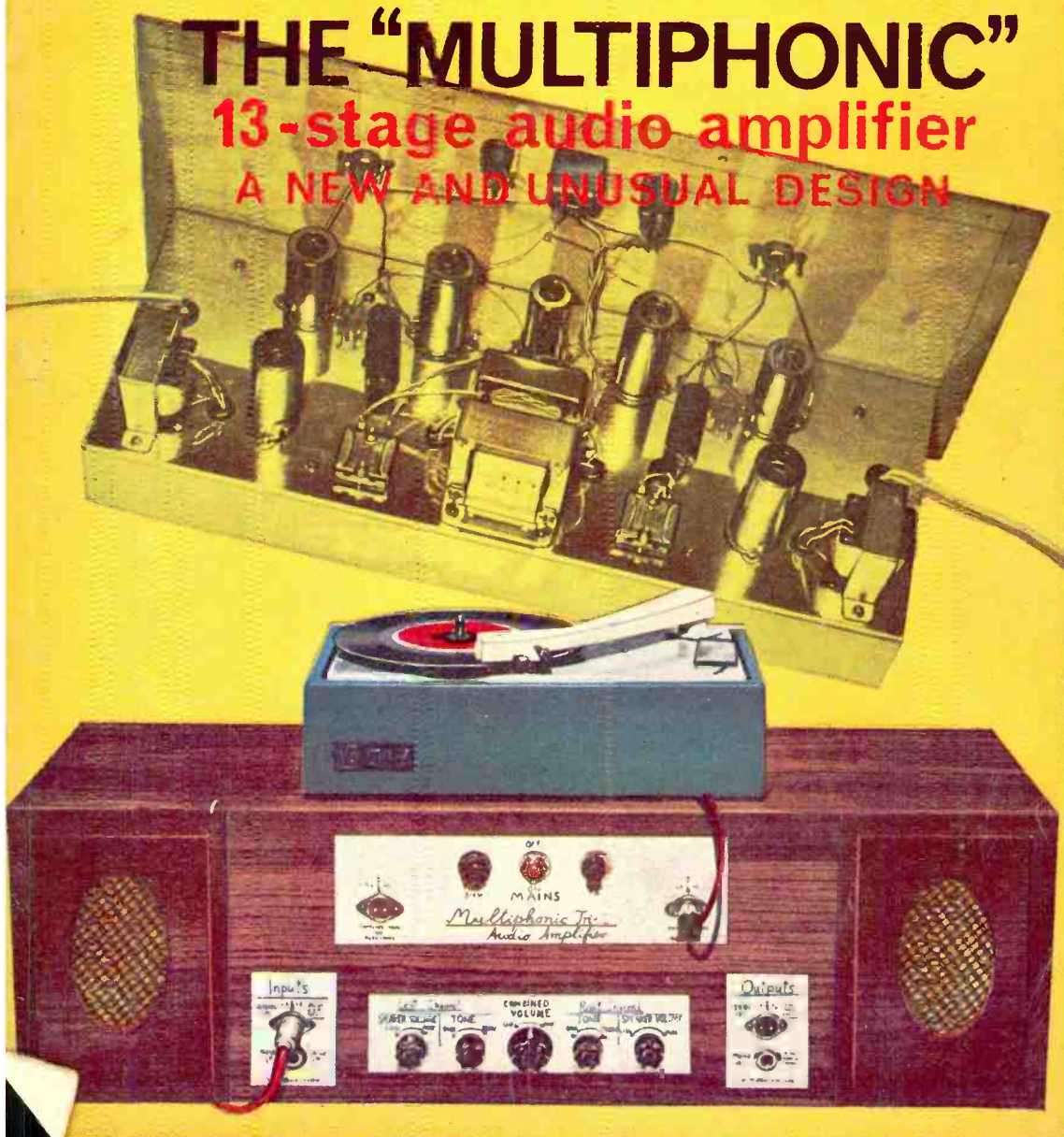


PRACTICAL WIRELESS

SEPTEMBER 1964

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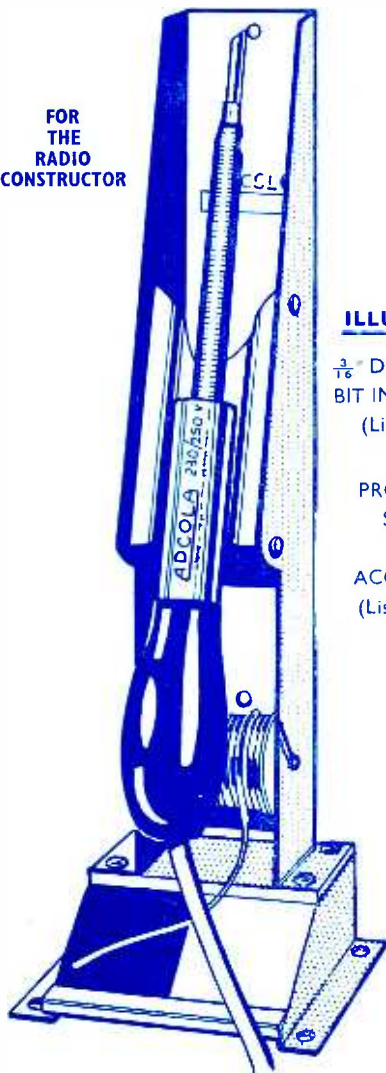
THE "MULTIPHONIC" 13-stage audio amplifier A NEW AND UNUSUAL DESIGN





SOLDERING EQUIPMENT

FOR
THE
RADIO
CONSTRUCTOR



ILLUSTRATED

$\frac{3}{16}$ " DETACHABLE
BIT INSTRUMENT

(List No. 64)

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GUITAR AMPLIFIERS WITH TREMOLO



Five jack socket inputs, four with separate mixing volume controls, and one input "straight through". All inputs are of very high sensitivity, only 10 millivolts input is required for full output, making them suitable for all types of guitars and microphones. Separate Bass and Treble

controls, giving a wide range of lift and cut. Separate master gain control. Tremolo speed and depth controls. Jack socket for remote tremolo switching. Outputs for 3 and 15 ohms speakers. Valves used in the 30 watt and 50 watt amplifier ECC83, ECC83, EL31, EL34, GZ34. In the 15 watt amplifier ECC83, ECC83, EL84, EL81, EZ81. An extra valve ECC83 is used in the tremolo circuit. Supplied as a kit or factory built. The kit includes full instructions and all parts with fully punched chassis. The chassis is complete with baseplate and is solidly made of 18 gauge steel, finished silver grey hammer. Size 12 x 8 x 6 1/2 inches high.

PRICES—

50 watt with tremolo. Kit £18.10.0. Factory built £21.10.0.
50 watt less tremolo. Kit £17.10.0. Factory built £20.10.0.
30 watt with tremolo. Kit £12.10.0. Factory built £15.10.0.
30 watt less tremolo. Kit £11.10.0. Factory built £14.10.0.
15 watt with tremolo. Kit £9.10.0. Factory built £12.10.0.
15 watt less tremolo. Kit £8.10.0. Factory built £11.10.0.
Add carriage 10/- any amplifier. Send for free descriptive leaflet.

STROUD AUDIO, Paganhill Lane, Stroud, Glos. Stroud 783

R.C.S. PERSONAL SET

Designed for personal listening without disturbing others. Supplied complete with battery and earpiece—no extras to buy. Sensitive one transistor diode circuit gives quality reproduction over medium wave band. Attractive case with large tuning dial. Ideal for use as tape tuner. Size only 2 1/2 x 2 1/2 x 1 1/2 inches. ONLY 22/6 P. & P. 2/-



BATTERY ELIMINATORS

The ideal economical and safe way of running any TRANSISTOR RADIO, RECORD PLAYER, TAPE RECORDER, AMPLIFIER, etc. requiring voltages shown.

Types Available: 9 volt, 6 volt, 4 1/2 volt (single output). Size 3 1/2 x 3 x 1 in. PRICE 35/- each. P. & P. 2/9.
9 v. - 9 v., 6 v. + 6 v., 4 1/2 v. - 4 1/2 v. (Two separate outputs)
Size 3 x 3 x 2 in. PRICE 42/6 each. P. & P. 2/9.

All the above units are completely isolated from mains by double wound transformer ensuring 100% safety.

LISTEN TO THE WORLD on TELSTAR our 1-VALVE SHORT WAVE RADIO



Receives speech and music from all over the world. Price includes valve and one coil covering 40-100 metres. Can be extended to cover 10-100 metres. Can be converted to 2 or 3 valve and all-mains speaker use. Total Building Costs 35/- P. & P. 2/-.

R.C.S. CRYSTAL RECEIVER

Covering medium wave band. Ideal for the beginner! All components in- 8/6 P. & P. cluding case. 1/6
(Suitable headphones 9/6). Easily converted to 1-transistor or 2-stage transistor receiver



All parts available separately

R.C.S. PRODUCTS (RADIO) LTD.

11 Oliver Rd., London, E.17. (Mail Order only)

Export Trade Enquiries Invited

Tubes

Carr. & Ins. 12/6

		HIGHEST QUALITY— COMPARE OUR PRICES		NEW TYPES	
		GUARANTEED 6 Months 12 Months			
MOST MULLARD, MAZDA, COSOR, EMITRON, EMI- SCOPE, BRIMAR, FERRANTI TYPES PROCESSED IN OUR OWN FACTORY	12.	£2. 0.0	£3. 0.0	MW 81/74	£3.15.0
	14in.	£2.10.0	£4.10.0	MW 36/84	£4.15.0
	15-17in.	£3. 5.0	£4. 5.0	CRM 172	
	21in.	£3.15.0	£5.15.0	MW 43/64	£6.0.0

SATISFACTION GUARANTEED

EKO L.O.F.T. Unused replacements for Perspex cased 1954/7 models, complete with E.H.T. rect. 39/- unrepeatable.

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

SPECIAL C.R.T. OFFER
Due to huge Bulk Special Purchase we are offering MW 31/74 Tubes at the unrepeatable price of 29/-. MW 36/24 ditto, 39/-. P.P. 12/6. The above are guaranteed for 6 months.

LOUDSPEAKERS. 3 Ω Top Makers
6in. 7/6 5in. 8/6
8in. 7 x 4in. 8/6

CONNECTING WIRE
P.V.C. Bright colours. Five 22ft. coils only. 4/-

3 VALVE AMPLIFIERS
Kit of new parts, consisting chassis, mains and output transformers, valves (P61, 6G6G 6X5G) and all components. With full instructions for making high gain amplifier with separate bass and treble controls, negative feedback, etc. Truly unusual value at 29/-

MAINS TRANSFORMERS
Excellent Quality Guaranteed.
Upright mounting 250-0-250 V
60 mA, 6.3 V 3 A (50mA 12/6)
Ditto semi-shielded 9/6

13 CHANNEL T.V.s
Table Models. Famous Makes. Absolutely Complete. These sets are unequalled in value due to huge purchase direct from sources. They are untested and not guaranteed to be in working order. Carr. etc. 15/-
12in. £2.19.0 14in. £4.19.0

LEAK AMPLIFIER SNIPS
Due to a fortunate purchase we are able to make the following unrepeatable offer. All amplifiers have line matching Output Transformers (Transformers to match these Amplifiers to 15 Ω Speakers can be supplied at 22/6 each).
TL/25 WATT (new) 215
Note—These Leak Amplifiers all have the added facility of volume and tone controls so that they can be used without a pre-amp. If very high gain is not required.

★ BULK BARGAINS ★
12 POTS. Popular values. 5K to 2 Meg. Unused, mixed, pre-set, long sp., switch, etc. 4/6
CONDENSERS. 25 Mixed. Electrolytic. Many popular sizes. List value £5. Our price 10/-

100 RESISTORS 6/6
Excellent. Sizes 1-3 watt.

100 CONDENSERS 9/6
Miniature Ceramic and Silver Mica Condensers, 3 pF to 5,000 pF. 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 5M Ω .

TRANSISTORS

GUARANTEED TOP QUALITY

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

Mullard Matched Output Kits OC81D and 2-OC81. 12/6

R.F. Kits (OC44, OC43 (2), 3 transistors. 12/6

AF114	8/-	OC44	5/6
AF115	7/6	OC45	5/6
AF116	7/6	OC72	5/6
AF117	7/6	OC81	5/6
AF127	9/6	OC81D	5/6
OC28	12/6	OC82	5/6
OC38	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 Make. Tested 250V working.
100mA 250mA
(3 for 9/6) 3/9 (3 for 19/6) 7/6

VALVE HOLDERS. B76, 6d. ea., with Screen 8d. ea., B94 6d. ea., with Screen 8d. ea. Int. Octal 6d., Mazda Octal 4d., BSA 6d. (less 15% in dozens).

TURRET TUNERS

Most makes your choice if available, with valve 16/-, less valves 10/-. S.A.P. enquiries.

COSOR D.B. SCOPE TUBES.

Type 60D split beam. Ideal for building your own quality oscilloscope whilst stocks last. 55/-

LINE TRANS.

Huge quantity. Most makes at only 29/-
S.A.E. enquiries.

RECTIFIERS.

250 V., 50 mA. 5/-
RM2, 6/8; RM3, 7/6; RM4 19/6; RM5, 19/6; 14A85, 17/-; 14A97, 19/6; 14A100, 19/6; 16C1-1-16-1, 7/6; 16C1-1-16-1, 6/6; 16C1-2-16-1, 14/-; 16C1-2-16-1, 14/-; 14A1-1-2-16-1, 20/-

ELECTRIC MOTORS.

A.C./D.C. 3-4 volts. Totally enclosed standard mounting, powerful V pulley. 7/6
spare brushes, 2in. x 2in.

AM/FM RADIOS

Fantastic offer. 7 valves plus 2 diodes. Contemporary Cabinet. Top quality and finish. A.F.C. A.V.C. Absolutely complete. Guaranteed 3 months. 11 gns

ENQUIRIES WELCOMED

Quantity Prices or Quotes for items not listed, particularly rare values. TELEPHONE C.O.D. ORDERS DISPATCHED THE SAME DAY.

★ GUARANTEED VALVES ★

by return of post
THE MOST ATTRACTIVE COMPETITIVE VALVE LIST IN THE COUNTRY

All valves are new and unused unless otherwise advised

POST	3 MONTHS GUARANTEE	FREE TRANSIT INSURANCE. Satisfaction or Money back Guarantee on Goods if returned within 14 days.
1 Valve 6d., 2-11, 1/- FREE for 12 or more valves.	1 in writing with every valve.	

