREET
LONDON, W.2
Phone: PADdington 4185
Open 6 days 9-6 pm.

BBC2 (625 LINE) TV AERIALS



Mast Mounting Arrays, 9 element 45/-; wide spaced high gain, 11 element 55/-; 14 element 62/6. **Wall Mounting with Cranked Arm,** 9 element 60/-; wide spaced, high gain, 11 element 67/6; 14 element 75/-. **Chimney Arrays Complete,** 9 element 72/-; wide spaced high gain, 11 element 80/-; 14 element 87/6. **Loft Arrays,** 7 element 32/6; wide spaced high gain, 11 element, **with Tilting Arm,** 62/6; 14 element 70/-. **All high gain units have special Multi-rod Reflector. Low loss co-axial cable 1/6** per yard. **UHF** transistor pre-amps from 75/-.

BBC · ITV · F.M. AERIALS



BBC (Band 1). Telescopic loft 21/-. External S/D 30/-.
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+571/3.
VHF transistor pre-amps from 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.

K.V.A. ELECTRONICS (Dept. P.W.)
27 Central Parade, New Addington
Surrey
LOD 2266

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 & 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.

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.

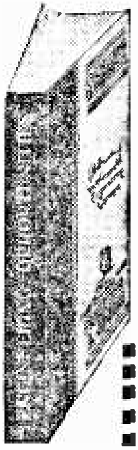
PRACTICAL EQUIPMENT

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

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
(Dept. 344B), 29 Wright's Lane, London, W.8

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

BULK BUYING enables us to offer you this month wonderful bargains at prices you can afford.

BATTERY ELIMINATORS (all 9 volts).
The 'Quanta' battery eliminator is a neat little unit that may be used as a substitute for a PP3 battery or where a low current 9v. supply is required. Made to sell at 20/- plus, our price is more than value for money.
a) **Quanta**—to replace PP3 battery. **ONLY 16/3,** plus 1/- P. & P.
b) **Eagle-Model LA-6P** with self contained pilot lamp, ONLY **23/6**, plus 1/- P. & P. Suitable for most transistor radios.
c) **Norman**—the most versatile eliminator of this size yet made available to the public, replaces PP3, 4, 7 and 9. Uses double wound mains transformer for maximum safety and yet is virtually the same size as a PP9 battery. Handy power supply for the home constructor and at ONLY **29/6,** plus 2/6 P. & P.

AERIALITE WIRE (insulated) Buy at old prices whilst stocks last.
25ft. coil .. **1/5** 50ft. coil .. **2/8** P. & P. 6d.

PRINTED CCT. BOARD KITS The most complete kit on the market at this low price. Includes everything you will need to produce your own professional style of circuit boards. Includes 6 x 4in. Copper laminated board. Wonderful value at **17/6,** plus 1/6 P. & P

EAGLE I.F. TRANSFORMER AND COIL KIT H-402. Complete set of min. I.F.'s, slab aerial, osc. coil, Tuning cap., and dial for std. 6Tr. radio. Supplied with S/ht. cct., ONLY **24/6,** plus 1/- P. & P.
The 'PARGO' All purpose 2A plug is a useful item to have in the workshop or home. It is a spring loaded—instantly adjustable 2-pin plug to suit all British and Continental sockets.
List Price, 7/6—OUR PRICE **6/-**, plus 6d P.&P.

REMEMBER:

BOTHWELL ELECTRIC SUPPLIES (Glasgow) LTD.
54 EGLINTON STREET,
GLASGOW, C.5.
Member of the Lander Group

is at your disposal whether you are a personal or mail order customer. Use our FREE ADVISORY SERVICE by writing, or 'phoning SOUth 2904.—Trade enquiries welcomed.

NEW VALVES!

Guaranteed Set Tested

24 HOUR SERVICE

1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94. SET OF 4, **14/-.**
DAF96, DF96, DK96, DL96. SET OF 4, **23/6.**

1R5	4/-	EB91	1/9	PL36	8/6
1S5	3/3	EBC41	6/3	PL81	6/6
1T4	1/9	EBF80	5/9	PL82	5/-
3S4	4/3	EBF89	5/9	PL83	5/11
3V4	5/-	ECC81	3/3	PL84	6/-
6K7G	1/3	ECC82	4/6	PY32	8/6
6K8G	3/3	ECC83	4/6	PY33	8/6
6Q7G	5/6	ECC85	5/3	PY80	4/9
6V6G	3/-	ECF82	5/9	PY81	5/-
10C2	11/-	ECH35	5/9	PY82	4/9
20L1	11/-	ECH42	7/9	PY83	5/3
20P3	10/6	ECH81	5/6	PY800	5/11
20P4	13/-	ECL80	5/11	U25	8/-
20P5	11/6	ECL82	6/6	U26	8/6
30FL1	9/3	ECL86	8/-	U191	9/6
30L15	9/9	EF39	3/6	U301	10/6
30PL13	10/-	EF41	5/9	U801	14/6
35L6GT	5/6	EF80	4/3	UABC80	5/-
CL33	8/6	EF85	4/6	UAF42	6/11
DAC32	6/9	EF86	6/6	UBC41	6/-
DAF91	3/3	EF89	4/3	UBF80	5/6
DAF96	5/11	EF91	2/9	UBF89	5/9
DF33	7/6	EL41	7/-	UCC84	7/11
DF91	1/9	EL84	4/6	UCC85	6/-
DF96	5/11	EY51	5/11	UCF80	8/3
DK32	7/-	EY86	5/6	UCH42	7/-
DK91	4/-	EZ40	5/6	UCH81	6/-
DK92	7/9	EZ80	3/9	UCL82	7/-
DK96	6/3	EZ81	4/3	UCL83	9/-
DL33	6/6	PCC84	5/6	UF41	6/6
DL35	4/9	PCC89	9/6	UF89	5/6
DL92	4/3	PCF80	6/3	UL41	7/-
DL94	5/-	PCF82	5/9	UL84	5/4
DL96	5/11	PCF805	8/-	UY41	3/11
DY86	6/3	PCL82	6/3	UY85	4/9
DY87	6/3	PCL83	8/6	W77	2/-
EABC80	5/6	PCL84	7/6	Z77	2/9

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

4-STATION INTERCOM

£7/19/0

Solve your communication problems with this new 4-station Transistor Intercom system (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. Operates on one 9v. battery. On/off switch. Volume control. Ideally suitable for Office, Factory Workshop, Warehouse, Hospital, Shop, etc., to keep instant inter-departmental contacts. Complete with long connecting wires and other accessories. Nothing else to buy. Post free.