024	4/6	6K76	2/-	20P3	12/6	DM71	5/9	EZ81	8/-	U22	8/9
1A7GT	3/3	6K7GT	4/2	20P4	17/-	EA50	1/3	FW4500	7/2	U24	12/6
1C5GT	7/-	6K8G	5/-	20P5	15/-	EABCO8	4/9	GT1C	12/6	U25	10/6
1D5	7/-	6K8GT	11/-	25A6G	8/-	EAC91	4/-	G232	7/6	U26	8/6
1D6	9/9	6K25	8/9	25B1GT	7/9	EAF42	8/3	GZ34	11/6	U31	7/-
1H5GT	8/-	8L1	9/9	25Y5G	8/-	EB34	1/3	HK90	9/6	U33	14/-
1L1	3/-	6L6G	7/6	25Z4G	7/-	EB41	5/-	HL41DD	5/6	U35	15/6
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1LN5	4/3	6L19	11/6	25Z6G	8/-	EB93	4/9	HN309	19/-	U50	4/9
1N5GT	8/9	6LD20	7/6	27SU	17/6	EB4C1	7/9	HVR2	9/-	U52	4/9
1R5	5/6	6N7	7/6	30C1	9/6	EB4C1	7/9	KT32	6/6	U58	5/6
1U5	5/3	6P1	9/6	30C15	11/6	EBF80	7/9	KT33G	4/9	U59	4/6
1S4	7/6	6P25	9/6	30F5	7/6	EBF83	9/6	KT36	14/-	U107	12/6
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1T4	3/-	6Q8G	6/6	30L1	6/6	EBL21	10/9	KT55	17/6	U281	9/6
2D21	5/6	6Q7GT	8/9	30L15	9/6	EC52	4/9	KT61	11/-	U283	12/6
3A4	4/-	6R7G	9/-	30P4	9/6	EC91	4/9	KT68	13/6	U301	12/-
3A5	5/6	6S47	7/6	30P5	7/6	EC92	4/9	KT68	13/6	U309	6/6
3D8	4/9	6S67	4/9	30P19	13/6	EC93	7/6	KT76	8/6	U322	9/6
3Q4	7/-	6S67	4/9	30P11	9/6	EC93C2	4/-	KT88	19/-	U332	11/6
384	5/-	6SH7	3/-	30P13	9/6	EC93	4/9	KTW61	5/9	U408	10/6
3V4	6/6	6S37	6/6	35C5	8/6	EC93C4	9/-	KTW62	6/6	U404	8/-
5R4GY	2/6	6S47	3/-	35W8	8/6	EC93C5	9/-	KTW63	5/6	U408	17/6
5T4	8/-	6S17GT	5/6	35W8	8/6	EC940	9/6	KTW66	11/6	U48C80	7/6
5U4G	6/6	6S27GT	4/9	35Z4GT	6/6	EC9C1	5/6	L67	3/6	U4F43	7/6
5V4G	7/6	6S27	4/9	35Z5GT	7/-	EC9C2	6/6	LM152	6/6	U4F43	7/6
5Y3G	4/9	6S37	3/6	41	6/6	EC9C3	6/6	LM14	7/6	U4F41	7/6
5Y3GT	5/6	6G6G	9/6	43	6/6	EC9C4	7/6	N37	10/6	U4B81	7/6
5Y4G	9/6	6Y6G	4/9	50B5	7/6	EC9C5	7/6	N178	17/-	U4F80	7/6
5Z4	9/-	6Y6GT	6/9	50C5	8/6	EC9C8	11/6	N188	8/6	U4F89	7/6
5Z4G	7/6	6X4	4/9	50L6GT	7/6	ECF80	8/6	N152	8/6	U4B12	12/-
5Z4GT	9/6	6X5G	6/-	53KU	9/6	ECF82	9/6	P41	7/6	U4C82	7/6
630L2	9/-	6X5GT	6/-	61B1T	17/6	ECH21	10/9	P61	2/9	U4C84	9/6
6A5	3/9	7B6	10/9	61B2T	11/-	ECH35	11/6	PABCO	8/-	U4C85	7/6
6A7	9/-	7B7	7/6	62B2T	13/6	ECH42	8/6	P83	11/6	U4C86	10/6
6A8G	7/9	7C5	7/6	75	5/6	ECH81	7/6	PC97	9/6	U4C87	9/6
6A8GT	12/6	7C8	7/6	78	5/6	ECH83	8/6	PC97	9/6	U4C88	9/6
6AC7	3/-	7H7	7/3	80	5/6	ECL80	8/6	PC98	9/6	U4C89	9/6
6A95	6/-	7H7	15/-	83	8/6	ECL82	8/6	PC98	9/6	U4C90	9/6
6AG7	6/9	7Y4	4/-	85BT	19/6	ECL83	10/6	PC98	11/6	U4C91	9/6
6AK5	5/-	7Z4	4/-	185BT	19/6	ECL84	12/6	PC98	9/6	U4C92	13/6
6AL5	3/3	8D	3/-	807	7/6	ECL85	10/3	PC189	12/6	U4F1	8/6
6AM6	3/-	10C1	11/6	813	4/9	EF22	7/6	PC99	6/6	U4F12	5/6
6A95	6/-	10C2	14/6	832	14/6	EF38	8/3	PCF82	12/6	U4F80	3/6
6AT8	5/-	10F1	4/9	866A	12/6	EF39A	7/6	PCF84	11/6	U4F81	7/6
6AU6	7/-	10F9	10/6	854	3/3	EF39	8/3	PCF86	11/6	U4F82	7/6
6AV6	5/9	10F18	10/-	955	2/3	EF40	11/-	PC182	7/3	U4L1	8/6
6B7	8/6	10L11	14/6	958	2/6	EF41	8/6	PC184	7/3	U4L4	14/6
6B8G	5/6	10P13	8/6	958	5/6	EF42	6/6	PC185	10/6	U4L8	9/6
6BA6	5/6	10P14	8/6	958	7/6	EF45-BR	11/6	PC186	10/6	U4M0	3/6
6BE3	5/6	10P18	7/-	9001	3/6	EF50A	2/6	PC95	9/6	U4M1	7/6
6BG6G	15/-	12A6	2/3	9002	4/9	EF54	3/6	PC95	9/6	U4M2	11/6
6BH6	8/6	12A18	11/-	9003	5/6	EF54	3/6	PC95	9/6	U4M3	11/6
6B16	5/9	12A76	6/6	ATP4	2/6	EF80	4/6	PL33	9/6	U4M4	9/6
6B7	8/6	12A76	6/6	AZ1	7/6	EF85	4/6	PL36	9/6	U4M5	9/6
6BR3	9/6	12A76	6/6	AZ1	7/6	EF86	4/6	PL38	15/-	U4M6	9/6
6BW6	5/-	12A76	6/6	B36	6/6	EF89	3/6	PL81	8/3	U4M7	6/6
6BW7	5/-	12A76	6/6	C1C	8/-	EF91	3/3	PL81	8/3	U4M1	9/6
6C4	2/3	12AX7	6/6	CBL31	13/6	EF92	3/6	PL82	8/6	U4M8	9/6
6C5	5/6	12BA6	4/-	CH35	13/6	EF183	9/6	PL83	6/6	U4M9	9/6
6C8	3/6	12BE6	6/6	CL33	9/6	EF184	9/6	PL84	7/6	U4M10	9/6
6C9	11/-	12BH7	8/9	CY31	7/6	EL32	3/6	PL85	8/3	U4M11	9/6
6CD6G	19/6	12C8	5/6	D77	3/3	EL32	3/6	PL86	8/3	U4M12	9/6
6D2	4/9	12E1	17/6	DA30	11/6	EL33	11/-	PL87	8/3	U4M13	9/6
6D3	9/6	12E2	17/6	DA32	8/6	EL34	11/-	PL88	8/3	U4M14	9/6
6D4	9/6	12E3	17/6	DA33	8/6	EL35	11/-	PL89	8/3	U4M15	9/6
6D5	3/-	12E7GT	6/-	DAF96	7/3	EL38	12/6	PL93	10/6	U4M16	9/6
6F1	4/9	12K7GT	4/9	DF33	8/9	EL41	8/3	PL92	10/6	U4M17	9/6
6F6	7/6	12K8	5/9	DF81	8/3	EL42	8/3	PL90	6/6	U4M18	9/6
6F8G	4/9	12K8GT	4/9	DF86	7/3	EL81	8/3	PL96	10/6	U4M19	9/6
6F13	4/9	12Q7GT	4/9	DF97	7/6	EL84	6/6	PL92	5/6	U4M20	9/6
6F14	9/6	12S47	7/-	DH63	6/6	EL85	6/6	PL93	6/6	U4M21	9/6
6F15	9/6	12S67	4/9	DH76	4/6	EL91	3/9	PL98	8/9	U4M22	9/6
6F18	6/-	12SH7	3/6	DK32	9/6	EL96	6/6	PL90	7/6	U4M23	9/6
6F2	4/9	12S7	6/6	DK91	6/6	EM34	8/9	PL99	10/6	U4M24	9/6
6F33	4/9	12SE7	4/6	DK92	7/6	EM30	8/9	PL99	10/6	U4M25	9/6
6G36	1/6	12SN7GT	6/9	DK96	7/9	EM51	8/6	R19	9/6	U4M26	9/6
6J5	4/9	12SNQ7	8/6	DL33	7/6	EM34	8/9	RL18	11/6	U4M27	9/6
6J6	3/-	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M28	9/6
6J6G	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M29	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M30	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M31	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M32	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M33	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M34	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M35	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M36	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M37	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M38	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M39	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M40	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M41	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M42	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M43	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M44	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M45	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M46	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M47	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M48	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M49	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M50	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M51	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M52	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M53	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M54	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M55	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M56	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M57	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M58	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M59	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M60	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M61	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M62	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M63	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M64	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M65	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M66	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M67	9/6
6J6GT	1/6	13D3	6/6	DL35	7/6	EM35	9/6	SA21	2/3	U4M68	9/6

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STANDARD post office jack plug. 2/6 each. P. & P. 6d. 2 for 4/6. P. & P. 9d. Chrome shielded. 3/6 each. P. & P. 9d. 2 for 6/6. Post free.

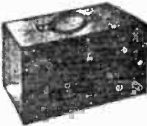
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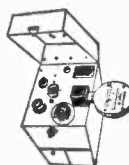
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A compact 14 valve VHF transceiver, covering approx. 400 to 470 mcs. Useful for model control, etc. Compactly housed complete with dynamotor in a black crackle finish, lightweight case. Price 52/6 P.P. 5/-.

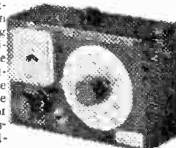
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Frequency range 20 to 100 Mc/s in two bands selected by plugging in the appropriate loop aerial, two of which are supplied with the set. Operates from a 6 v. D.C. supply which is converted by an internal vibrator pack to 250 V. and 4 v. L.T. vibrator unit worth pounds. The unit is in good condition, and a clear circuit drawing is mounted on the interior of the rear panel. The equipment contains many useful components, e.g. twin gang tuning condenser, valve, transformer, chokes, resistors, etc. A neat compact unit in grey enamelled case 16 1/2 x 7 x 6 in. with carrying handle. 35/- P. & P. 5/-.



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6BA6	6/- 12Q7GT	4/8 EABC80	5/8 EM84	7/8 P84	5/8 UCL83	8/3
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THE HE-30 4-BAND COMMUNICATION RECEIVER



an Aerial Trimmer, 2 IF Stages, Controls Function Switch, Audio Gain, Selectivity (Q-multiplier) Frequency (BFO), Band Selector, IF Gain, Trimmer, AVC-MVC Switch, Ant Switch, Main Tuning, Bandspeed Tuning and Headphone Jack. Selectivity—60dB at 10Kc/s, 0.8Kc/s at 6dB (with Q-multiplier) IF-455Kc/s. External PM Speaker reqd., 4 or 8 ohms impedance. Output 1.5 watts, 8 modern Miniature BTG Base Valves and 5Y3 Rectifier. Size 15 x 10 x 7 1/2in. Grey crackle finish. 220/240 volt A.C. mains. 50/60 cycle operation. Full instructions and circuit diagram supplied. Send S.A.E. for leaflet.

One of the finest general coverage bandspeed Receivers available at this price. Covering 550Kc/s—1600Kc/s, 4.8Mc/s—14.5Mc/s, 1.6Mc/s—4.8Mc/s, 10.5Mc/s—30Mc/s. Illuminated slide rule dial, calibrated every 5Kc/s on 80 and 40 metres. Edgewise S-meter, 0-100 logging scale, coverage from 9.55—30Mc/s. 8 valve plus Rectifier superhet circuits. RF stage with B.F.O. control Q-multiplier. Frequency (BFO), Band Selector, IF Gain, Trimmer, AVC-MVC Switch, Ant Switch, Main Tuning, Bandspeed Tuning and Headphone Jack. Selectivity—60dB at 10Kc/s, 0.8Kc/s at 6dB (with Q-multiplier) IF-455Kc/s. External PM Speaker reqd., 4 or 8 ohms impedance. Output 1.5 watts, 8 modern Miniature BTG Base Valves and 5Y3 Rectifier. Size 15 x 10 x 7 1/2in. Grey crackle finish. 220/240 volt A.C. mains. 50/60 cycle operation. Full instructions and circuit diagram supplied. Send S.A.E. for leaflet.

PRICE 40 Gns. Carriage Paid

THE HE-30 COMMUNICATION RECEIVER (KT320), now available in sub-assembled form. All I.F. Transformers and coils are factory aligned and therefore only require peaking when receiver is assembled. Full easy-to-follow instructions supplied

32 Gns. Post Paid

THE NEW HE-80 COMMUNICATION RECEIVER



The HE-80 has outstanding sensitivity 0-100 logging scale for instant re-set built-in "S" meter special recording Jack, remote Control Socket allowing simultaneous control with transmitter, 100Kc crystal oscillator circuit providing accurate harmonic signals of either 4 or 8 ohms impedance. Two headphone sockets, one high, one low.

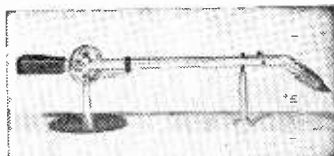
TECHNICAL SPECIFICATIONS.

Frequency Coverage: Band 1 540—1605Kc/s; Band 2 1.6—4.8Kc/s; Band 3 4.8—14.5Mc/s; Band 4 10.5—30Mc/s; Band 5 144—146Mc/s. Band Spread (Ham Band directly read): 80 Metre Band; 40 Metre Band; 20 Metre Band; 15 Metre Band; 30 Metre Band. Sensitivity: 1 microvolt for 10dB signal to noise ratio. Selectivity: Normal 10Kc at —75dB, 1.25 at —6dB. With Q-Multi: variable to 700 c.p.s. at 6dB. Operation: AM, SSB, CW and FM. AM diode detector, SSB/CW product detector (BFO). FM rated beam detector. Power Source: 240 volts 50/60 Cycles A.C. Power Consumption: 60 watts. Audio Output: 1.5 watts, 8 or 500 ohms impedance. Auxiliary Circuit: Electrical Bandspeed, Q-Multiplier, ANL, AVC-MVC, BFO, 100Kc crystal calibrator. Valve Line-up: 4—8A08, 6BL8, 3—6BA6, 2—6BE6, 6AL5, 6AQ5, OA2, 6CA4. Dimensions: 17in. wide, 6 1/2in. high, 10in. deep.

PRICE 59 Gns. Carriage Paid

OUTSTANDING PRICE REDUCTION

THE B. & O.
ST/M PICKUP
COMPLETE
WITH SP 11
STEREODYNE
MAGNETIC
CARTRIDGE



A Transcription

Pickup of outstanding quality employing a specially designed counter-balanced and unique weight adjustment.

Specifications: Length 10 1/2in. from tip of Cartridge. Height 2 1/2in. Stereo/Mono Cartridge.

Frequency Response: +2.5dB from 30 c.p.s. to 15 K.c/s.

Output Voltage: 7mV per channel at 5 cm/sec. at 1000 c.p.s.

Separation: 20dB minimum.

DC Resistance: 1250 ohms.

Inductance: 200mHs.

Recommended Tracking Force: 2 to 4 grams.

Compliance: 5 x 10⁻⁶ cm/dyne in all directions.

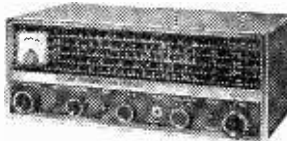
Stylus: Diamond, radius of curvature: 7th.

Recommended Load: 47000 ohms.

PRICE 9 1/2 Gns. Plus 3/8 P. & P.