INTERCOM/BABY ALARM

Usually ~~£6GNS.~~
Our Price ONLY
57/6

Modernise your Office, Shop, Warehouse, Workshop, Surgery, Nursery and Home with this latest two-way Transistor Intercom, consisting of two units, Master and Sub, in strong plastic cabinets with chromium stands. Elegantly designed for use as two-way instant communication system—call/talk/listen—between two persons anywhere indoors or outdoors. Operates on one 9v. battery. Complete with 60ft. wire. Battery 2/-. Ready to operate. P. & P. 2/6.

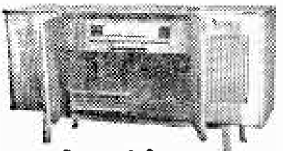
BATTERY ELIMINATOR & CHARGER, 27/6

Use your Transistor Radio or Intercom from domestic A.C. mains and charge dry battery PP3 9v. to boost battery's life many times. Unbeatable value. Save you pounds on batteries. P. & P. 1/6. Complete with Plug, Lead and Snap cord.
Full price refunded if returned in seven days.

WEST LONDON DIRECT SUPPLIES (PW/11)
6 Chignell Place, West Ealing, London, W.13

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. P.36)

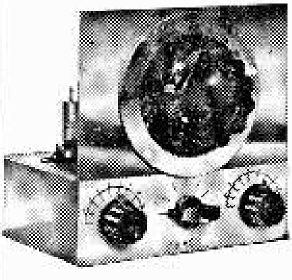
Capitals please

LEWIS radio

100 Chase Side, Southgate, London
Tel: Palmers Green 3733/9666

FAMOUS FOR THIRTY YEARS for 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.), 44 Old Bond St., London W.1

WORLD RADIO & TV HANDBOOK 1966, 28/-

by JOHANSEN, postage 1/3.

ABC's of Electronic Organs by Crowhurst, 16/-, P. & P. 1/-.
Practical Transistor Servicing, New Ed., by Caldwell, 24/-, P. & P. 1/-.
Electric Guitar Amplifier Handbook by Darr, 24/-, P. & P. 1/-.
Hi-Fi Year Book, 1966 by Miles Henslow, 12/6, P. & P. 1/-.
Amateur Radio Call Book 1966 by R.S.G.B 6/-, P. & P. 8d.
Transistor Pocket Book by Hibberd, 25/-, P. & P. 1/3.
Technical Topics by R.S.G.B., 10/-, P. & P. 1/-.

Where possible 24 hours service guaranteed

UNIVERSAL BOOK CO.
12 LITTLE NEWPORT STREET,
LONDON, W.C.2
(adjoining Lisle Street)

Trouble getting . . .

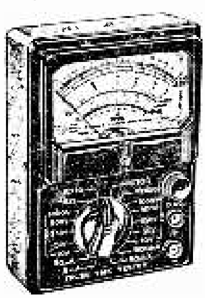
LUXEMBOURG
CAROLINE
LONDON ?

They're all yours for only 39/6 with the
FABULOUS DEWTRON WAVE TRAP

Just place NEAR your Transistor portable and BOOST all distant stations! Extend battery life! NO CONNECTIONS! Use in car INSTEAD of aerial.

Send £2 (post free)
Money-back guarantee (7 days)
D.E.W. LTD., Dept. P.W. Ringwood Road, Ferndown, Dorset

TEST METERS



20,000 O.P.V. MODEL TP 58. Reads voltage up to 1,000 D.C. at 20,000 ohms per volt and A.C. at 10,000 O.P.V.; D.C. Current to 500mA; Resistance to 10 Megs.; Capacitance to 0.1μF; Decibels from —20 to +36. Size 3½in. × 5¼in. × 1¾in., £5.19.6.

2,000 O.P.V. MODEL TP 10. Reads A.C. and D.C. Volts up to 1,000 D.C. Current to 500mA; Resistance to 1 Meg.; Capacitance to 1μF; Decibels from —20 to +36; Output jack for Audio Measurements. Size 3¼ × 5 × 1½in. £3.19.6.

30,000 OHMS PER VOLT MODEL 500. Reads voltages up to 1,000 D.C. at 30,000 ohms per volt and A.C. at 15,000 O.P.V.; D.C. current to 12 amps. Resistance to 60 Megs.; Decibels from —20 to +56; incorporates internal buzzer for audible warning of direct shorts and blocking condenser for A.F. output measurements. Size $3^5/_{16} \times 6^5/_{16}$ × 2¾in., £8.19.6.

20,000 OHMS PER VOLT TESTMETER MODEL 700. Reads A.C. and D.C. voltages up to 5,000. Alternating and Direct Current up to 10 amps. Resistance up to 50 Megohms, Decibels from —10 to —42dB. Internal buzzer for audible warning of short circuits or continuity and fitted with automatic overload protection for movement. Meter size 4½in. × 2½in., overall dimension 7½in. × 5¾in. × 3¾in. Has rigid handle which can be swivelled for use as a tilt support. ONLY £17.10.0.

TRANSISTORISED TEST EQUIPMENT. Fully guaranteed, brand new. By NOMBREX: 150 Kc/s.—350 Mc/s. Signal Generator, £9.10.0. Resistance-Capacitance Bridge, £8.5.0. 1-15 volts D.C. Power Supply, £6.10.0. Audio Generator 10/100,000 c/s. £16.15.0. Inductance Bridge, £18.0.0.

VALVE VOLTMETER. D.C. Input Impedance 11 Megohms. 7 Voltage ranges, D.C. to 1,500 A.C. to 1,500 R.M.S., 4,200 Peak to Peak. Resistance .2 ohm to 1,000 Megohms. Centre zero setting for receiver alignment. Complete with A.C./D.C. probe and leads. Full illustrated details on request. **ONLY £13.19.6** (Post 3/6).

FREQUENCY METERS TYPE LM. Frequency range 125-20,000 kc/s. in 2 bands. This is the United States Navy Model of the well-known BC221 Frequency Meter, but has many additional features which increase its usefulness. Voltage stabilisation circuits and Crystal control ensure extreme accuracy and in addition it is fitted with an Internal Modulation switch to allow use as a Signal Generator. Size only 8¾in. × 8in. × 8½in. **ONLY £15.**

VARIABLE VOLTAGE TRANSFORMERS. Fully shrouded. Input 230 v. A.C. 50/60 cycles. Output. 0-260 v. 2.5 amps. type **£5.17.6.** 5 amps. type **£9.** 10 amps. type **£16.10.0.** 20 amps. type **£32.10.0,**

STANDARD TRANSFORMERS
Vacuum impregnated, interleaved E.S. screen. Universal mounting. Size 4in. × 3½in. × 2½in
ALL BRAND NEW 18/6 each. Post 2/6.
Type 1. 250-0-250 v. 80 mA., 6.3 v. 3 a. tapped at 4 v. 4 a. 6.3 v. 1 a. tapped at 4 v. and 5 v. 2 a.
Type 2. As above but 350-0-350 v. 80 mA.
Type 3. 30 v. 2 a. tapped at 12, 15, 20, and 24 v. to give 3-4-5-6-8-9-10 v. etc.