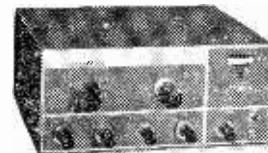
THE HE-40 4-BAND COMMUNICATION RECEIVER

Completely built and ready to go. High sensitivity Superhet receiver covering 550Kc/s—1,600 Kc/s, 1.6 Mc/s—4.8 Mc/s, 4.4 Mc/s—11 Mc/s, 11 Mc/s—30 Mc/s. Electrical Bandspeed tuning. Slide rule type tuning dial. Internal ferrite rod aerial for medium waveband reception and 1 5/8in. 10 section chromium plated telescopic whip aerial for the short wave bands. Sockets for optional outdoor aerial, internal high flux monitor loudspeaker. Latest modern miniature BTG base valves. Headphone socket (may also be used for external loudspeaker). ANL, BFO, built-in "S" meter, 220/240 volt A.C. mains. 50/60 cycle operation. Handsomely styled cabinet with grey crackle finish and handsome front panel, with chrome and satin chrome fittings. Measures 13 1/2in. x 8 1/2in. x 5 1/2in. (high) and weighs only 11 1/2 lb. A comprehensive instruction manual is supplied. An ideal receiver for the radio amateur and short wave listeners of all ages. Send S.A.E. for leaflet.



PRICE £24.15.0 Carriage Paid

"STARFLITE TRANSMITTER"



Designed to meet the needs of most amateurs the Starflite has single-knob band-switching. Front panel switch to select any of five crystal positions with provision for an external VFO. Controlled carrier modulator permits almost 100% of the CW input to be used on AM peaks. Grid-block. Keying provides chirp-free operation. A full wave silicon diode power supply effects extremely low output ripple for

cleaner CW transmission, electron-coupled Pierce Oscillator, capacitance bridge neutralisation of the final and a three-stage lowpass filter. An illuminated edgewise D'Arsonval panel meter. Pi-network output provides the correct impedance match between the plate circuit and any 50-72 ohm co-axial feeder. Easy to follow point-to-point instructions supplied with each set of components. When constructed the Unit is housed in a heavy gauge steel Cabinet finished in grey crackle.

SPECIFICATIONS: Power Input—20 watts peak; Operation: C.W., AM Phone—crystals or VFO Control; Band coverage: 80-10 metres; Coupling: Pi-network; Valve Line-up: 6146, (2) 6CL6, 12AX7, 6DE7, Low Pass Filter. Size 13 1/2in. wide x 12in. deep (inc. knobs) x 8 1/2in. high (inc. rubber feet). Weight 28 lb. Power requirements, 200/240 v. 50/60 c.p.s. 225 watts.

MAY BE BUILT FOR 35 Gns. Carriage & Insurance 15/-

SEE FOLLOWING PAGES FOR ADDRESSES AND OTHER ITEMS

STERN-CLYNE

Electronics Centres throughout Great Britain

MULLARD 2-VALVE PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves and designed to operate with the Mullard AMPLIFIERS but also perfectly suitable for other makes with input up to 250 mV.

★ Equalisation for the latest R.I.A.A. characteristics. ★ Inputs for Crystal Pickups and variable reluctance magnetic types. ★ Input (a) Direct from High Imp. Tape Head. (b) From a Tape Amplifier or Pre-Amplifier. ★ Sensitive Microphone Channel. ★ Wide range BASS and TREBLE Controls.

KIT OF PARTS **£6.6.0** (Carr. & Ins. 5/-). ASSEMBLED AND TESTED **£9.10.0** (Carr. & Ins. 5/-).

Instruction book and detailed price list (free with kits) available separately at 2/- Post Free.



MULLARD 3-VALVE PRE-AMPLIFIER TONE CONTROL UNIT

Designed mainly for Mullard Range of Amplifiers, also suitable for any Amplifiers requiring input up to 250mV. Incorporates 5 input Channels, including for Tape and Magnetic Pickups. Separate Bass and Treble controls. High pass filter 20 to 160 c/s. low pass filter 5-9 Kc/s. Totally enclosed in case Size 11 x 4 1/2 x 4 1/2.

KIT OF PARTS **£10.0.0** (Carr. & Ins. 5/-). ASSEMBLED AND TESTED **£13.13.0**

Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.



MULLARD "5-10" MAIN AMPLIFIER

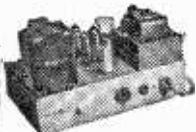
For use with MULLARD 2 or 3 valve pre-amplifiers with which an undistorted power output of up to 10 watts is obtained. SPECIFIED COMPONENTS and MULLARD VALVES including PARTRIDGE MAINS TRANSFORMER and choice of PARMEKO or PARTRIDGE Output Transformer.

COMPLETE KIT (Parmeko Output Trans.) **£10.0.0**

ASSEMBLED AND TESTED **£13.13.0**

(Carr. & Ins. 6/6).

ABOVE incorporating PARTRIDGE OUTPUT TRANS. £1.6.0 extra. Instruction book and detailed price list (free with kit) available separately at 3/- Post Free.



COMBINED PRICE REDUCTION

MULLARD 5-10 Main amplifier and 2 valve Pre-Amp. Kit **£15.15.0**. C. & I. 8/6. Built and tested. **£21.10.0**. C. & I. 8/6.
MULLARD 5-10 Main Amplifier and 3 valve Pre-Amp. Kit **£19.10.0**. C. & I. 8/6. Built and tested. **£25.10.0**. C. & I. 8/6. With Partridge Transformer **£1.6.0** extra.

THE MULLARD 5-10RC AMPLIFIER

The popular complete "5-10" incorporating Passive Control Unit providing up to 10 watts high quality reproduction with input of 600mV. Specified components and new MULLARD VALVES, includes PARTRIDGE MAINS TRANSFORMERS and choice of PARMEKO or PARTRIDGE Output Transformers. Surplus power available for Tuner

COMPLETE KIT **£12.0.0**

ASSEMBLED AND TESTED **£16.0.0** (Carr. & Ins. 7/6).

Instruction book and detailed price list (free with kit) available separately at 2/- Post Free.



THE MULLARD 3-3RC

A HIGH QUALITY AMPLIFIER DEVELOPED FROM THE VERY POPULAR 3-WATT MULLARD "3-3" DESIGN.

KIT OF PARTS **£8.8.0**

ASSEMBLED AND TESTED **£11.10.0** (Carr. & Ins. 6/6).

Complete to the MULLARD specification including PARMEKO OUTPUT TRANSFORMER. Switched inputs for 78 and



L.P. records plus a Radio position. Extra power to drive a Radio Tuning Unit is also available. Please state L.S. Impedance. Instruction book and detailed price list (free with kit) available separately at 2/- Post Free.

TAPE PRE-AMPLIFIER MULLARD Type "C"

Suitable for most 1 track. Mono Tape Decks. Incorporates Ferroxcube Push-Pull Oscillator. Treble Inductor and 3-sp. Equalisation. Includes separate Power Unit.

KIT OF PARTS **£14.0.0** (Carr. & Ins. 7/6). ASSEMBLED AND TESTED **£19.10.0**

Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.



THE "MONO-GRAM"

A small Amplifier of genuine high quality performance. Incorporates MULLARD ECL86 Valve, separate BASS and TREBLE controls. PARTRIDGE output Transformer producing up to 3 watts undistorted output.



KIT OF PARTS **£4.10.0** (Carr. & Ins. 3/6). ASSEMBLED **£6.0.0**
Instruction book and detailed price list (free with kit) available separately at 2/6 Post Free.

Perfectly suited for Portable Installations for which purpose we offer PORTABLE CASE (£3.10.0), the AMPLIFIER (Kit £4.10.0) and 8" x 5" SPEAKER (£1.0.0). All for.. **£9.0.0**

Alternatively with ASSEMBLED AMPLIFIER **£10.0.0** (Carr. & Ins. 5/-).

The Case quoted above will accommodate some 4-speed Single Record Units. A larger model is available for extra 10/- With this Equipment a COMPLETE PORTABLE RECORD PLAYER can be built for **£14.0.0**



MODEL CR3/S TAPE RECORDER

MODEL CR3/S incorporates the HF/TR3 Mk. II Tape Amplifier (described below) and the Collaro "Studio" Twin-Track 3-speed Deck operating at 11in, 3 1/2in and 7 1/2in. speeds. Complete with microphones and 1200ft. tape.

KIT OF PARTS **£33.8.0**

ASSEMBLED AND TESTED **£43.0.0**

(Carr. & Ins. 15/- extra).



STEREO TAPE PRE-AMPLIFIER

MODEL STP-1. For use with current TRUVOX, BRENNELL or COLLARO "STUDIO" 1 and 1 track Stereo Decks. Incorporates Ferroxcube Oscillator, 4-speed Equalisation Signal Lever Meter and separate Gain Control. Includes separate Power Unit. KIT OF PARTS **£22.0.0** (Carr. & Ins. 8/6). ASSEMBLED **£28.0.0**

Instruction book and detailed price list (free with kit) available separately at 5/- Post Free.



MULLARD TAPE AMPLIFIER

MODEL HF/TR3/MK. II

Based on Mullard's Type "A" design and suitable for most 1 track Mono Tape Decks, incorporates Ferroxcube Treble inductor, Gilson Output Transformer, and 3-speed Equalisation. Includes separate Power Unit, using PARTRIDGE Mains Transformer.

KIT OF PARTS **£13.13.0** (Carr. & Ins. 7/6). ASSEMBLED **£19.0.0**

Instruction book and detailed price list (free with kit) available separately at 3/- Post Free.



COMBINATION TAPE UNITS

All our Tape Units can be supplied specially matched to any Tape Deck such as Collaro, Brennell Mk.5 Series II, also the Wearite. Specimen prices as below.

	Kit	Assembled
STP-1 Pre-amp with Collaro Studio Tape Deck.....	£88. 0.0	£42. 0.0
Assembled with track switch fitted, £44.2.0		
STP-1 with Brennell Mk. 5 Series II with Track Switch fitted.....	£88. 4.0	
STP-1 with Brennell Mk. 5 Series II, 4 Track Deck.....		£74.15.0
Type "C" Pre-amp with Collaro Studio Tape Deck.....	£24.10.0	£30. 0.0
Assembled with deck wired and matched, £32.2.0		
Type "C" Pre-amp with Brennell Mk. 5 Series II Deck.....	£46.11.0	£53. 1.0
Assembled with deck wired and matched, £55.3.0		
HF/TR3 with Collaro Studio Tape Deck.....	£24. 8.0	£39.10.0
Assembled with deck wired and matched, £31.12.0		
HF/TR3 with Brennell Mk. 5 Series II Deck.....	£46. 4.0	£51.11.0
Assembled with deck wired and matched, £53.13.0		
Carr. & Ins. 15/- above units. Send S.A.E. for comprehensive price list.		

SEE PRECEDING PAGE FOR
OTHER STERN-CLYNE PRODUCTS

SEND FOR CURRENT PRICE LIST OF ALL LEADING RECORDING TAPES AND ACCESSORIES

STERLING-CLYNE

Electronics Centres throughout Great Britain

THE TUDOR STEREO HI-FI SYSTEM

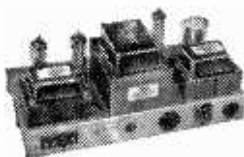


Comprising a Self Powered AM/FM Tuner, Stereo Pre-amplifier, 12 watt per channel Stereo Power Amplifier. The Tuner and Pre-amplifier are housed in matching black crackle finish metal cabinets for shelf mounting, with silver metal dials and matching knobs. Specifications: Tuner: Outstanding quality providing full V.H.F. FM long and medium waveband coverage, frequency range FM 87.5-108.5 Mc/s, AM/MW 522-1630 Kc/s. LW 145-270 Kc/s. 100mV output mains supply 105/240 A.C. Valve line-up: ECC33, ECH81, EBF69, EB91, EM84, ECC33. Multiplex outlet provided. Pre-amplifier—Designed for use with Tudor Stereo Power Amplifier with inputs for most types of Pickups, direct play from Tape-Heads and ample sensitivity for either Crystal or Moving Coil Microphone. Distortion 0.1%, tape outputs 100mV from 90K, ohm source inputs—Microphone 5 mV. Tape 5.3 mV. R.I.A.A. 4.3 mV flat 250 mV. Tuner 2—EF86, 4—ECC83. Power Amplifier—14 watts per channel, sensitivity 1 volt r.m.s. for 14 watts output, frequency response ± 0.5 dB 20 c/s. —20Kc/s. Speaker impedance 4, 8, or 16 ohms, surplus power available for Tape Pre-Amp. mains supply 105/240 v. A.C. Valve line-up: 2—ECC83, 4—EL84, 1—GZ34.

AM/FM TUNER AVAILABLE AT 24 GNS. P. & P. 7/6.
STEREO PRE-AMPLIFIER AND POWER AMPLIFIER TOGETHER AT 24 GNS. P. & P. 10/-.

DUE TO PRODUCTION STREAMLINING WE ARE PLEASED TO ANNOUNCE REDUCTIONS IN PRICE!

★ J.L.10 POWER AMPLIFIER



Incorporates the latest triode-pentode ECL86 valves in push-pull, PARTRIDGE ultra linear output transformer. PARTRIDGE mains transformer and smoothing choke. 10 watts power output, surplus power available for tuner. Output impedance 3—7.5—15 ohms.

KIT OF PARTS **£10.0.0** C. & L. 7/6

READY BUILT **£13.13.0**

★ DOUBLE FEATURE PRE-AMPLIFIER



Inputs for microphone, crystal or magnetic Pickups, tuner unit, and in addition offers full facilities for tape recording and high fidelity replay. This unique feature means that should you wish to include tape in your hi-fi system at a later date all that is required is a suitable tape deck. Push-button switching for 3 tape speeds equalised. Tape erase Bias Oscillator circuit incorporating ferro-cube transformer. Function switch, separate base, treble and volume controls, level control and latest EM87 magic eye level indicator. The pre-amplifier is totally enclosed in a silver hammer finish steel case, and an attractive perspex front panel completes the presentation.

KIT OF PARTS **£13.13.0** READY BUILT **£19.19.0** C. & L. 5/-

PRICES: If both above units are purchased together:

KIT OF PARTS **£23.13.0** READY BUILT **£32.0.0** C. & L. 10/-.

WEST END:	18 Tottenham Court Road, W.1.	MUSEum 5929/0095	Half-day Sat
(Premier Radio)	23 Tottenham Court Road, W.1.	MUSEum 3451/2	Half-day Thurs
(Premier Radio)	309 Edgware Road, W.2.	PADddington 6963	Half-day Thurs
CITY:	109 Fleet Street, E.C.4.	FLEet St. 5812/3	Half-day Sat
NORTH LONDON:	162 Holloway Road, N.7.	NORth 7941	Half-day Thurs
SOUTH LONDON:	9 Camberwell Church Street, S.E.5.	RODney 2875	Half-day Thurs
CROYDON:	12 Suffolk House, George Street.	MUNicipal 3250	Half-day Wed
BRISTOL:	26 Merchant Street, Bristol 1.	Bristol 20261	Half-day Wed
LIVERPOOL:	52 Lord Street, Liverpool.		
MANCHESTER:	20/22 Withy Grove, Manchester 4.	BLAckfriars 5379	Open 6 days a week

Mail Orders and enquiries to Dept. P.W. 3/5 Eden Grove, Holloway, London, N.7.

SEND STAMP FOR COPY OF OUR INTERESTING LITTLE BOOKLET "What is High Fidelity?"