HARRIS ELECTRONICS
(London) LTD.
138 GRAY'S INN ROAD
LONDON, W.C.1.
Telephone: TERminus 7937
Please include carriage cost on ALL items.
Trading hours 9 a.m.—6 p.m., Monday—Friday. Closed Saturday. We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.

VALVES SAME DAY SERVICE

NEW! TESTED! GUARANTEED!

SETS 1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94. Set of 4 for 15/-. DAF96, DF96, DK96, DL96. 4 for 24/6.

1A7GT	7/6	7B7	7/9	85A2	5/9	ECC83	7/-	GZ33	12/6	TH233	6/6
1H5GT	7/3	7C5	7/9	6063	12/6	ECC84	6/3	GZ37	8/9	TY86F	10/9
1N5GT	7/9	7C6	5/9	AZ31	9/3	ECC85	5/6	KT61	6/6	U25	8/6
1R5	4/9	7H7	4/9	B36	4/6	ECF80	7/6	MU14	4/-	U26	8/9
1S4	4/9	7Y4	5/-	CL33	9/6	ECF82	6/-	N18	5/6	U47	8/6
1S5	3/9	9BW6	6/6	CY1	12/6	ECF86	10/9	PC97	5/9	U52	4/6
1T4	1/9	10C2	11/6	DAC32	7/3	ECH35	6/-	PCC84	5/6	U54	8/9
3A5	6/9	10F1	9/9	DAF91	3/9	ECH42	8/3	PCC89	9/6	U78	3/6
3Q4	5/6	10LD12	7/6	DAF96	6/-	ECH81	6/-	PCC189	9/-	U191	9/9
3S4	4/9	12AT7	3/9	DCC90	6/9	ECL80	6/3	PCF80	6/6	U301	10/9
3V4	5/6	12AU6	4/9	DF33	7/9	ECL82	6/9	PCF82	6/-	U801	15/-
5U4G	4/6	12AU7	4/9	DF91	1/9	ECL86	8/6	PCF84	8/-	UABC80	5/9
5Y3GT	4/11	12AX7	4/9	DF96	6/-	EF39	3/9	PCF86	8/3	UAF42	7/9
5Z4G/GT	6/9	12K7GT	3/6	DH76	3/6	EF41	6/3	PCF805	8/-	UBC41	6/6
6/30L2	8/9	12K8GT	8/6	DH77	4/-	EF80	4/9	PCL82	6/3	UBC81	6/3
6AL5	2/-	12Q7GT	3/6	DH81	12/6	EF85	5/-	PCL83	8/6	UBF80	6/-
6AM6	2/9	19BG6G	6/9	DK32	7/9	EF86	6/9	PCL84	8/3	UBF89	5/9
6AQ5	4/9	20L1	11/9	DK91	4/9	EF89	4/3	PCL85	8/-	UCC84	8/-
6AT6	4/-	20P3	10/9	DK92	8/-	EF91	2/9	PCL86	8/6	UCC85	6/6
6BA6	4/6	20P4	13/6	DK96	6/6	EF92	2/-	PENA4	6/6	UCF80	8/3
6BE6	4/3	20P5	11/6	DL33	6/9	EF97	7/6	PEN383	9/6	UCH42	7/6
6BH6	5/-	25L6GT	4/3	DL35	5/-	EF183	6/9	PEN36C	15/-	UCH81	6/6
6BJ6	5/6	25U4GT	11/6	DL92	4/9	EL33	6/6	PFL200	17/6	UCL82	7/3
6BW6	7/9	25Z4G	6/3	DL94	5/6	EL38	11/9	PL36	8/9	UCL83	9/3
6CH6	6/6	30C18	8/-	DL96	6/-	EL41	7/3	PL81	6/9	UF41	6/9
6F13	3/6	30F5	8/6	DY86	6/9	EL84	4/6	PL82	5/6	UF42	4/6
6F14	9/-	30FL1	9/6	DY87	6/9	EL90	4/9	PL83	6/-	UF80	6/-
6F23	9/-	30L15	10/3	EABC80	6/-	EL95	5/-	PL84	6/3	UF89	5/9
6K7G	1/6	30L17	12/-	EAF42	7/6	EM80	5/9	PL500	14/-	UL41	7/3
6K8G	4/3	30P4	13/6	EB41	4/-	EM81	7/3	PL801	7/6	UL44	15/-
6K8GT	7/6	30P12	7/6	EB91	2/-	EM84	5/9	PX25	7/9	UL46	8/6
6P28	9/6	30P19	13/6	EBC33	6/-	EM87	6/6	PY32	8/9	UL84	5/9
6Q7G	5/9	30PL1	9/6	EBC41	6/6	EY51	6/3	PY33	8/9	UY41	4/9
6SL7GT	4/9	30PL13	10/9	EBF80	6/-	EY86	6/-	PY80	5/3	UY85	4/9
6V6G	3/6	30PL14	11/-	EBF83	7/6	EZ40	6/3	PY81	5/3	VP4B	11/-
6V6GT	5/6	35L6GT	6/3	EBF89	5/9	EZ41	6/6	PY82	5/-	W76	3/6
6X4	3/6	35W4	4/6	ECC40	6/9	EZ80	4/-	PY83	5/9	W77	2/-
6X5GT	6/3	35Z4GT	4/6	ECC81	3/9	EZ81	4/6	PY800	6/6	X79	24/6
7B6	10/6	53KU	8/6	ECC82	4/9	FW4/500	6/3	TH21C	9/6	Z77	2/9

READERS RADIO

24 COLBERG PLACE,
STAMFORD HILL
LONDON N.16. STA 4587

& 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.

THE Radio Constructor

FREE OFFER TO NEW READERS

To Data Publications Ltd. 57 Maida Vale, London W.9.

Please send me a recent sample copy of "The Radio Constructor". I enclose 6d. in stamps for postage.

Name ....

Address ....
(Block Capitals)

....

....

MONTHLY 2/3

TRANSISTOR ELECTROLYTICS

COMPARE THESE PRICES!

32μF	1·5 volt	25μF	6 volt	4μF	15 volt
·25μF	3 volt	30μF	6 volt	5μF	15 volt
2μF	3 volt	50μF	6 volt	6μF	15 volt
3μF	3 volt	100μF	6 volt	8μF	15 volt
8μF	3 volt	2μF	9 volt	16μF	15 volt
10μF	3 volt	10μF	9 volt	32μF	15 volt
12μF	3 volt	20μF	9 volt	50μF	15 volt
20μF	3 volt	2μF	12 volt	64μF	15 volt
30μF	3 volt	3μF	12 volt	2·5μF	25 volt
40μF	3 volt	4μF	12 volt	16μF	25 volt
·25μF	6 volt	10μF	12 volt	32μF	25 volt
2μF	6 volt	20μF	12 volt	2μF	30 volt
3·2μF	6 volt	25μF	12 volt	16μF	30 volt
4μF	6 volt	30μF	12 volt	25μF	30 volt
8μF	6 volt	1μF	15 volt	1μF	50 volt
10μF	6 volt	2μF	15 volt	5μF	70 volt

All the above at 1/2 each.