STEREO TAPE DECK WITH BUILT-IN PRE-AMPLIFIER



A professional addition to your Hi-Fi Stereo System consisting of two basic units, the Tape Deck and Pre-amplifier, which employs 4 Transistors and 4 Valves. The Unit with record and playback 1 track stereo or or 1 track mono at either 7 1/2 i.p.s. or 3 1/2 i.p.s. both speeds being fully equalised.

Features: Track System: 1 track 2 channel stereo or monaural record and playback. Independent single channel recording on either channel while playback on other channel. Head Type: 1 track 2 channel inline stereo and associated erase heads. Low loss laminated pole pieces. Level indicators: 2 Meters, 1 per channel. Digital Counter: 3 digit tape position indicator. Automatic Stop: When tape runs out or breaks. Inputs: Microphone 1mV (50K, ohms impedance) Gram/Tuner 50mV (high impedance). Output: (cathode follower). Monitor Sockets: 2 x 5 K. ohms impedance. Audio Output: 500mV. Oscillator: Push-pull 80 Kc/s. S/N Ratio: —45dB or better at 7 1/2 in. tape speed. Separation: 45dB or more between stereo channels. Frequency Response: 40 to 15,000 cycles per sec. at 7 1/2 i.p.s. 40 to 9,000 cycles per sec. at 3 1/2 i.p.s. Single Motor: 4 pole heavy duty induction type. Power Supply: 240v. A.C. 50 cycles. Size 6 1/2 x 10 1/2 x 15 1/2. Tape Size: Up to 7 in. Line Up: 4-2SB173 Transistors, 2-12AT7, 1-1A07, 1-12BH7 Valves.

THE 'HIGHWAYMAN'



OUR QUALITY CAR RADIO TO BUILD YOURSELF AT A NEW LOW PRICE

Look at these features:

★ Attractive styling. ★ Push-pull output. ★ Three latest Buzz, high output and sensitivity. ★ Printed circuit (latest type). 7 x 4 in. high flux p.m. speaker and baffle. ★ Medium and Long Waves. ★ Push button for fingertip control. ★ Extremely low battery consumption (less than 1 amp). ★ Easy to fit any make car (Positive earth only). ★ 12-volt operation. ★ Compact size, measures only 7 x 7 x 2 1/2 in. deep. ★ Easy assembly, supplied with dial and drive already mounted.

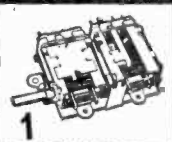
Special inclusive price of ONLY **£7.19.6** Plus 5/- P. & P. All parts available separately. Individually priced parts list and comprehensive instruction booklet 2/6 post free. (Deducted from cost if complete parcel purchased later). Optional extras: 3 section chromium plated weatherproof telescopic aerials type 1 17/44", 19/6; type 2, 27/44", 29/6, both plus P. & P. 3/6 if purchased separately.

ACOS MONAURAL STETHOSCOPE HEADSETS

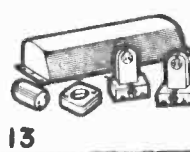
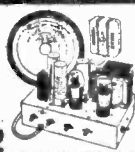
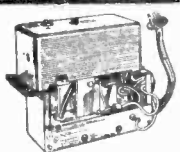
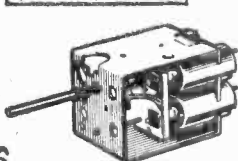
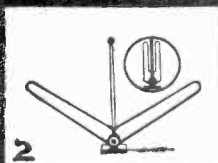
Suitable for Tape Recorders, or monitoring tape recorders, 100 ohm impedance magnetic. Complete with lead. 12.6 P. & (Originally 21/-). OUR PRICE **12.6 P. 1/6**

NEWS FLASH !!

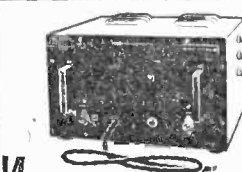
YET ANOTHER NEW ELECTRONICS CENTRE NOW OPEN AT 52, LORD STREET, LIVERPOOL.



Just a few of our **BARGAINS**



FREE OFFER
ELECTRIC
SOLDERING IRON
with the
POCKET
MULTI-METER
See item No. 7
for further details



- 1. CYLON A.M. F.M. PERMEABILITY TUNER FOR ALL TRANSISTOR OPERATION.** Size $2\frac{1}{2} \times 2\frac{1}{2}$ in. approx. By famous manufacturer. A.M. I.F. 470 Kc/s. F.M.-I.F. 10.7 Mc/s. A.M. coverage from 1820 Kc/s-525 Kc/s. F.M. coverage 108 Mc/s-88 Mc/s. Circuit diagrams 2/6. FREE with Tuner, 25/-, 1st, 2nd, 3rd A.M. I.F.'s. 12/6 set. 1st, 2nd, 3rd and 4th F.M. I.F.'s. 12/6 set. V.H.F. Osc. choke, 1/-, A.M. I.F. trap, 1/6. A.F. 114 and A.F. 116. 5/- each. All the above are the RF end of an AM/FM receiver car radio, etc. The above six items purchased together, £21.0.0.
- 2. 625 INDOOR AERIAL.** Complete with stand, fully extendable, can also be used for 405, I.T.V. BBC and FM. 19/6, plus 1/- P. & P.
- 3. A.C./D.C. POCKET MULTI-METER KIT.** 2in. moving coil inner scale, calibrated in A.C./D.C. volts, ohms and milliamperes. Voltage range A.C./D.C. 0-50, 0-100, 0-250, 0-500. Milliamperes 0-10, 0-100, Ohms ranges 0-10,000, 0-100,000, 19/6. P. & P. 2/-. Wiring diagram 1/-, free with parts.
- 4. SIGNAL GENERATORS:** Cash £7.5.0 or 30/- deposit and 6 monthly payments of 21/6. P. & P. 1/6. Coverage 100 Kc/s to 100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Case 10 x 6 1/2 x 5 1/2 in. Three miniature valves and Metal Rectifier. A.C. mains 200/250v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. Modulated or unmodulated R.F. output continuously variable 100 millivolts, C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy 2 per cent.
- 5. SIGNAL GENERATORS.** Cash £5.5.0. P. & P. 6/6. Coverage 150 Kc/s to 84 Mc/s. Case 10 x 6 1/2 x 4 1/2 in. Size of scale 6 1/2 x 3 1/2 in. 2 valves and rectifier. A.C. mains 230-250v. Internal modulation of 400 c.p.s. to a depth of 30 per cent, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.F. output and moving coil output meter. Accuracy ± 3 per cent.
- 6. CYLON PERMEABILITY TUNER** medium and long wave Tuner. Size $3 \times 2 \times 1\frac{1}{2}$ in. approx. Coverage 190-540 Metres. 1250-2000 metres. I.F. 470 Kc/s. Price 19/6. P. & P. 1/6.
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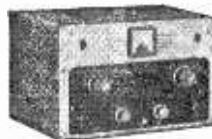
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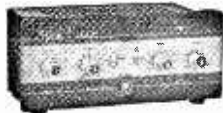


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227M A.M./F.M. Radio chassis, 10 watts £23.18.0
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 Leak Variolope 2 stereo pre-amplifier £25.0.0
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MONO AMPLIFIERS

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THE R.S.C. BASS-MAJOR 30 WATT GUITAR AMPLIFIER

A MULTI-PURPOSE HIGH FIDELITY, HIGH OUTPUT UNIT
FOR VOCAL AND INSTRUMENTALIST GROUPS

Eminently suitable for bass, lead or rhythm guitar and all other musical instruments

- ★ Incorporating two 12in. heavy duty 25-watt high flux (17,000 lines) loudspeakers with 2in. diameter speech coils. Designed for efficiently handling full output of amplifier at frequencies down to 25 c.p.s.
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- ★ For 200-250 v. to 50 c.p.s. A.C. mains operation.
- ★ Four jack socket inputs and two independent vol. controls for simultaneous connection of up to four instrument pick-ups or microphones.
- ★ Separate bass and treble controls providing more than adequate "Boost" or "Cut".
- ★ LEVEL frequency response throughout the audible range.
- ★ SUPERIOR TO UNITS AT TWICE THE COST.

39¹/₂ Gns.

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R.S.C. G5 GUITAR AMPLIFIER
5-watt high quality output. Incorporating high flux 12in 10 watt 12,000 line loudspeaker. Sensitivity 60 m.v. High impedance jack input. Handsome strongly made cabinet (size 14 x 14 x 7in. approx.) finished in complementary shades of Rexine/Tygan. 200-250 A.C. mains.

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LINEAR TREMOLO/PRE-AMP. UNIT
Designed for introducing the Tremolo effect to any amplifier which is fitted with a reserve power supply point for smoothed H.T. and 6.3 v. A.C. L.T. This applies to practically all amplifiers of our manufacture, and to those of several other manufacturers. The unit plugs into power supply point and any input socket or amplifier. Controls are Speed (frequency of interruptions). Depth (for heavy or light effect). Volume and Switch. Three sockets are for two inputs and Foot Switch. ONLY **4 Gns.**

R.S.C. SENIOR 15 WATT LEAD or RHYTHM GUITAR AMPLIFIER

High-fidelity push-pull output. Separate bass and treble "cut" and "boost" controls. Twin separately controlled inputs so that two instruments or "mike" and pick-ups can be used at the same time. Loudspeaker is a heavy duty high flux 12in. 20 watt model with cast chassis. Cabinet is well made and finished as Junior Model. Size approx. 18 x 18 x 8in.

Only **19 Gns.** Carr. 10/-

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R.S.C. B20 BASS GUITAR AMPLIFIER

A highly efficient unit incorporating a massive 15in. high flux loudspeaker specially constructed to withstand heaviest load conditions. Rating 25 watts. Individual bass and treble controls give ample "boost" and "cut". Two high impedance jack socket inputs are separately controlled. All controls are conveniently positioned in a recess on top of the cabinet. Cabinet is of substantial construction and attractively finished in two contrasting tones of Rexine and Vynair. Size approx. 24 x 21 x 13in. Operation from 200-250 c.p.s. A.C. mains.

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Brand New Complete £7.19.6 Carr. 5/6.
Manufacturers' discontinued Model. Push-pull output. Latest high efficiency valves. Dual separately controlled inputs for "Mike". Separate Bass and Treble Controls. High sensitivity. Output for 3 or 15 ohm speaker. Guaranteed tested and in perfect working order.

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COMPLETE POWER PACK KIT, 19/11
Consisting of Mains Trans., Metal Rectifier. Double electrolytic, smoothing choke chassis and circuit. For 200-250 v. A.C. mains. Output 250 v., 60 mA, 6.3 v., 2 a.

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

A highly sensitive Push-Pull high output unit with self-contained Pre-amp, Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 dB down. Frequency response ± 3 dB 30-20,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUT-DOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for RADIO FEEDER UNIT. An extra input with associated tone control is provided so that two separate inputs such as Gram and "Mike" can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 3 and 15 ohm speakers. Complete Kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. If required perforated cover with carrying handles can be supplied for 19/9. The amplifier can be supplied, factory built with EL34 output valves and 12 months' guarantee, for 14 gns. Send S.A.E. for leaflet.

11 Gns.

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 Terms: DEPOSIT 33/9 and 9 monthly payments of 33/9.
 Suitable microphones and speakers available at competitive prices.

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SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner (specially suitable for use with our Amplifiers). Delayed A.V.C. Controls are Tuning, W.Ch. and Vol. Only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size approx. 9 x 6 x 7in. high. Simple alignment procedure. Point-to-point wiring diagrams, instructions and priced parts list with illustrations. 2/6. Total building cost £55.0. S.A.E. for leaflet.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

R.S.C. BATTERY TO MAINS
 Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains are 250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 and 90 v. This includes low consumption types. Complete kit with diagrams, 39/9, or ready to use, 46/6.



kit of parts with diagrams and instructions, 49/9, or ready to use, 59/6.

P.M. SPEAKERS. 10in. W.B. "Stentorian" 3 or 15 ohms type HF1012 10 watts. hi-fidelity type. Recommended for use with our A11 Amplifier. £4.12.6. 12in. R.A. 3 ohms 10 watts (12,000 lines), 59/9.

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R.A. 12in. DUAL CONE 3 ohm 8 watt Speakers. Ideal for Stereo. Only 39/9 ea.

JASON FM/IT V.H.F./F.M. Radio Tuner design. Total cost of parts including valves-Tuning dial, Escutcheon, etc., £6.19.6.

LINEAR 1.45 MINUTIME 4-5 WATT QUALITY AMPLIFIER. Suitable for any record playing unit and most microphones. Negative feed-back 12 dB. Separate Bass and Treble Controls. For mains 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Mullard valves E280, ECC83, EL84. Size only 7 x 5 x 5 1/2 in. high. Guaranteed 12 months. Only 6 gns. Send S.A.E. for leaflet. Terms: Deposit 23/9 and 5 monthly payments of 2/9.



230-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue Hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use 25/- extra. Plus 3/6 carr. or deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

R.S.C. 4/5 WATT AS HIGH-GAIN AMPLIFIER

A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all "mikes". Separate Bass and Treble controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 dB down. 15 dB of Negative feedback is used. H.T. of 300 v. 25 mA and L.T. of 6.3 v. 1.5 A is available for the supply of a Radio Feeder Unit, or Tape-Deck pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with baseplate) with Blue Hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0, or assembled ready for use 25/- extra. Plus 3/6 carr. or deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

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R.S.C. BASS REFLEX CABINETS, JUNIOR MODEL. Specially designed for W.B. HF1012 Speaker, but suitable for any good quality 10in. speaker. Acoustically lined and ported. Polished walnut veneer finish. Size 18 x 12 x 10in. Handsome appearance. Ensure superb reproduction for only £3.19.6.

STANDARD MODEL. As above but for 12in. speakers. Size 20 x 15 x 13in. For vertical or horizontal use, £5.19.6. Set of legs with brass ferrules, 19/6.

R.S.C. JUNIOR HI-FI REPRODUCER. The very latest Goodman Axiote 8 High Fidelity loudspeaker (retailing at approx. 5 gns.) in a specially designed Bass Reflex cabinet size 12 x 18 x 10in. Acoustically lined and ported and finished in polished walnut veneer. Matching impedance 15 ohms. Frequency range 40-15,000 c.p.s. Power handling 15 watts nominal. Ideal for Stereo. 8 Gns. Carr. 4/6.

MULTI-METER CABY ML. Sensitivity 2,000 ohms per volt. A.C. and D.C., 54/-, A.10. Basic meter sensitivity 155 microamps A.C. and D.C. ranges £4.11.6. B.40. Sensitivity up to 10,000 ohms per volt A.C. and D.C., £6.2.6. 50,000 ohms per volt, with overload buzzer, £8.19.6.

R.S.C. CORNER CONSOLE CABINETS

Polished walnut veneer finish. Pleasing design. **JUNIOR MODEL.** Size 20 x 11 x 8in. for 8 x 5in. or 10 x 6in. speakers, £22.9.9. **STANDARD MODEL.** Size 27 x 18 x 12in. for 8 or 10in. speakers, £4.11.9. **SENIOR MODEL.** Size 30 x 20 x 15in. for 12in. Speaker. Suitable for speaker systems below. Only 7 gns.

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. The smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating £4.19.9. Carr. 5/- or Senior 15 watt, £6.19.9. Carr. 7/6.

AUDIOTRINE EQUIPMENT CABINET. Size 34 x 15 x 18in. Beautifully finished. Walnut veneer. Elegant design. Robust construction. Unrust, removable baseboard. Depth above baseboard 5 1/2 in. Only 12 1/2 gns. Carr. 13/-
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REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN AN HOUR. Incorporating the latest Collaro Studio Tape Transcriber. 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 tastefully covered in two contrasting shades of Rexine and Vynair, size 14 1/2 x 15 x 8 1/2 in. high and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.E.A. for leaflets. TERMS. Deposit £2.13.9 and 12 monthly payments of 44/-.

HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

PUSH-PULL ULTRA LINEAR OUTPUT 'BUILT-IN' TONE CONTROL PRE-AMP STAGES

Two input sockets with associated controls allow mixing of "mike" and gram., as in A10. High sensitivity. Includes 5 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 + 3 dB 30-30,000 c/s. Six negative feedback loops. Hum level 40 dB down. ONLY 23 millivolts INPUT required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best designs for **STANDARD or LONG PLAYING RECORDS.** For MUSICAL INSTRUMENTS such as **STRING BASS, LEAD or RHYTHM GUITARS, etc.** OUTPUT SOCKET with plug provides 300 v. 30 mA. and 6.3 v. 1.5 a. For supply of a RADIO FEDER UNIT. Size approx. 12 x 9 x 7 in. For A.C. mains 200-250 v. 50 c.p.s. Output for 3 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/- (Or factory built 51/- extra.) If required louvered metal cover with 2 carrying handles can be supplied for 18/9. Send ON ASSEMBLED UNITS. DEFONIT 24/9 and 9 monthly payments of 24/9. Send S.A.E. for illustrated leaflet detailing Cabinets, Speakers, Microphones, etc., with cash and credit terms.

LINEAR TAPE PRE-AMPLIFIER. Type LP/1. Switched Negative feedback equalisation Positions for Record (lin., 3in., 7in. and Playback, EM84 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriber and a high fidelity amplifier, but suitable for almost any Tape Deck. Only **9 gns.** S.A.E. for leaflet.

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



Kit can be supplied assembled and

A complete set of parts for the construction of a stereo-phonograph amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts. Suitable for all crystal stereo heads. Ganged Bass and Treble Control give equal variation for "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. Carr. 10/-.

ONLY 4 PICK-UP ARMS. COMPLETE AND WITH LATEST ACOS/HI-TURNOVER CARTRIDGE 29/11.



R.S.C. GRAM. AMPLIFIER KIT. 3 watts output. Negative feedback. Controls Vol., Tone and Switch. Mains operation 200-250 v. A.C. Fully isolated chassis. Circuit, etc., supplied. Only 39/9. Carr. 3/9.

HI-FI CRYSTAL PICK-UP HEADS. (Cartridges) Acos Standard replacement for Garrard, B.S.R. and Collaro. 18/9. Acos Stereo-Monaural. 29/9. Ronette Stereo-Monaural 39/9. B.S.R. Stereo 39/9.

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MARRIOTT RECORDING HEADS. High Impedance. Record/Playback 15/-, Low Impedance. Erase. 10/-.

PICK-UP ARMS. Complete and with latest Acos/HI-Turnover Cartridge 29/11.

CRYSTAL MICROPHONES. Hami type NP110 14/9, R.T.C. 19/9, Acos Mic 40 25/9, Acos Mic 45 29/9, Stick type Acos 39-1 39/9, BM3 with neck band and heavy table stand 59/9. Lajel type 29/9.

PILLAR JUNIOR. 4-speed Single Player Unit and Crystal Pick-up with hi-Turnover head. Only 63-19-6.

B.S.R. UA4 4-sp/d AUTO-CHANGERS with hi-T turnover head. 88-19-6. Carr. 4/6.

GARRARD AUTO-SLIM 4-SPEED AUTO-CHANGER with high fidelity pick-up. Latest model. For 200-250 v. A.C. mains. £7.17-6. Carr. 4/6.

GARRARD AT6 AUTO-SLIM DELUXE 4-SPEED AUTOCHANGERS. Turnover GCB head, for 200-250 v. A.C. mains. £11-10-0.

GLA MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. A.C. mains. Size 1 1/2 x 2 1/2 in. Controls: Vol. and Tone with Switch. Only 59/8.

R.S.C. BATTERY CHARGING EQUIPMENT

Guaranteed 12 months.

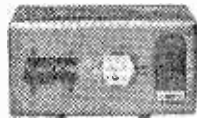
SENSATIONAL STEREO OFFER

A complete set of parts to construct of a good quality Stereo amplifier with an undistorted output total 8 watts. For A.C. mains input of 200-250 v. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and wiring diagrams supplied. Stereo Pick-up Head 19/9 extra with above only.

4 Gns.

HEAVY DUTY CHARGER KIT

6/12 v. 6 amps., variable output. Consisting of Mains Transformer 0-200-250 v.; F.W. (Bridge) Selenium Rectifier; Ammeter, Variable Charge Rate Selector, Panels, Plugs, Fuses, Fuseholder and circuit. 59/9. Carr. 4/8.



charging. Louvered steel case with stoved grey hammer finish. Fused and ready for use with mains and output leads and battery clips. Carr. 4/6. Terms: Deposit 12/- and 5 monthly payments of 12/-.

CHARGER KIT. 12 v. 14 AMP or 24 v. 7 AMP

Consisting of mains trans. 200-250 v. F.W. (Bridge) selenium Rectifier, Ammeter, Fuses, Variable Resistor, Heavy Steel Stove enamelled case and Circuit. Only 99.19.8. Carr. 15/-.

R.S.C. MAINS TRANSFORMERS (GUARANTEED)

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

TOP SHROUDED DROP THROUGH

250-0-250v.	70mA.	6.3v. 2a.	0-5-6.3v. 2a.	17/9
350-0-350v.	60mA.	6.3v. 2a.	0-5-6.3v. 2a.	19/9
250-0-250v.	100mA.	6.3v. 2a.	0-5-6.3v. 1a.	21/9
250-0-250v.	130mA.	6.3v. 2a.	0-5-6.3v. 1a.	21/9
250-0-250v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	27/9
300-0-300v.	130mA.	6.3v. 4a.	0-5-6.3v. 1a. for Mullard 510 Amplifier	38/9
300-0-300v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	27/9
350-0-350v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	27/9
350-0-350v.	150mA.	6.3v. 4a.	0-5-6.3v. 3a.	35/9

FULLY SHROUDED UPRIGHT

250-0-250v.	60mA.	6.3v. 2a.	0-5-6.3v. 2a.	17/11
250-0-250v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	28/9
300-0-300v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	28/9
300-0-300v.	130mA.	6.3v. 4a.	0-5-6.3v. 3a.	35/9
350-0-350v.	100mA.	6.3v. 4a.	0-5-6.3v. 3a.	35/9
350-0-350v.	150mA.	6.3v. 4a.	0-5-6.3v. 3a.	37/9

FULLY SHROUDED (continued)

425-0-425v.	200mA.	6.3v. 4a.	C.T. 5v. 3a.	57/9
425-0-425v.	200mA.	6.3v. 4a.	C.T. 6.3v. 4a.	57/9
450-0-450v.	250mA.	6.3v. 4a.	C.T. 5v. 3a.	59/9

OUTPUT TRANSFORMERS

Midget Battery Pentode 68:1 for 384. etc.

Small Pentode 5,000 to 30	4/6
Small Pentode 700 to 30	4/6
Standard Pentode 5,000 to 30	5/8
Standard Pentode 7,000 to 30	5/8
10,000 to 30	5/8
Push-Pull 8 watts, EL84, or 6V6 to 30	9/9
or matched to 15	9/9
Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5 to 15	10/9
Following types for 3 and 15 ohm speakers:	
Push-Pull 10-12 watts 6V6 or EL84	18/9
Push-Pull 15-18 watts 6V6 or EL84	22/9
Push-Pull Mullard 510 Ultra Linear	25/9
Push-Pull 20 watts, sectionally wound, 6L6, KT66, EL34, etc.	49/9

BATTERY CHARGER KITS

Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case, Fuses, Fuse-holders, Grooves, panels, Heavy Duty Clips, circuit. Carr. 3/9 extra.

6v. or 12v. lamp.	22/9
As above, with Ammeter	28/9
6 v. 2 amps.	19/9
6 v. or 12 v. 2 amps.	25/9
6 v. or 12 v. 2 amps. inclusive of Ammeter	35/9
6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector	52/9

CHARGER AMMETERS

0-1.5 a., 0-4 a., 0-7 a. 8/9 ea.

CHARGER KIT. 12v. 10 Amp.

with variable charge rate adjustment and ammeter. £4.19.8. Carr. 10/-.

MIDGET MAINS PRIMARIES 240-250 v

50 c/s. 250v. 60mA. 6.3v. 2a.	11/9
250-0-250v. 60mA. 6.3v. 2a.	12/11
Both above size 2 1/2 x 2 1/2 in.	

FILAMENT TRANSFORMERS

All with 200-250v. 50 c/s. primaries 6.3v.	
100mA. 10H. 350 ohms	6/9
12v. 1a. 7/11; 6.3v. 3a. 8/11; 6.3v. 6a. 17/6	
12v. 1.5a. 20 watt, 17/6.	

SMOOTHING CHOKES

150mA. 7-10 H. 250 ohms	11/9
100mA. 10H. 350 ohms	8/9
100mA. 10H. 350 ohms	8/9
60mA. 10H. 400 ohms	4/11

CHARGER TRANSFORMERS

All with 200-250-250v. 50 c/s. Primaries:

0-9-15v. 11a. 12/9; 0-9-15v. 2a. 14/9; 0-9-15v. 3a. 16/9; 0-9-15v. 5a. 18/9; 0-9-15v. 6a. 23/9;	
0-9-15v. 8a. 28/9.	

AUTO (step up/step down) TRANS.

0-110-120-230-250v. 50-60 watts. 13/9;

MICROPHONE TRANSFORMERS

120:1 high grade, clamped. 8/9.

TRANSISTORISED MORSE OSCILLATOR

Fitted 24in. Moving Coil Speaker. Uses type PP3 or equiv. 9 v. battery. Complete with latest design Morse Key, 22/6. Plus 1/6 P. & P.

SEMI-AUTOMATIC "BUG" SUPER SPEED MORSE KEY

7 adjustments. precision tooled speed adjustable. 10 w.p.m. to as high as desired. Weight 21lb. Price £4.12.6. Post paid.

BUILD AN EFFICIENT STROBE UNIT FOR ONLY 37/6

The ideal instrument for workshop, lab. or factory. This wonderful device enables you to "freeze" motion and examine moving parts as stationary. We supply a simple circuit diagram and all electrical parts including the NSP2 Strobe tube which will enable you to easily and quickly construct a unit for infinite variety of speeds, from 1 flash in several seconds to several thousands per minute. New modified circuits bring price down to 37/6 plus 3/- P. & P. NSP2 CV2596 STROBOTRON FLASH-TUBE made by Ferranti, brand new. I.O. base. Price 15/- P. & P. 1/-.

ULTRA VIOLET BULBS

Easy to use source of UV for dozens of practical and experimental uses. 12 volt 36 watt AC/DC SBC 8/6. P. & P. 1/- 12 volt 60 watt AC/DC SBC 8/6. P. & P. 1/- Transformer to suit the above: Input 200-240 A.C. Output 12 Volt A.C. 36 watt, 16/8. P. & P. 2/6 Input 200-240 A.C. 12 volt A.C. 60 watt, 22/8. P. & P. 3/6. Set of four colours FLUORESCENT Paint. Orange, Yellow, Green and Red, in 4oz. tins. Ideal for use with the above Ultra Violet Bulbs, 9/6. P. & P. 1/6.

VARIABLE VOLTAGE TRANSFORMER £4.10.0



Post Paid Input 230 v. A/C. Output 0-260 v. at 1 amp., fully shrouded, new. Also available 2.5, 5, 8, 10, 12 and 20 amp. Write for details.

SIEMENS SEALED HIGH SPEED RELAYS

H96A, 2.2 ohm + 2.2 ohm, new .. 12/6
H96B, 50 ohm + 50 ohm, new .. 12/6
H96C, 145 ohm + 145 ohm, new .. 12/6
H96D, 500 ohm + 500 ohm, new .. 12/6
H96E, 1700 ohm + 1700 ohm, new .. 16/8
SOLENOID. Overall length 3 1/2 in. stroke 1/2 in. Maximum push 8oz. 12-24 v. D.C. operation. D/C resistance 35 ohm. Price 8/6. P. & P. 1/6.

VAN DE GRAAF GENERATOR

Equipped with Motor drive for 230 v. A/C. giving a potential of approx. 50,000 volts. Supplied absolutely complete, including accessories for carrying out a number of interesting experiments, and full instructions. This instrument is completely safe, and ideally suited for School demonstrations. Price £6.6.0, plus 4/- P. & P.

LIGHT SENSITIVE SWITCH

Kit of parts, including ORP, 12 Cadmium Sulphide Photocell, Relay, Transistor and Circuit, etc., price 25/- plus 2/6 P. & P. ORP 12 including circuit, 10/6 each, plus 1/- P. & P.

TRANSISTORS

OC41	7/-	OC139	12/-	GET573	12/6
OC45	5/-	OC139	12/-	2G110	12/6
OC71	5/-	OC140	19/-	2N458	20/-
OC72	7/-	OC171	10/6	2N345	7/6
OC73	6/-	OC200	10/6	AC107	14/6
OC201	7/-	OC201	21/-	AF114	11/-
OC76	6/-	OC203	13/-	AF115	10/6
OC77	9/-	GET104	6/-	AF116	10/-
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Available in matched pairs.

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PHILIPS ELECTRONIC ENGINEER KITS

The Philips EE8. A wonderful new kit for the beginner. Eight different circuits can be built including two radio receivers, a gramophone amplifier and morse practice set. High quality components only are supplied including Mullard Transistors. No soldering required; all components can be used again and again.

Price £4.19.6, post free

The Philips A20 Accessory Kit. This is for use with the EE8 Kit and it makes possible the construction of a further twelve circuits including an Electronic Organ and Inter-comm set.

Important. The A20 kit cannot be used by itself and is only suitable for use in conjunction with the EE8.

Price £3.9.6, post free

An illustrated leaflet is available free. Please send 3d. stamp for postage.

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Please note: Post orders only.

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PADGETTS RADIO STORES

OLD TOWN HALL, KNOWLER HILL,
LIVERSEDGE, YORKS.

Telephone: Cleckheaton 2866

Motors removed from Washing Machines Fully guaranteed. 230 volt. 1/4 hp., 25/- Carriage 8/- B.R.S. Rail quicker 10/6 Hoover Motors, 1/6 hp. Complete with Drive Pulley, 15/- Carriage 6/- Hoover Pump, 7/6. Post 2/6.

Transistor Clearance, 10p grade. OC71, OC72, OC45, OC200, OC77, all at 3/6 each. Post paid. Diodes, 4/- dozen. New 12in. Speaker with Built-in Tweeter, 25/6. 3 or 15 ohms. Post free.

New Valves, £5 Units, POST FREE. 6X7 1/8 each, doz. 12/-, 6X8 2/8 each, doz. 22/-, 6V6 2/8 each, doz. 22/-, 607 USA 4/6, PP3/250 (PX4) 5/-, AC2PEN (PENA4) 2/6, 5U4 3/-, 6V6GT 4/6, EF91 1/9, EL91 1/9, 8P6 2/-, 5Z4 5/6, 5Y3 4/6, 6X5 4/6, EF50 1/9, 6/- doz. AR12 1/8, 5 for 5/6, box of 50 1/9, KT86 8/-, ARTP2 2/-, ART4 2/-, APP37 2/-, AR8 2/-, 174 2/-.

13 Channel TV Sets, 14in. untuned 30/-, each 10/-, 17in. untuned 50/-, carr. 10/- Well packed, sent at owner's risk.

TV Tubes, Complete rebuilt and refaced. 12 months' guarantee. Sizes up to 17in. Special trade price of 75/- Carr. and ins. 7/6 B.R.S. Mail 12/6.

RECLAIMED TUBES

Mullard 12 and 14. Mazda CRM141-2 at 17/-, carr. 7/6. Mullard and Mazda 17in., 30/-, carr. 7/6. Guarantee.

P.M. Speakers. Guaranteed ex TV Sets. 6in. round, 6 x 4in. Rola and Plessey, Philips 5in. round, all at 3/- each. Post 2/-, 6 for 20/-, post paid. Goodmans 7 x 4in., 5/-, post 2/-, 6in. round, 6/-, post 2/-.

Valves Removed from TV Sets. Tested on a Mullard Valve Tester and are 100w as new. Three months' unconditional guarantee. POST FREE.

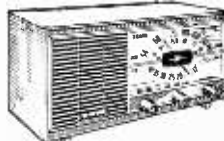
Spare for your 19 Set. 500 micro-amp Tester, 5/-, post 1/9.

Complete Set of Tester Valves, 15/-, post free.

Relays, type 3000. 1/9, post 1/9, doz. lots 20/-, post paid.

ECL80	2/-	10P14	5/-	P133	4/-
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EF91	9d.	20P1	5/-	PCF80	4/6
EL18	6/-	U25	5/-	PC84	4/6
ESM7	2/6	U801	8/6	E36	4/-
6F1	1/-	U281	5/-	N37	5/-
6F14	5/-	U282	5/-	6U4	5/-
6F15	5/-	U329	5/-	6P25	3/6
6P20	5/-	U396	5/-	6K25	3/6
6C21	5/-	PL41	5/-	6P28	3/6
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10P13	5/-	PL83	5/-	18SBT	8/-

EF80 1/6, or 10/- per doz. Grade II EF80 for test purposes 4/- per doz.



BRAND NEW A.C. MAINS 5 VALVE SUPERHET RADIO RECEIVERS

Housed in beautifully styled cabinets offering terrific performance and very high quality reproduction. Built-in ferrite rod aerial for reception of all your favourite programmes. Fully guaranteed.

MODEL 55 (as illus.). Covers Medium, Long and Short Waves. Size 8 1/2 in. x 3 1/2 in. d 4 1/2 in. b. PRICE ONLY £7.17.6. P. & P. 5/6.

MODEL 36. Similar circuitry to above but covers Medium waves only. Size 7 1/2 in. x 3 1/2 in. d 4 1/2 in. b. PRICE ONLY £4.14.6. P. & P. 5/6.

SPECIAL OFFER

HIGH GRADE TWO-STAGE GRAM AMPLIFIERS

Made by very well-known manufacturer. Using a double-wound mains transformer (fully isolated chassis) with tapped primary, full wave contact cooled rectifier and Mullard ECL82 triode-pentode valve. 3 watt output. Separate tone and volume controls. Overall size 6 1/2 in. wide x 3 in. deep x 4 1/2 in. high. Each amplifier Brand New and tested and supplied complete with valve. 3 ohm output transformer and knobs.

PRICE 49/6 P. & P. 4/-.

(Ideal as an add-on self contained Audio unit for our MK1 or MK2 FM Tuner).

BRAND NEW 3 OHM LOUDSPEAKERS

3 1/2 in., 12/6; 6 in., 15/-; 8 in., 21/-; 10 in., 25/-; 12 in., 27/6; 15 in., 30/-; 10 in. x 6 in. 26/- Latest type E.M.I. 131 x 8 in. with high flux ceramic magnet, 11,000 gauss. Aluminium centre cone. 10 watts. 50 c/s to 10 Kc/s., 42/- P. & P. up to 6in. 1/6; over 6in. 2/6 per speaker.

SPECIAL OFFER !!

BRAND NEW HEAVY DUTY 12 in. SPEAKERS Response 45-13 kc/s. 14in. voice coil. Available in 3 or 15 ohm. Guaranteed full 15 watts British rating. Heavy cast aluminium frame. These are current production by world famous makers 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/-.

SPEAKER AND CABINET FABRIC Oatmeal or Red and Gold Vynair for speaker and cabinet covering, also Red Rexine for cabinet covering only. All 54in. wide and usually sold at 35/- yard.

OUR PRICE 13/6 per yard length. plus P. & P. 1/9 (Minimum order 1 yard). Send S.A.E. for samples.

BARGAIN OFFER CORNER

ROLA CELESTION. Approx. 9in. x 6in. x 3 ohm. Middle register speaker, 10/6. P. & P. 2/6.

MAINS TRANSFORMER

Drop thru type. Tapped primary 110v., 200v., 220v., 240v. 320-0-320v. at 80ma and 6.3v. at 3 amps. Geiger counter. Stack size 3 1/2 x 2 1/2 in. Weight 4 lbs. ONLY 15/- P. & P. 2/6.

ACOS CRYSTAL MIKES. High imp. For desk or hand use. High sensitivity. 18/6. P. & P. 1/6.

TSI 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 1 1/2 in. long x 1/2 in. dia. 2 for 3/6. Post free.

TRANSISTOR DRIVER AND OP TRANSFORMERS. (Tapped 3 ohms and 15 ohms output) plus 4 suitable Transistors giving approx. 1 watt output, 30/- P. & P. 2/-.

CONDENSERS. 5,000 mFd. 12 v. wkg. Size 3 1/2 in. dia. 2/- each. P. & P. 6d. each.

BRAND NEW PLESSEY 12v. 4 pin non-synch. vibrators. Type 12.14SD. ONLY 9/6. P. & P. 1/6 each.

3-PUSH BUTTON SWITCH UNIT. 4 single pole changeover on each push-button. Approx. 3 x 1 1/2 x 2 in. An absolute Bargain at 4/6 each P. & P. 1/- each.

MATCHED PAIR OF 21 WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stack size 1 1/2 x 1 1/2 in. Output taps for 3 ohm and 15 ohm output. 10/- pair plus 2/- P. & P. Worth double.

Harverson Surplus Co. Ltd. ▶

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 7 1/2 in. w. x 4 in. d. x 4 1/2 in. h. Incorporates ECC83, EL84, E280 valves, heavy duty double-output transformer matched for 3 ohm speaker, separate Bass, Treble and volume controls. Negative feedback line. Output 4 1/2 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, P. & P. £4.50 5/- etc., wired and tested for only

TAPE DECKS

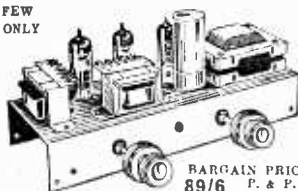
COLLARO STUDIO DECK. £10.10.0 plus 5/6 carr. and ins.

B.S.R. MONARDECK. Single speed, 3 1/2 in. per sec., simple control uses 5 1/2 in. spools, £6.15.0 plus 5/6 carr. and ins. (Tapes extra only both).

STEREO AMPLIFIERS

Incorporating 2 ECC83s and 1 E280 heavy duty double-wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.

FEW ONLY



BARGAIN PRICE
89/6 P. & P. 5/-

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband transistor superhet

- Printed circuit panel (size 8 1/2 x 2 1/2 in.).
- 3 pre-aligned I.F. transformers.
- High-grain 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 £4.50 P. & P. 2/6

35 OHM SPEAKERS

Suitable for use with above. 3 in. Goodmans. Ideal replacement for most pocket portables. 8/6 3 1/2 in., 12/6; 5 in., 17/6; 7 x 4 in. 21/-.

P. & P. 1/6 per speaker.

Portable CABINET

Size approx. 9 1/2 x 13 x 3 1/2 in. Suitable for above using 3 1/2 in. speaker, 25/-.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 I.F. transformers, one oscillator coil, one driver transformer and wound Ferrite aerial (med., long and aerial coupling). 32/6 complete, post 1/-.

3 transistor printed circuit board to match, 8/6. Post 5d. Circuit diagram 1/6 extra.

SPECIAL TRANSISTOR BARGAINS ALL BRAND NEW

GET 15 Matched Pair 15/-

OC71 5/- OC72 6/- OC76 6/-

PXA101 6/6 XA103 6/6 V16/10p 12/6

Set of Mullard 4 transistors. OC44, 2-OC45, OC81D matched pair OC81, 25/-.

EDIWAN MAZDA

R.F. 1 Pack: 1—PXA102 Mixer: 2—PXA101 I.F. Amp. (Equiv. OC44 and OC45). 12/6

R.F. 2 Pack: 2—PXA101 I.F.—PXA102 Osc.: 1—PXA102 Mixer. 12/6

L.P. Pack: Consisting of PXB12 Driver, Matched pair PXC171, mounted complete with heat sinks (Equiv. OC81D and OC81). 12/6

ALL TRANSISTORS POST FREE

QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. Size 7 in. w. x 2 1/2 in. d. x 3 1/2 in. h. This amplifier (which is used in a 29 gm. record player) employs ECC83 EL84, E280 valves. Bass treble and volume controls. Complete with output transformer matched for 3 ohm speaker. Ready built and tested.

PRICE 69/6 P. & P. 3/6

ALSO AVAILABLE. Mounted on board with output transformer and 6 in. speaker, ready to fit into cabinet below. PRICE 89/6 P. & P. 4/6

QUALITY PORTABLE RECORD 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 3 1/2 in.

PRICE £39.6 Carr. 5/-

Superior CABINET To take 8 x 5 in. speaker, with motor board will accommodate BSR UA14 or UA16, £29.6. Carr. 5/6. Speaker 10/6 extra. P. & P. 1/6 extra.

LARGE CABINET Similar to above with 3 ohm speaker, £29.6. Carr. 5/-

4-SPEED PLAYER UNIT BARGAINS

All Brand New in Makers' Original Packaging

SINGLE PLAYERS

B.S.R. TU/12.....£20.0 Carr. 3/6

B.S.R. GU7 with built mounted pick-up arm £18.8. Carr. 4/-

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B.S.R. TA14.....£25.10.6

Latest B.S.R. A10.....£21.6

Garrard ATG Mono.....£10.10.0

LATEST GARRARD AUTO-SLIM. With heavy duty, 1-hp motor, FEW ONLY £7.7.0. (Standard Auto-Slim £8.10.0). Carr. 3/- on each.

NEW CARTRIDGE BARGAINS!

B.S.R. T088. High output compatible Stereo Cartridge. Brand new. Complete with Stereo/LP/78 sapphire stylus and universal mounting bracket. Original price 44/11. OUR PRICE 22/6. P. & P. 1/-

RONETTE STEREO 105 CARTRIDGE. Stereo/LP/78. Complete with two sapphire. Original list price 67/9. OUR PRICE 24/-.

COLLARO HI-FI STEREO TWO CARTRIDGE. Type "C". Complete with universal bracket and stylus for Stereo, L.P. and 78. Original list price 59/8. OUR PRICE 25/-.

E.M.I. 4-speed Player and P.U.

FURTHER HUGE PURCHASE enables us to offer these at P. & P. 67/6 4/6

Heavy 8 1/2 in. metal turntable. Low flutter performance 200/250 V. shaded motor with tap at 45v. for amplifier valve filament if required. Turnover LP/78 head.

THE NEW HARVERSON KIT FOR THE HOME CONSTRUCTOR

A really excellent all purpose A.C. mains 250/240V.

AMPLIFIER KIT TYPE HSL FOUR 3 VALVE, 4 WATT USING ECC83, EL84, E280

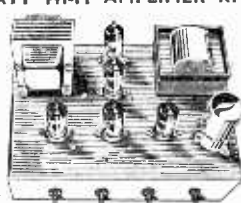
VALVES Special features include:

- 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 to use with gramophone or record player.
- Provision for remote mounting of controls or direct on chassis.
- All this builds on to a chassis size only 7 1/2 in. wide x 4 in. deep. Overall height 4 1/2 in.
- 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)

79/6

Comprehensive circuit diagram, practical layout and parts list 2/6. (Free with Kit.)

10 1/2 WATT HI-FI AMPLIFIER KIT



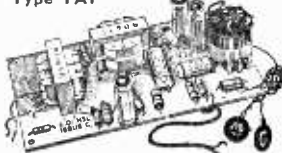
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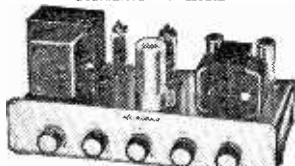
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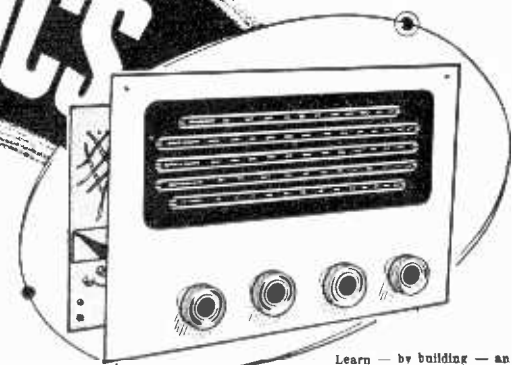
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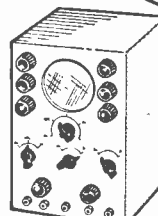
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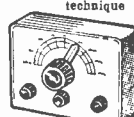
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British National Radio School

Practical Wireless

Vol. XL No. 691 SEPTEMBER, 1964

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Columns and all that

VARIOUS speculations are rife concerning the possible whereabouts of columnist Thermion. Of these, we can state quite categorically that there is no truth in the rumours that (a) he has emigrated, pursued hotly by seething readers, (b) he is in jail for not paying his wireless licence, and (c) that he has joined Radio Caroline as a disc jockey!

In actual fact, he has now taken up a position on another technical journal which precludes the continuance of his column. He was, of course, the last in a line of "Thermions", the first of whom burst into print in the early 20's.

In thanking him for his regular contributions in the past, we are sure that all readers will want to join us in wishing him every success in his new appointment—even those whose rage he invariably invoked. He, in turn, asks us to pass on his kind regards to all his old fans (and enemies), hoping that by his forthright views he at least provided the raw material for many discussions—if not open combat!

As we say farewell to Thermion, let us welcome a new columnist, whose pseudonym "Henry" covers the identity of a well-known technical author and consultant and who makes his debut in this issue, ably assisted by "Pax"—who has illustrated his work for many years.

Our new contributor will draw on his wide and lifelong experience in the radio business—both as an amateur and a professional—to instruct, amuse and—we hope—provoke. His approach will be different from that emanating from the pen of Thermion, but his apparent lighthearted touch will be found to hide many sly digs and shrewd observations. His basically humorous treatment is underlain with gentle satire. We think you will enjoy his regular commentary.