320μF	2·5 volt	250μF	15 volt	150μF	25 volt
200μF	3 volt	500μF	15 volt	100μF	30 volt
250μF	6 volt	100μF	18 volt	200μF	30 volt
400μF	6 volt	64μF	25 volt	50μF	150 volt

All the above at 1/6 each.

1,000μF	6 volt	750μF	15 volt	1,000μF	25 volt
1,000μF	12 volt	1,000μF	15 volt	500μF	50 volt
4,000μF	12 volt	500μF	25 volt	1,000μF	50 volt

All the above at 2/- each.

200/100μF, 257V or 200/200μf, 275V ... ... 6/6 each

CONDENSERS
Silver Mica, 3·3pF to 6,800pF. Including High Voltage Disc Ceramics (normally 3/- each) ... ... 10/- per 100
Paper Condensers: ·0001μF, ·001μF, ·002μF, ·005μF, ·02μF and ·04μF, all at 7/6 per 100. £3 per 1,000; ·1μF, ·25μF, ·5μF, 10/- per 100.

RESISTORS
1/10th, 1/6th, 1/4th, watt ... ... 10/- per 100
Mixed wattages ½ watt to 3 watt. Close Tolerance. Assorted Values. Polythene wrapped on cards of 10. Give-away price, 50/- per 1,000, plus 5/- post and packing.

TRANSISTORS (At a price you can afford)
OC71 equivalent, 1/- each, 25 for £1, 100 for £3.
NKT124 or NKT125. Switching transistors, 2/- each, 6 for 10/-.
Large Car Radio type Output Transistors, OC25, OC35, NKT405, 10/ each.
Packet containing: three 2G417, two 2G371, one 2G381, one 2G339, one diode (for making superhet with complementary symmetry transformerless output stage) ... £1 complete
Diodes, 1/ each. Zener Diodes, ZE12, ZB4·3, 5/- each.
BY100 Mains Rectifiers for TV Sets. 7/6 each.

SIGNAL INJECTOR. R.F./I.F./A.F. Transistors, components and circuit to make. Only 10/- complete.

LOUDSPEAKERS. Brand New, 4 inch. Excellent reproduction. 10/- each.

Midget Earpieces, complete with plug and lead ...	5/- each
Magnetic Lapel Microphone with plug and lead ...	10/- each
Transistor Holders	1/- each
Miniature Soldering Irons, complete with Bit ...	20/- each
Set of 5 assorted Bits to suit any job	20/- set
Crystal Set kits	15/- each
POCKET-SIZE MULTIMETERS, AC/DC/Ohms	£3
Transistor Intercomm. Units...	55/- pair

FLUORESCENT FITTINGS: 5ft. with choke and starter, 39/6; 4ft. with choke and starter, 32/6. Carriage 10/- per fitting.

ACOS PICK-UP HEADS. COMPLETE WITH NEEDLES
This is the price you would expect to pay for the needles only!

Monaural	14/-
Stereo	21/-
Diamond Stereo	28/9

Will fit most record changers. Can be very profitable!

RELAYS
700 ohm or 2,500 ohm coil. Transparent dust cover. 2 pairs of change-over contacts. PLUG-IN TYPE. Base included in price. 25/- each.
For orders less than 10/- please add 6d. towards postage.

G. F. MILWARD

17 PEEL CLOSE, DRAYTON BASSETT
Near TAMWORTH, STAFFORDSHIRE
Tamworth 2321 *Post only*

Head Office and Warehouse
44A WESTBOURNE GROVE
LONDON W2
Tel.: PARK 5641/2/3
Please write 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

BRAND

ELECTRONIC VALVES

OA2	6/-
OA3	11/-
OB2	6/-
OB3	6/-
OC3	6/-
OD3	5/-
1A3	3/-
1A5GT/G	5/-
1A7GT	8/-
1B3GT	7/-
1C5GT	6/-
1D5	7/6
1G6GT	7/-
1H5GT	7/-
1L4	2/6
1L6	17/6
1N5GT	8/-
1R4	6/-
1R5	5/-
1S4	5/-
1S5	4/6
1T4	3/-
1T5GT	6/-
1U4	5/-
1U5	6/-
1V	5/-
1V2	10/-
1X2A	7/-
1X2B	7/-
2A3	5/-
2A4G	30/-
2C26A	5/-
2C51	12/-
2C52	12/-
2C53	50/-
2CW4	12/-
2D21	6/-
2E24	40/-
2E26	30/-
2G21	18/-
2X2	8/-
3A4	4/-
3A5	7/-
3B7	5/-
3B22	30/-
3B24	5/-
3B24W	12/-
3D6	4/-
3E29	60/-
3Q4	6/6
3Q5GT/G	6/6
3S4	5/-
3V4	6/-
4D1	4/-
5R4GY	9/-
5U4G	5/-
5U4GB	6/6
5V4G	8/6
5Y3GT	5/-
5X4G	8/-
5Z4G	8/-
6/30L2	10/6
6A6	4/-
6A8	8/-
6AB4	6/6
6AB7	4/-
6AC7	4/-
6AF6G	11/-
6AG5	2/6
6AG7	6/-
6AH6	10/-
6AJ5	9/-
6AK5	5/6
6AK6	7/-
6AK7	6/-
6AL5	3/-
6AM6	4/-
6AN4	15/-
6AN5	15/-

6AN8	10/-
6AQ4	5/-
6AQ5	6/-
6AQ5A	7/6
6AR5	6/-
6AR6	6/-
6AR8	17/6
6AS5	5/-
6AS6	5/-
6AS7G	20/-
6AT6	4/6
6AU4GT	9/-
6AU6	6/-
6AV5GT	11/-
6AV6	6/-
6AW8A	14/-
6AX5GT	12/6
6B4G	16/-
6B7	5/-
6B8	7/-
6B8G	2/6
6B8GT	5/-
6BA6	5/-
6BA7	15/-
6BC4	17/6
6BE6	5/6
6BG6G	15/-
6BF6	6/-
6BH6	7/6
6BJ6	8/-
6BJ7	7/-
6BK4	25/-
6BK7A	9/-
6BL7GT	9/-
6BN6	7/6
6BQ6	11/-
6BQ7	8/-
6BR7	12/-
6BR8	5/-
6BS7	17/-
6BW6	9/6
6BW7	10/-
6BZ6	6/-
6BZ7	11/-
6C4	2/6
6C5	8/-
6C5G	5/-
6C6	4/-
6C8G	7/-
6C6	11/-
6C31	8/-
6CB6	5/-
6CD6GA	17/-
6CG7	10/-
6CH6	6/-
6CL6	9/-
6CW4	12/-
6CY5	10/-
6CY7	11/-
6D3	7/6
6D6	3/-
6DC6	12/6
6DK6	6/-
6DQ6G	11/-
6DS4	15/-
6EA8	11/-
6EV5	12/-
6F1	14/-
6F6	8/-
6F6G	5/-
6F7	5/-
6F8G	5/-
6F11	6/-
6F13	6/6
6F14	15/-
6F15	11/-
6F17	6/-

6F23	11/6
6F26	6/6
6F28	10/6
6F32	3/-
6G6G	2/6
6H6	2/-
6J4	9/-
6J5	6/6
6J6	3/6
6J7	9/-
6J7G	5/-
6K6G	6/-
6K7G	2/-
6K7GT	5/-
6K8	8/-
6K8G	4/-
6K23	7/6
6K25	24/-
6L1	10/-
6L6GA	8/-
6L7	5/-
6L18	8/-
6N7	8/-
6N7GT/G	7/-
6P1	11/-
6P25	12/6
6P28	12/6
6Q7G	6/-
6R7	6/-
6S7	7/-
6SA7	8/-
6SC7	9/-
6SG7	6/-
6SJ7	8/-
6SK7	5/-
6SL7GT	5/-
6SN7GT	4/6
6SQ7GT	5/-
6SS7	8/-
6T8	7/-
6U4GT	10/6
6U7G	7/-
6U8	6/6
6U8A	9/6
6V6	9/-
6V6G	5/-
6V6GT	7/6
6WC5	7/-
6X4	4/-
6X5G	4/6
6X5GT	6/-
6Z4	5/-
7B5	10/-
7B6	11/-
7B7	7/-
7C5	10/-
7C6	7/-
7C7	5/-
7D5	8/-
7E5	5/-
7E6	4/-
7J7	14/-
7K7	10/-
7Q7	9/-
7S7	18/-
7Y4	8/-
7Z4	6/-
9BW6	7/-
10C2	13/-
10D1	7/-
10F1	14/-
10F3	8/-
10F9	10/-
10F18	9/-
10L1	7/6
10P13	12/6
10P14	13/-
10Y	15/-
11D3	7/-

11D5	7/-
12A6	3/-
12A7	10/-
12AC6	8/-
12AD6	8/-
12AH7GT	5/-
12AL5	7/-
12AQ5	7/-
12AT6	5/-
12AT7	4/-
12AU6	6/-
12AU7	5/6
12AV6	6/-
12AV7	8/-
12AW6	20/-
12AX7	6/-
12AY7	10/-
12B4A	9/-
12BA6	6/-
12BE6	5/6
12BH7A	7/-
12BY7A	10/-
12C8	4/-
12E1	20/-
12F5GT	8/-
12H6	3/-
12J5GT	3/-
12J7GT	7/6
12K5	10/-
12K8	8/-
12Q7GT	5/6
12SA7	7/-
12SC7	4/-
12SF5GT	9/-
12SG7	4/-
12SH7	4/-
12SJ7	4/-
12SK7	5/-
12SQ7GT	6/6
12SR7	5/-
12Y4	2/6
13D1	5/-
13D3	5/-
14Q7	10/-
14S7	18/-
19AQ5	5/-
19G6	15/-
20P1	14/-
20P3	13/-
20P4	14/-
20P5	12/-
25A6G	5/-
25C5	10/-
25Z4G	8/-
25Z5	10/-
25Z6GT	11/-
28D7	7/-
29C1	20/-
30A5	7/-
30C1	7/6
30C15	11/-
30C17	13/-
30C18	11/-
30F5	11/-
30FL1	12/6
30FL12	12/-
30FL14	12/-
30L1	6/6
30L15	12/6
30L17	14/-
30P12	10/-
30P19	14/-
30PL1	12/-
30PL13	12/-
30PL14	12/-
30PL15	12/-
35A3	12/-
35A5	11/-

35C5	6/6
35D5	12/-
35L6GT	7/-
35W4	5/-
35Z3	10/-
35Z4G	4/-
35Z4GT	8/6
35Z5GT	6/-
41	5/-
42	5/-
431U	8/-
50A5	12/-
50B5	7/-
50C5	6/6
50L6GT	6/6
50Y6GT	10/-
75	9/-
75C1	12/-
76	5/-
77	5/-
78	5/-
80	6/-
85A1	25/-
85A2	8/6
85A3	5/6
90C1	12/-
100TH	60/-
150B2	10/-
150C4	7/6
185BTA	15/-
211	30/-
220PA	7/-
262B	30/-
416B	200/-
715A	30/-
715B	60/-
807	9/-
811	25/-
812A	55/-
813	70/-
815	40/-
829	30/-
832	20/-
866A	14/-
872A	35/-
884	15/-
931A	60/-
954	5/-
955	3/-
956	2/-
958A	4/-
959	8/-
991	7/-
1616	5/-
1619	5/-
2050	12/6
5517	6/-
5544	120/-
5642	13/-
5654	8/-
5670WA	12/-
5672	7/-
5726	7/-
5750	12/-
5763	10/-
5787	10/-

5814A	10/-
5840	10/-
5842	65/-
5845	30/-
5847	30/-
5963	10/-
5965	5/-
6005	7/6
6021	12/-
6058	7/-
6059	18/-
6060	5/-
6072	15/-
6073	7/6
6095	7/6
6100	10/-
6101	7/-
6111	12/-
6130	30/-
6132	12/-
6135	10/-
6136	9/-
6140	30/-
6146	27/6
6159	32/-
6186	10/-
6197	25/-
6202	8/-
6211	4/6
6336	80/-
6350	4/-
6463	7/-
6550	30/-
6922	14/-
6939	45/-
7044	10/-
7551	30/-
7586	22/6
7895	22/6
8013A	25/-
8020	12/6
9001	4/-
9002	5/6
9003	9/-
A1820	20/-
A1834	20/-
A2087	17/6
A2134	8/-
A2226	18/-
A2293	16/-
AC/HL/DD	8/-
AC/P4	4/-
AC/TH1	10/-
AC2/HL	9/-
AC5/PEN	10/-
AC5/PEN/DD	8/-
AC6/PEN	6/-
AR8	6/-
ARP3	3/-
ARP12	3/6
AZ1	9/-
AZ11	6/-