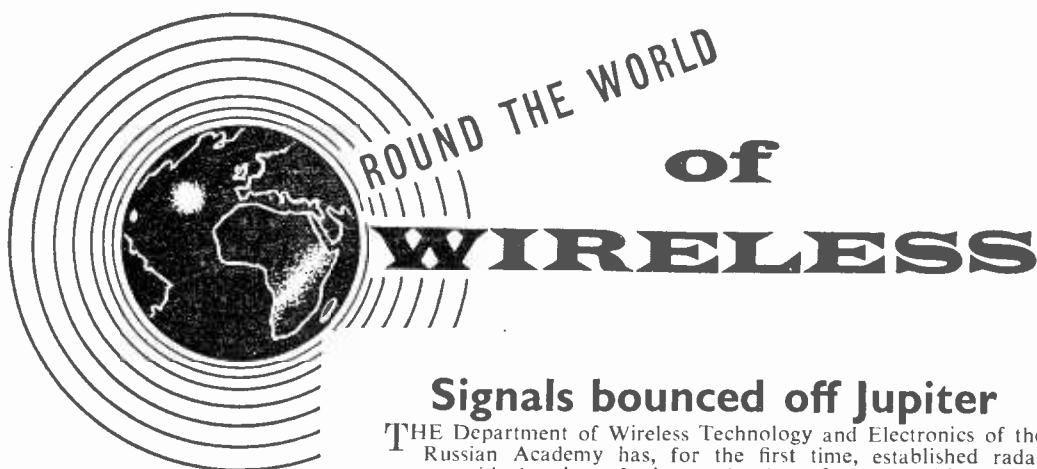
While on the subject of columnists, many readers have written to express appreciation of the John Guttridge feature "On the Short Waves". For although there are various newsletters and magazines available from societies to their members, we are the only magazine on general sale in this country, providing both amateur and broadcast band DX news.

Until comparatively recent years, there was always a selection of magazines catering for the short wave listener. Their untimely demise was largely due to that boggy of modern publishing, an uneconomical circulation—despite a consistent interest in short wave DX.

PRACTICAL WIRELESS has the right sort of circulation and we are thus able, in a small measure, to provide a monthly budget of DX news even though the bulk of the magazine must, of course, consist of practical constructional material.

Whether we are able to increase the editorial allocation for such topics depends on the response from readers. If you are interested in seeing more short wave DX news, please write and let us know. Logically there should be a great demand for such information, judging from the number of short wave sets being built. We hope you are all making the most of them!

Our next issue dated October will be published on September 4th



NEWS AT HOME AND ABROAD

G.P.O. INTRODUCE DATEL SERVICE

A TELEGRAPH private circuit service which will transmit data to and from computers at 14 characters per second—twice the existing rate—is to be introduced by the Post Office, stated the Postmaster General, the Rt. Hon. Reginald Bevins, M.P. The cost of this service would be only about one-third more.

Data can already be transmitted over Post Office telex and private telegraph circuits at about seven characters a second. All these services are being grouped and will be known as Datal 100 Service.

Next year facilities for data transmission over telephone circuits up to 150 characters per second will be supplemented by the provision of a new Data Set No. 1A for the modulation of signals. This service will then be known as Datal 600 Service.

Other Datal services planned for the future are Datal 200 and Datal 300 which, respectively, will provide facilities for two-way data transmission at up to 25 characters per second and one-way data collection at up to 20 characters per second.

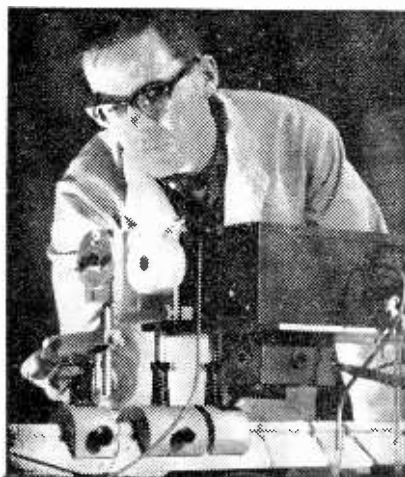
Signals bounced off Jupiter

THE Department of Wireless Technology and Electronics of the Russian Academy has, for the first time, established radar contact with the planet Jupiter at the time of the opposition of the planet in September/October 1963. The Director of the Department, W. A. Kotelnikow, reported that wireless echoes have been successfully received upon their return to Earth from Jupiter. A

distance of over 400 million miles was spanned in this experiment.

A mere 13W of r.f. power reached the entire surface of the mammoth planet, of which some 1,300 milliwatts were reflected and a minute portion thereof finally reached the Earth again. The time elapse between transmission and reception of the echo was one hour and six minutes.

Frequency analysis of the radar pulse broadening in the received echo compared to the sharp pulse originally transmitted confirmed the extremely rapid rotation of Jupiter (one day on Jupiter has a length of only ten hours) and was used as one characteristic to identify the returning echo.



Highest power levels yet reported for a high repetition rate laser have been achieved with this combination of Raytheon LH8 laser (black box at right) and Baird-Atomic electro-optic light modulator (white circular device in centre). August Graf, engineer at Raytheon Company's Laser Advanced Development Center in Waltham, Mass., aligns elements along an optical bench in tests that produced 100 million watts of peak power in flashes at one second intervals, combination of devices is more than 100 times more powerful than any reported previously.

Semiconductors Research—New grant

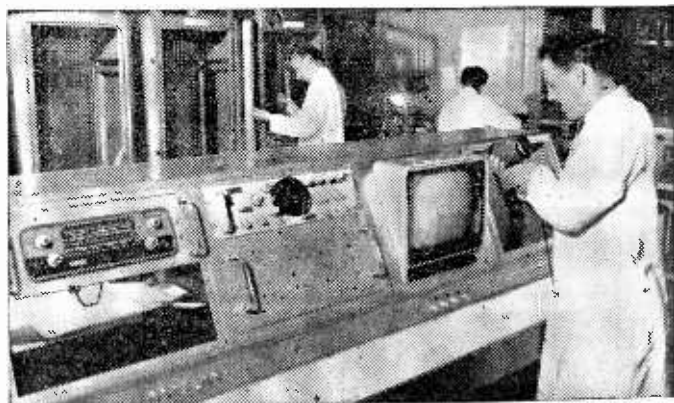
A THREE-YEAR research project to seek experimental confirmation of recent theory on electrical conduction in certain materials on the borderline between insulators and semiconductors, is to be carried out by the Electrical Research Association with the support of a DSIR grant of up to £17,400.

The work proposed in the present project will start from the basis of theoretical work done at Liverpool University which has yet to be confirmed experimentally.

RADIO SHOW CONTROL ROOM

BELLING AND LEE LTD. have been appointed as main contractors for all the Television and Radio signal services required at this year's Radio Show. The project entails the complete design, supply, and installation of all the control room equipment.

Belling-Lee will supply and install the receiving aerials, and be responsible for the distribution of these signals to some 400 outlets, and the equipment will enable a signal to be received off the air and overland; from both BBC and ITA on 405 and 625 lines. In addition, two telecine units will be in operation, feeding 405 and 625 line signals (derived



from films or slides) into the system.

The outgoing signal to the receiver at the exhibition will comprise of one 405 line, and

one 625 line transmission, selected from the available incoming feeds. In addition, an f.m. signal will also be distributed to the stands.

Mullard Develop Image Intensifier

MULLARD Research Laboratories, in conjunction with the Atomic Energy Research Establishment, have developed a high-sensitivity image intensifier tube for use in experiments involving sub-atomic particles.

In many experiments involving sub-atomic particles it is necessary to photograph one event of special interest among a million or so others. For example, it may be necessary to record the light track of a single particle involved in a collision process, or to determine the energy of the particle by means of the Cerenkov radiation it causes.

In the example quoted, the small amount of light produced would barely affect one grain of the emulsion on a photographic plate. Therefore, if useful photographs are to be obtained, the light must be intensified without its pattern being distorted. This can be done by means of image intensifier tubes incorporating photo-emitters which have a much higher quantum efficiency than photographic emulsions.

The Mullard two-stage image intensifier being supplied to the A.E.R.E. is such a device. It intensifies the light from a single particle into an image that provides a suitable input for a high-gain image amplifier.

Silver Jubilee of RAFARS

SILVER jubilee celebrations of the R.A.F. Amateur Radio Society—postponed from last year—were held during July 4-5. A dinner at the Grand Atlantic Hotel, Weston-Super-Mare was attended by members of the society, representatives of affiliated organisations and other amateur radio enthusiasts.

On July 5 the society's headquarters at No. 1 Radio School, R.A.F., Locking, near Weston-Super-Mare, and the school training laboratories were open to the public. In the afternoon, a rally was held in conjunction with the Weston-Super-Mare Amateur Radio Mobile Group.

New I.E.E. Publication

THE I.E.E. announces that the first issue of a new monthly publication "Current Papers" will appear in August 1964. Each issue will list about 700 titles (with authors and references) covering electrical and electronic engineering selected from several hundred British and foreign periodicals.

Voucher copies of the first issue are available from the Secretary, The Institution of Electrical Engineers, Savoy Place, London, W.C.2.

R/T SYSTEM FOR B.R.

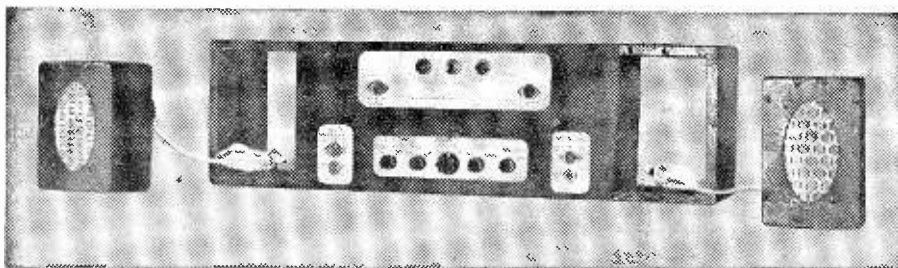
A MARCONI microwave radio relay system, providing initially a maximum of 159 telephone channels between York, Darlington and Newcastle, will come into service with British Railways on May 31st. This expansion of telephone communications forms part of the main London to Glasgow railway communication link.

During the initial planning stage, British Railways found that a considerable financial saving could be made by operating a private telecommunications link, using microwave radio.

The overall length of the link from York to Newcastle, is 75 miles. Between York and Darlington, where the radio terminal is sited in the railway station, there is a repeater station at Woolmoor, and again, between Darlington and Newcastle, there is a repeater at Ferryhill.

The radio equipment, Type MH140B, is manufactured by Marconi Italiana, the Italian subsidiary of The Marconi Company. It operates in the super high frequency band at 7500Mc/s and frequency modulation is employed. The capacity of the system is 300 channels, although only 159 will be available during the initial period of operation.

THE "MULTIPHONIC"



A 13-STAGE STEREO AMPLIFIER

BY MARTIN L. MICHAELIS

THIS unit is designed to provide a complete and economical 2.5W per channel stereo system with good tone quality. It also incorporates some unusual features.

In addition to the two identical channel amplifiers a 3V input/output matrix is incorporated. One valve of this matrix splits an ordinary monaural input, fed in at the coaxial socket provided, into two equal signals for simultaneous drive of the two stereo channels. Tone and volume may thereby be set equal or controlled individually on the two channels, enabling a maximum of "room-dimension" effect to be realised even on a monaural signal.

The total power of the two channels together used in this fashion is 5W, yet the maximum realisable undistorted "apparent" volume is greater than that normally associated with a 5W conventional amplifier. This is because the physical intensity of sound produced by the same electrical power is always greater when coming from two speakers separated in space than when coming from a single speaker at one point in space.

Moreover, the use of two speakers in this fashion, especially when fed from separate amplifiers as here, combats the sensation of sound coming out of a speaker speech cone, projecting it instead into the room bodily.

Another valve of the matrix combines signals from the two main amplifier channels—whether these are running on stereo or monaural—and gives a monaural output for monitor headphones or for a third additional amplifier for a central bass speaker, proving useful in large base-line stereo reproduction. There is also a stereo output suitable for feeding stereophonic headphones.

A fundamental feature of this input/output matrix arrangement is its "simultaneousness", freedom from cross-talk between channels and freedom from switching. Thus all functions can be operated simultaneously. There are two main input sockets, one for two-channel stereo signals and one for ordinary monaural signals.

If signals of both kinds are simultaneously fed in at the respective sockets the stereo signal will be heard with full stereo effect, and the monaural signal will in addition appear on both channels in such a way that it seems to be located fixed in the middle of the stereo field without otherwise disturbing it.

At the same time monaural and stereo versions of the complete signals may be taken from the respective output sockets for any purpose, simultaneously if required.

Controls

Conventional stereo amplifiers often have ganged controls for volume and tone and a single balance control. A rather different arrangement has been adopted here to achieve maximum useful control of room-dimension effects on monaural signals and a maximum of independent control of signal levels at the speakers and the output sockets without unduly increasing the number of controls.

A ganged main volume control is retained but each channel has, in addition, another volume control situated later in the amplifier chain beyond the point of extraction of signals for the output matrix. These individual volume controls are thus operative only for the main speakers, and enable the speaker volume to be reduced to zero when listening on headphones or searching for a programme (e.g. searching for the start of a

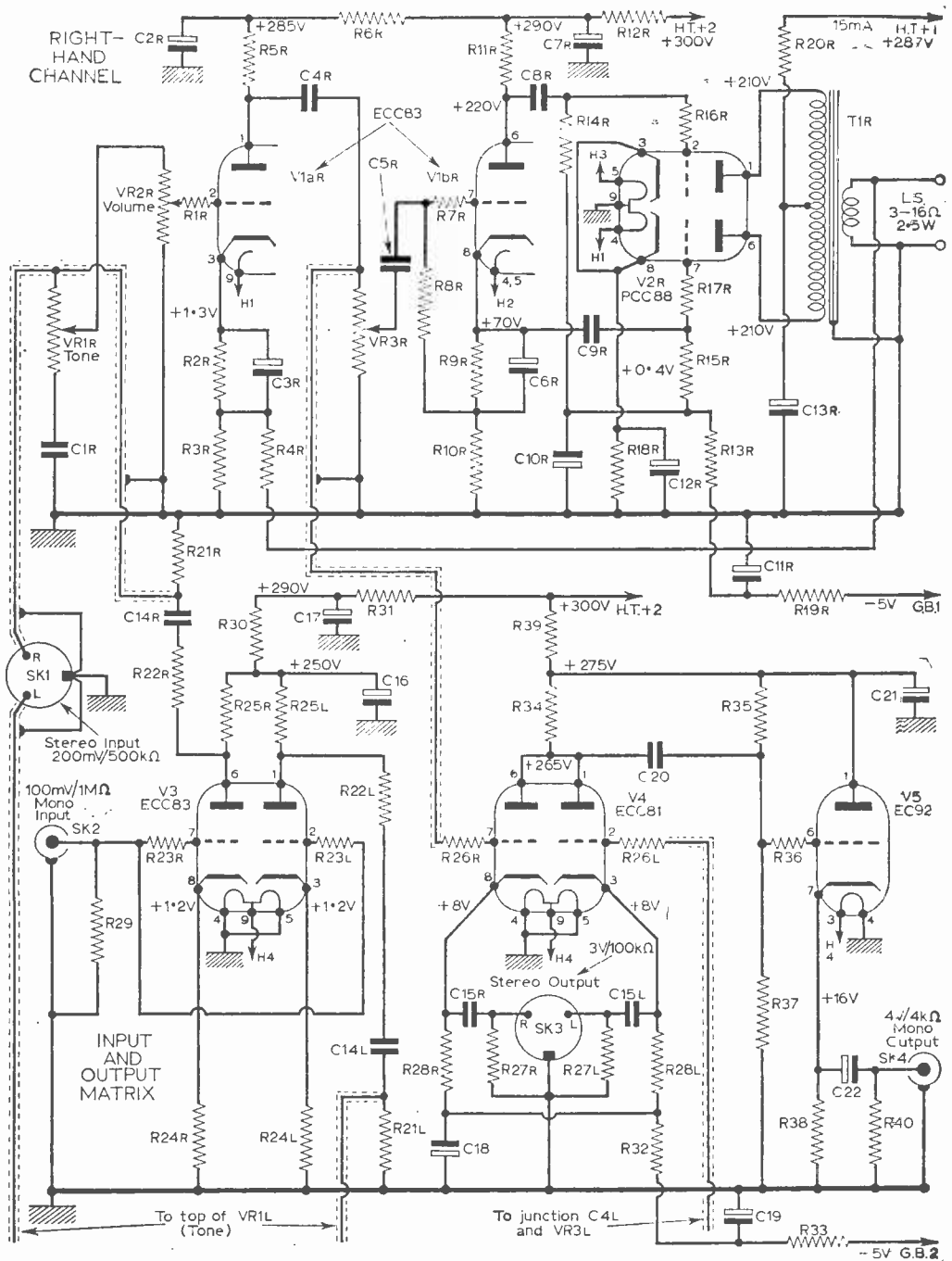


Fig. 1: The circuit of the right-hand channel and the input/output matrix. The left-hand channel (not shown) is identical to the right.

required item on a stereo record or tape, using headphones, turning up the volume on the speakers for the general audience only when found). Suitable relative settings of ganged main volume control (controlling everything) and individual volume controls also enable any desired relative volume on headphones and speakers to be obtained simultaneously.