AZ12	9/-
AZ31	9/-
AZ41	7/-
CBL1	15/-
CBL31	15/-
CL33	9/-
CY31	7/-
D41	5/-
DA30	10/-
DA41	40/-
DAF91	4/6
DAF92	6/-
DAF96	7/-
DC90	8/-
DF64	5/-
DF96	7/-
DF97	11/-
DH63	6/-
DH77	5/6
DK32	8/-
DK40	11/-
DK91	5/-
DK92	9/-
DK96	8/6
DL63	8/-
DL68	10/-
DL91	5/-
DL92	5/-
DL93	4/-
DL94	6/-
DL95	6/6
DL96	7/6
DM70	5/6
DM160	10/-
DY30	7/-
DY86	8/-
DY87	9/-
E1T	55/-
E80CC	20/-
E88CC	14/-
E90CC	12/-
E91H	8/-
E92CC	7/-
E180CC	8/-
E186F	22/-
EA50	2/-
EA52	30/-
EA76	8/6
EABC80	7/-
EAC91	4/-
EAF42	9/6
EB34	1/6
EB41	5/-
EB91	3/-
EBC21	7/6
EBC33	7/-
EBC41	8/6
EBC81	6/6
EBC90	4/6
EBC91	6/-
EBF2	12/-
EBF80	7/6
EBF83	9/-
EBF89	7/-
EBL1	14/-
EBL21	11/-

EBL31	18/-
EC53	10/-
EC86	12/-
EC88	12/-
EC90	2/6
EC91	5/-
EC92	6/6
ECC31	5/-
ECC40	10/-
ECC70	15/-
ECC81	4/-
ECC82	5/6
ECC83	6/-
ECC84	7/-
ECC85	6/6
ECC86	7/-
ECC88	10/-
ECC91	3/6
ECC189	12/-
ECF80	8/-
ECF82	7/6
ECF84	13/-
ECF86	11/-
ECF804	13/-
ECH21	10/-
ECH35	12/-
ECH42	9/6
ECH81	6/6
ECH83	7/6
ECL80	7/6
ECL82	7/6
ECL83	9/6
ECL84	12/-
ECL86	9/6
EF36	5/-
EF37A	8/-
EF39	5/6
EF40	9/6
EF41	8/6
EF42	8/-
EF50	2/-
EF54	6/-
EF55	8/-
EF80	5/6
EF85	6/6
EF86	8/-
EF89	5/6
EF91	4/-
EF92	2/-
EF94	6/-
EF95	5/6
EF183	8/-
EF184	8/-
EF804	21/-
EFP60	10/-
EH90	7/6
EK32	6/-
EL2	8/-
EL5	10/-
EL32	3/-
EL35	5/-
EL36	9/-
EL37	17/6
EL38	17/6
EL41	9/6
EL42	9/-
EL50	6/-
EL81	9/6
EL83	8/-
EL84	5/-
EL85	8/-
EL86	8/-
EL90	6/-
EL91	2/6
EL95	6/-
EL360	22/-
EL821	6/-
EM4	10/-
EM31	5/-

EM34	12/-
EM35	8/-
EM71	12/6
EM80	7/-
EM81	7/6
EM84	8/-
EM87	7/-
EN31	10/-
EN91	6/-
EN92	6/-
EY51	8/-
EY70	10/-
EY81	8/-
EY83	9/6
EY84	7/6
EY86	7/6
EY87	8/-
EY88	10/-
EY91	3/-
EZ35	5/6
EZ40	7/6
EZ41	8/-
EZ80	5/6
EZ81	5/6
EZ90	4/-
FW4/500	7/-
FW4/800	8/6
GS10D	55/-
GS10H	40/-
GT1C	10/-
GT3	15/-
GZ30	8/-
GZ31	5/-
GZ32	10/-
GZ34	10/-
HABC80	8/-
HL2K	8/-
HL23DD	6/-
HL41	4/-
HL92	6/6
HL133DD	10/-
HR2	12/-
KF35	3/6
KT2	5/-
KT8C	20/-
KT32	8/-
KT33C	6/-
KT41	7/6
KT44	5/-
KT45	15/-
KT63	6/-
KT66	16/-
KT71	6/6
KT88	22/-
KTZ41	6/-
LP2	7/-
MH4	5/-
MH41	9/-
ML6	6/-
MS/PEN	8/-
MSPENT	10/-
N78	15/-
NSP1	25/-
NSP2	22/-
ORP12	12/-
ORP60	10/-
PABC80	7/6
PC86	12/-
PC88	12/-
PC97	9/6
PC805	12/-
PCC84	6/6
PCC85	8/-
PCC88	12/-
PCC89	12/6
PCC189	12/-

PCF80	7/6
PCF82	8/-
PCF84	8/-
PCF86	9/-
PCF87	13/-
PCF800	11/-
PCF801	11/-
PCF802	11/-
PCF805	11/-
PCF806	13/-
PCF808	12/-
PCL80	12/-
PCL81	9/-
PCL82	8/-
PCL83	8/6
PCL84	8/6
PCL85	9/6
PCL86	9/6
PCL801	12/-
PEN45	7/-
PEN45DD	12/-
PEN46	6/-
PEN220A	7/-
PEN383	10/-
PEN384	7/-
PEN453DD	10/6
PENA4	7/6
PENDD 4020	7/6
PFL200	17/6
PL36	10/-
PL38	16/-
PL81	8/-
PL82	7/6
PL83	7/6
PL84	7/-
PL302	14/-
PL500	15/-
PY33	9/6
PY80	6/-
PY81	6/6
PY82	6/6
PY83	7/-
PY88	8/6
PY800	8/6
PY801	8/6
PX25	10/-
PZ30	10/-
QP25	5/-
QQVO3-10	35/-
QQVO3-20A	100/-
QS92/10	3/6
QS95/10	5/6
QS108/45	15/-
QS150/15	8/-
QV04-7	10/-
QY3-125	160/-
R10	12/-
R17	8/-
R18	7/6
RL18	10/-
S130	12/6
SP4	5/-
SP41	5/-
SP42	8/-
SP61	4/-
SU2150A	10/-
T41	12/6
TH233	6/-
TH2321	7/-

TP25	5/-
TT15	35/-
TT21	35/-
TZ40	40/-
U12/14	8/-
U17	5/-
U18/20	7/-
U19	30/-
U22	6/-
U25	11/-
U26	11/-
U76	4/-
U191	11/6
U251	12/6
U281	13/-
U282	14/-
U301	12/-
U403	7/-
U801	18/-
UABC80	5/6
UAF42	9/-
UB41	11/-
UBC41	8/-
UBC81	8/-
UBF80	7/-
UBF89	7/6
UBL21	11/-
UC92	6/-
UCC84	10/-
UCC85	7/-
UCF80	10/-
UCH21	9/6
UCH42	9/6
UCH43	8/-
UCH81	7/-
UCL82	8/6
UCL83	10/-
UD143	12/6
UF41	9/-
UF42	9/-
UF43	8/-
UF80	8/-
UF85	8/-
UF86	11/-
UF89	7/6
UL41	9/-
UL84	6/6
UM4	10/-
UM80	7/-
UU5	8/-
UU7	8/-
UU8	13/-
UU9	7/-
UY1N	9/-
UY21	9/-
UY41	6/6
UY82	9/6
UY85	6/-
VP23	3/6
VP41	5/-
VP210	5/-
VU39	8/-
VU111	7/6
VU120	10/-
W21	5/-
W81M	6/-
X65	5/6
X66	8/-
X76M	7/6
X78	20/-
X81M	18/-
XC12	7/6
XC15	4/6
Z700U	4/-
Z729	8/-
Z759	23/-
Z803U	15/-

TRANSISTORS

OC23	17/6
OC24	22/6
OC25	12/-
OC26	8/-
OC28	17/6
OC29	17/6
OC35	15/-
OC36	15/-
OC42	7/6
OC44	6/-
OC45	5/-
OC70	5/-
OC71	5/-
OC72	6/-
OC73	11/-
OC75	6/-
OC76	6/-
OC77	8/-

OC78	6/-
OC78D	6/-
OC81M	7/-
OC81DM	7/-
OC83	6/-
OC139	12/-
OC140	16/-
OC141	25/-
OC170	7/-
OC171	8/-
OC200	9/6
OC202	15/-
OC204	17/6
OC205	20/-
OC206	22/6
2N410	3/6
2N412	8/6
2N697	17/6

2S002	20/-
2S004	15/-
2S006	20/-
AC128	8/-
AF114	9/-
AF115	7/-
AF116	8/-
AF117	6/-
AF118	17/6
CXT1	3/-
GET114	5/6
GET115	8/6
GET116	12/-
GET875	9/-
GET880	10/-
MAT101	8/6
MAT121	8/6
T1166	6/-

SILICON BRIDGE CONNECTED POWER RECTIFIERS, 100 P.I.V.

1B20K10, 2 amps DC (1.4"x1.4"x.6") 25/-
1B40K10, 4 amps DC (1.4"x1.4"x.6" 30/-
1B100K10, 10 amps DC (2.25"x2.25"x1") 85/-

GERMANIUM DIODES

OA5	4/6
OA6	4/-
OA10	8/-
OA70	2/-
OA73	1/6
OA79	2/3

OA81	2/-
OA85	3/-
OA86	3/6
OA90	2/-
OA91	2/3
OA95	3/-

CG4E	2/-
CG10E	1/6
CG12E	2/-
GEX23	1/6
GEX44	1/6
GEX54	2/-

ZENER DIODES

OAZ200	10/-
OAZ201	9/6
OAZ202	6/-
OAZ203	7/-
OAZ204	6/6
OAZ205	6/-

OAZ206	8/-
OAZ207	9/6
OAZ208	6/-
OAZ210	6/-
OAZ211	5/6
OAZ212	7/6

OAZ213	6/6
OAZ224	10/-
VR425	6/6
VR475	6/6
VR575	6/6
VR7B	6/6

VR10A	8/-
VR11A	8/-
VR13A	8/-
ZNB10	7/6
ZNB20	9/6

STC SILICON JUNCTION RECTIFIERS, HALF WAVE. 3 AMPS D.C.

RS310, 140 piv 4/-
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/-

FERRITE ROD AERIALS

OSMOR PW/FRI .. ..8/6 PP
WEYRAD RA2W, with Car Aerial Coil 12/6
FERRITE RODS ONLY, ⅛" dia. x 6" 1/9 each
15/- per dozen

CATHODE RAY TUBES

3GP1—As recommended for P.E. Oscilloscope. 3" dia. screen; 6.3v heaters. Max. EHT 1500v, **50/-**; USM11 Tube Base **6/6.**

DG7-5, 2½" screen; EHT 800v.; 6.3v heaters, **55/-**; B9G Tube Base, **1/6.**

408A, 1½" screen, EHT 800v.; 4.0v heaters. Blue short persistence coating suitable for photography, **60/-.** B9 Tube Base, **1/6.**

5FP7, 5" screen, yellow long persistence coating. Magnetic focussing and defection. EHT 6000v. Exceptional brightness of the trace, **12/6.** B14A Base, **6/6.**

SUB-CHASSIS EX TR 1934/5 AIRCRAFT TRANSMITTER-RECEIVER

1 **Transmitter and Receiver Chassis** (available in 100-125 Mc/s or 124.5-145 Mc/s), **15/-.**

2 **I.F. Chassis Type 476, 9.72 Mc/s. 15/- P.P. 5/-** per chassis.

These units are not in themselves complete and cannot be used as complete transmitter or receiver. They are however, eminently suitable for **use as sub-units in Amplifiers, Tuners, etc.**

PRACTICAL WIRELESS *blueprints*

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London W.C.2.

DOUBLE-FEATURE BLUEPRINTS

The Strand Amplifier ... ... The PW Signal Generator	5/-
The Savoy VHF Tuner ... ... The Mayfair Pre-amplifier	5/-
The Berkeley Loudspeaker Enclosure The Luxembourg Tuner	5/-
The PW Troubadour ... ... The PW Everest Tuner	7/6
The PW Britannic Two ... ... The PW Mercury Six	6/-
Beginner's Short Wave Two ... ... S.W. Listener's Guide	5/-
Beginner's 10-watt Transmitter ... Transmitting and Aerial Data... ...	5/-
PW "Sixteen" Multirange Meter ... Test Meter Applications Chart ...	5/-
The Celeste 7-transistor Portable Radio The Spinette Record Player	5/-
Transistor Radio Mains Unit ... ... 7 Mc/s Transceiver	5/-

SINGLE-FEATURE BLUEPRINTS

The Tutor	3/-
The Citizen	5/-
The PW Pocket Superhet	5/-
The PW 35-watt Guitar Amplifier	5/-
The Mini-amp	5/-
The PT Multimeter	5/-
The Beginner's Short Wave Superhet ...	5/-
The Empire 7 Three-band Receiver	5/-
Electronic Hawaiian Guitar	5/-
Progressive Short Wave Superhet	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.

QUERY SERVICE

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.

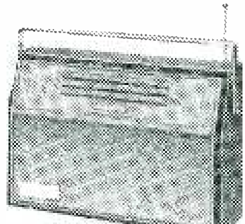
(*f*) We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.

QUERY COUPON

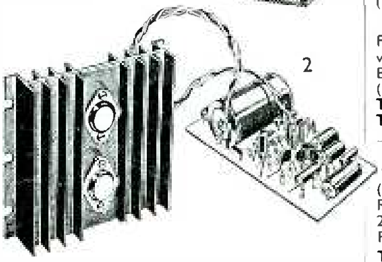
This coupon is available until 3rd March, 1966 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, MARCH, 1966

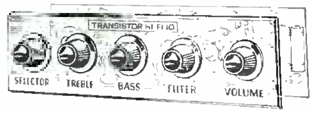
Published on the 7th of each month by GEORGE NEWNES LIMITED, Tower House, Southampton Street, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia) Ltd. South Africa: CENTRAL NEWS AGENCY LTD. Rhodesia, Malawi and Zambia: KINGSTONS LTD. East Africa: STATIONERY & OFFICE SUPPLIES LTD. Subscription rate including postage for one year: To any part of the World £1.9.0.



1

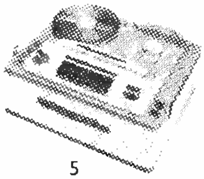


2

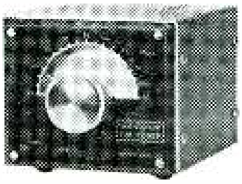


3

4



5

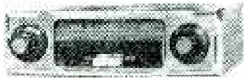


6

7

8

9



10

HENRY'S RADIO LTD.

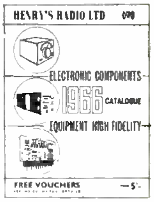
303 EDGWARE ROAD, LONDON W2
PADdington 1008/9
Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday.

NEW 1966 CATALOGUE 150 PAGES

Fully detailed and illustrated components, equipment and Hi-Fi. All types and makes. 5000 Stock lines. The Finest Range available. A mine of information. Price 6/- post paid.

FREE with Catalogue, 6/- Discount vouchers gives 2/- in pound discount on purchases.

CATALOGUE COSTS NOTHING AFTER USING VOUCHERS



(1) GLOBEMASTER MW/LW/SW PORTABLE

Full 3-waveband tuning. Pushbutton wavechange. Superhet printed circuit. Black-chromed cabinet 11 x 7½ x 3¼in. (SW 17-50 metres). Ear/Record sockets.

TOTAL COST TO BUILD £8.19.6 P.P. 3/6.

(6) VHF FM TUNER

87/105 Mc/s Transistor Superhet. Geared tuning. Terrific quality and sensitivity. For valve or transistor amplifiers. 4 x 3½ x 2¼in.

TOTAL COST TO BUILD £6.19.6 P.P. 2/6.

(Cabinet Assembly 20/- extra)

10 AND 20 WATT TRANSISTOR MONO AND STEREO HI-FI UNITS

(2) **POWER AMPLIFIERS.** 10 watts RMS output. 100mV input. 30c/s to 20kc/s ± 1dB. 6 transistor. Push-pull. Panel size 4 x 2½ x 1in. H/S 4 x 4in.

TPA10/3 3-5 ohm spkr. **£5.10.0,** p.p. 2/6

TPA10/15 12-16 ohm spkr., **£5.19.6,** p.p. 2/6

(Mains unit for 1 or 2 amplifiers, **59/6,** p.p. 2/6)

The Finest High Fidelity at Unbeatable Prices

(3) **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 (brown or 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

(4) TRANSMITTER/RECEIVERS

★ Up to ½-mile range **£7.19.6,** p.p. 2/6 per pair

★ Up to 5 mile range **£22.10.0,** p.p. 3/6 per pr.

HI-FI
WE CAN NOW SUPPLY FROM STOCK ALL MAKES OF HIGH FIDELITY EQUIPMENT
VISIT OUR HI-FI ROOM

(9) MICROPHONES

★ Professional 50K ohms Dm301 **79/6**

★ 50k Stick Dm107, Dynamic **69/6**

★ 100c Xtal Stick with stand **32/6**

★ BM3 Stick Mic. Xtal **47/6**

(5) BUILD A TAPE RECORDER

Three speeds—3 watts.

Complete kits with new "363" decks. Supplied as preassembled sections. Complete with portable cabinets and Speaker—excellent quality.

★ TWO TRACK **£26** P.P. 8/6 ★ FOUR TRACK **£30** P.P. 8/6

(7) 5 WATT AMPLIFIER

6-Transistor Push-pull, 3 ohms. 6mV into 1K. 12/18V supply. 2⅞ x 2 x 1½in.

BUILT AND TESTED 79/6 P.P. 2/- (optional mains units **54/-** p.p. 2/-).

New matching Preamplifier, 6 inputs, treble/bass/selector/volume controls. 6-10mV o/put. 9-18V supply. **79/6,** p.p. 2/-

(8) REGENT-6 MW/LW POCKET RADIO

6-transistor superhet. Geared tuning. Push-pull output. Moulded cabinet 5 x 3 x 1¼in. Phone socket.

TOTAL COST TO BUILD 85/- P.P. 2/-

MULTI-METERS

PT34	1kV	**39/6**	TP55	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**
IT1-2	20kV	**89/6**	EP100k	100kV	**£10.10.0**
EP20k	10kV	**99/6**			

FREE Lists on request.

★ 12 page. Transistor, SCR. diode, lightcell, quartz crystal, valve, heat sink, Zener catalogue and 4 page short catalogue of units.

SINCLAIR KITS

Micro FM (VHF) Kit ...	...	**£5.19.6**
Micro 6 (MW) Kit	...	**£2.19.6**
Slimline (MW) Kit ...	...	**£2.9.6**
X10 Built	Mains unit **54/-**	**£6.19.6**
X10 Kit		**£5.15.6**
X20 Built	Mains unit **99/6**	**£9.19.6**
X20 Kit		**£7.19.6**
12 Amplifier ...	... ...	**£4.9.6**

(10) ROADSTER MW/LW CAR RADIO

Supplied as Preassembled Panels. Permeability tuned superhet. Push-button wave-changer. Push-pull output. Fits any car. 7 x 4 x 2in. 12 volt (+) earth.

ASSEMBLY TOTAL COST £8.19.6 P.P. 3/6

(Speaker/Baffle/Car Fixing Kit, **20/-.**)

● LET US QUOTE FOR PARTS FOR YOUR CIRCUIT. SEND LIST OF PARTS FOR QUICK REPLY. MOST PARTS IN STOCK FOR ALL PUBLISHED DESIGNS.

GARRARD DECKS — BRAND NEW FULLY GUARANTEED

1000 mono	£6 10 0	AT5 stereo	£6 6 0	AT60 less cart.	£11 10 0	AT6 mono	£8 19 6
1000 stereo	£6 19 6	SP25 less cart.	£10 10 0	AT60 mono	£11 19 6	AT6 Stereo	£9 10 0
2000 mono	£6 19 6	SP25 mono	£10 19 6	AT60 stereo	£11 19 6	AT6 Deram	£11 19 6
2000 stereo	£7 10 0	SP25 stereo	£11 10 0	AT60 Deram	£14 10 0	Decca dec MkII	£17 17 0
3000lm stereo	£8 19 6	SP25 Deram	£13 19 6	LAB80 less cart	£25 0 0	(Carr. 5/- ext. any mod.)	