The remaining two controls consist of individual tone controls for each channel in the popular treble-integrator arrangement. These tone controls are operative on everything passing through the amplifier, for all inputs and outputs. Normally equal settings are required on both channels but individual adjustment may be beneficial in correcting poor stereo recordings—e.g. ones made with a stereo microphone in a room with asymmetric acoustics. Individual adjustment of the tone controls may also be beneficial on monaural

signals consisting of certain kinds of music when a measure of pseudo-stereo is required to give better differentiation of various instruments.

Main Amplifier Channels—Circuit Principles

Each main amplifier channel uses two double-triodes. The first stage of each amplifier is a conventional voltage preamplifier using half of an ECC83. The other half of each ECC83 is used as a conventional split-load phase-splitter for obtaining push-pull drive for the output stages.

The only new feature is the incorporation of the individual volume controls between the preamplifier output and phase-splitter input grid. The latter is driven from the slider of the individual volume control, whereas the entire output of the preamplifier is taken to the output matrix, so that the individual volume control is therefore not operative.

COMPONENTS LIST

Resistors:

R1 10k Ω	R23 10k Ω
R2 2.2k Ω	R24 2.2k Ω
R3 100 Ω	R25 220k Ω
R4 6.8k Ω	R26 10k Ω
R5 220k Ω	R27 1M Ω , 1W
R6 10k Ω	R28 27k Ω , 1W
R7 10k Ω	R29 1M Ω
R8 1M Ω	R30 33k Ω , 1W
R9 1k Ω	R31 10k Ω
R10 47k Ω , 1W	R32 1k Ω
R11 47k Ω , 1W	R33 1k Ω
R12 4.7k Ω , 1W	R34 10k Ω , 1W
R13 10k Ω	R35 22M Ω , 1W
R14 680k Ω	R36 10k Ω
R15 680k Ω	R37 1M Ω
R16 10k Ω	R38 10k Ω , 1W
R17 10k Ω	R39 10k Ω , 1W
R18 27 Ω , 1W	R40 1M Ω
R19 10k Ω	R41 6.8 Ω , 1W
R20 5k Ω , 5W	R42 6.8 Ω , 1W
R21 22M Ω	R43 6.8 Ω , 1W
R22 4.7M Ω , 1W	R44 6.8 Ω , 1W

All $\pm 10\%$, $\frac{1}{2}$ W Carbon, unless otherwise stated.

Potentiometers:

VR1 500k Ω lin.	VR3 500k Ω lin.
VR2 500k + 500k Ω log. dual ganged	

Valves:

V1 ECC83	V3 ECC83	V5 EC92
V2 PCC88	V4 ECC81	

Rectifiers and Diodes:

MR1, 2 E250C50 selenium
DI, 2 S36 silicon (Brush Crystal Co., Southampton)

Transformers:

- T1 Push-pull output transformer for 10k Ω anode-to-anode secondary to match speakers used
- T2 Mains transformer. Secondaries 0-240V, 75mA; 6.3V, 1.5A tapped at 4V; 6.3V, 1.5A tapped at 4V. (A Douglas MT1 is suitable, with h.t. centre-tap earthed. Operate MR1/MR2. one off each 250V end of the winding. LT1 of MT1=6, 7, 8 (Fig. 2); LT2 of MT1=3, 4, 5 (Fig. 2). Run only pilot lamp off H2 as shown. Move VIL, R heaters to H4-chassis.)

Capacitors:

C1 500pF paper 500V
C2 8 μ F electrolytic 350V
C3 50 μ F electrolytic 25V
C4 0.05 μ F paper 500V
C5 0.05 μ F paper 500V
C6 50 μ F electrolytic 25V
C7 8 μ F electrolytic 350V
C8 0.05 μ F paper 500V
C9 0.05 μ F paper 500V
C10 100 μ F electrolytic 15V
C11 100 μ F electrolytic 15V
C12 25 μ F electrolytic 25V
C13 8 μ F electrolytic 350V
C14 0.025 μ F paper 500V
C15 0.05 μ F paper 500V
C16 8 μ F electrolytic 350V
C17 8 μ F electrolytic 350V
C18 100 μ F electrolytic 15V
C19 50 μ F electrolytic 15V
C20 0.025 μ F paper 500V
C21 8 μ F electrolytic 350V
C22 50 μ F electrolytic 25V
C23 16 μ F electrolytic 350V
C24 16 μ F electrolytic 350V
C25 32 μ F electrolytic 350V
C26 50 μ F electrolytic 25V
C27 100 μ F electrolytic 15V

Sockets:

SK1,3 Stereo panel sockets
SK2,4 Coaxial panel sockets
SK5,6 Mains outlet 3-pin panel sockets

Miscellaneous:

- LI 15H 30mA smoothing choke
- SI S.P.S.T. mains on/off switch
- FI 1A mains fuse
- LPI 8V 0.15A pilot lamp
- Two elliptical loudspeakers. 6 noval and one B7G valveholders, preferably ceramic with screening cans. Chassis 16in. x 6in. x 2in. 5 control knobs. One pilot lampholder. One fuse holder. Screened and mains cable. Wander plugs and sockets and flex for speakers. Quantity of wood for cabinets. Tagstrip, solder tags, wire, etc.

The really unusual point about this design is the PCC88 push-pull output triode in each amplifier. Few readers are likely to have been previously aware of the possibilities available for the use of this valve as audio power output stage as it is normally found only in television tuners. Most valve data lists specify the valve for no other purpose but some official manufacturers' notes do point out possible uses as power amplifier.

The achievable power output in the type of arrangement described is comparable to that of small conventional power pentodes such as the ECL82 in single-ended Class A, yet operating in push-pull here the distortion is very considerably less.

pentode is generally much smaller than the internal anode impedance of the valve at the operating point, so that a pentode gives no useful damping of any speaker resonances, etc. However, the internal impedance of a triode is generally less than the optimum anode load (internal anode resistance about $3k\Omega$, optimum load $10k\Omega$, in the present case), so that good damping of spurious resonances is obtained.

Furthermore, even moderate mismatch into the anode circuit of a power pentode rapidly leads to marked increase of distortion except at very low power, whereas with a triode this effect is much less, especially in a push-pull arrangement as here used.

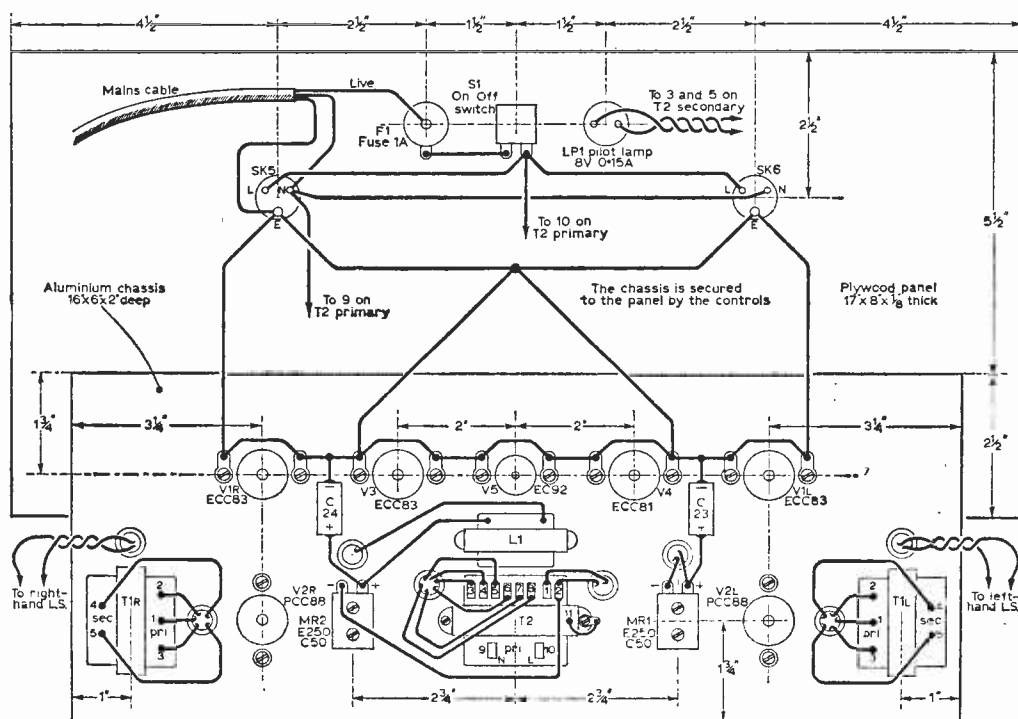


Fig. 2: The above-chassis layout and wiring between major components.

Moreover, the power efficiency is very good, being about 65% at full volume in the present design. The standing total anode current is, furthermore, for both channels together, here less than that of the equivalent pentode for a single channel. The h.t. voltage for this stage is also less than that normally required for a pentode output stage.

All these facts lead to simplifications in the power supply as quite small, low-capacity items can be used, and they lead to the production of less heat, a great advantage when housing two amplifiers in one cabinet. There are still further advantages. The optimum anode load for a

Thus, apart from the novelty of using a PCC88 television tuner valve as push-pull audio output stage, there are clearly many reasons of a much more practical nature favouring the adoption of such an arrangement for *low-power* amplifiers.

Critical Ratings

The only serious problem with such an output stage is that the PCC88 is being driven close to the maximum permissible limits of anode dissipation and anode voltage. It is *most important* indeed that the no-signal h.t. voltage measured between each anode and chassis does **not** exceed

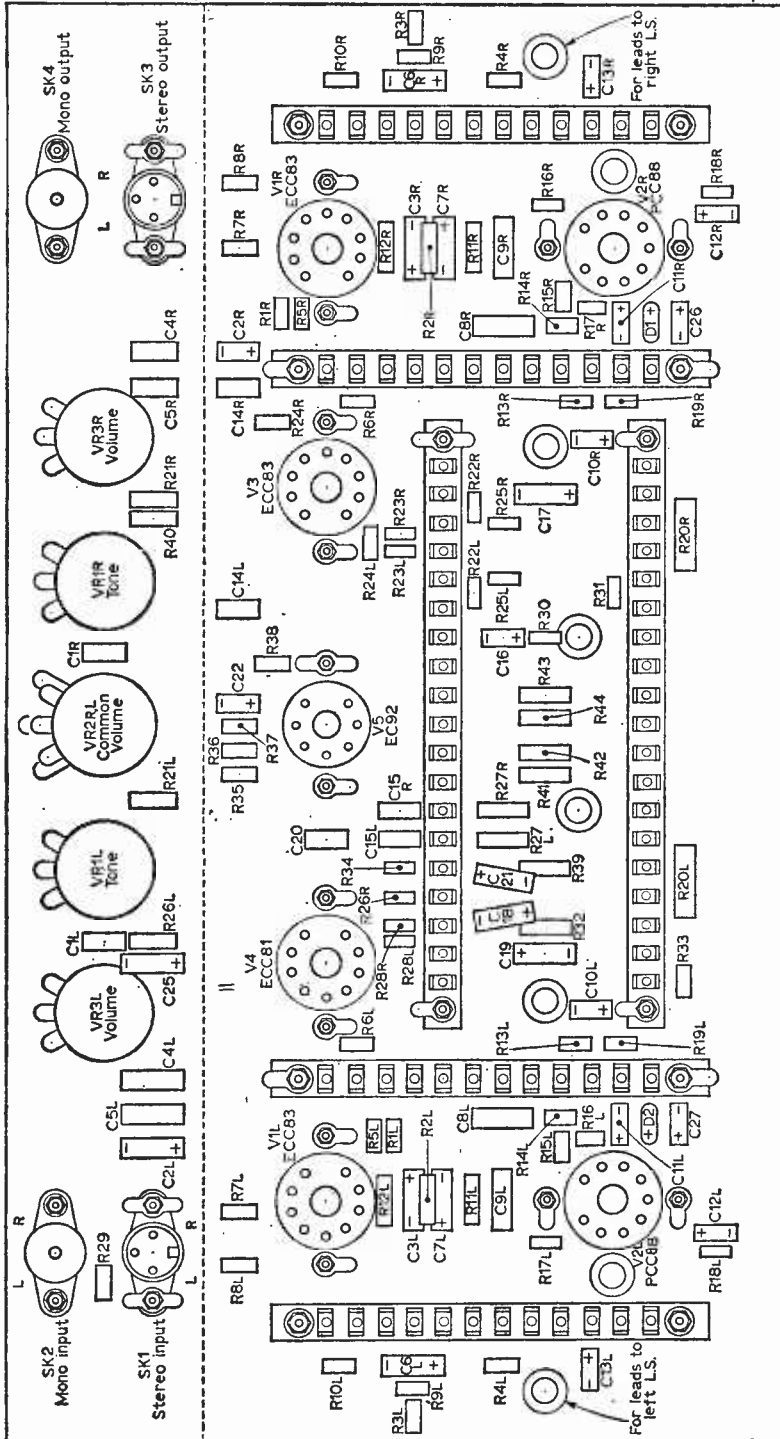


Fig. 3: An underchassis view showing the layout of components.

the specified value of 210V. Use a meter of at least 4,000 ohms per volt when testing to avoid falsification. If the slightest excess is used early failure of the PCC88 is possible.

The voltage should definitely lie between 200 and 210V and if outside this range, e.g. when using modified power supply arrangements in using alternative components to those specified, it must be corrected by appropriate adjustment of the value of R20 in each amplifier, using series or parallel resistors if necessary. If large corrections are required the possibilities of shunting C13 with a suitable resistor can also be exploited.

Whilst it is in principle possible to use almost any form of h.t. rectifier and smoothing arrangement with available components, the specified input voltage at the top end of R20 *must* be approximately maintained. Thus under no circumstances use an h.t. supply of 210V and omit R20—this would lead to overshoot of peak anode ratings of the PCC88 on sustained loud signal passages.

The manufacturer's specification, which prompted experimental work leading to the present article, stipulated that the cathodes of the PCC88 should be earthed direct to chassis and a fixed negative grid bias of about 6V should be used, giving a total h.t. current of 10mA for both anodes together at 200V h.t. The specified output power is then 1.5W for 4% distortion.

The author developed the present modification, using slightly reduced fixed bias and consequently greater standing current. The small cathode

is sufficient, the more conservative rating at higher grid bias may be returned to.

An elegant and modern method of achieving this would be to remove the existing grid bias arrangement, returning both grid leaks R14 and R15 to chassis. The combination C12, R18 is also removed, being replaced by a 6V Zener diode. If adopting these measures make sure that a matched pair of such Zener diodes are obtained for the two channels and that the Zener voltage really does lie between 5.8 and 6.0V.

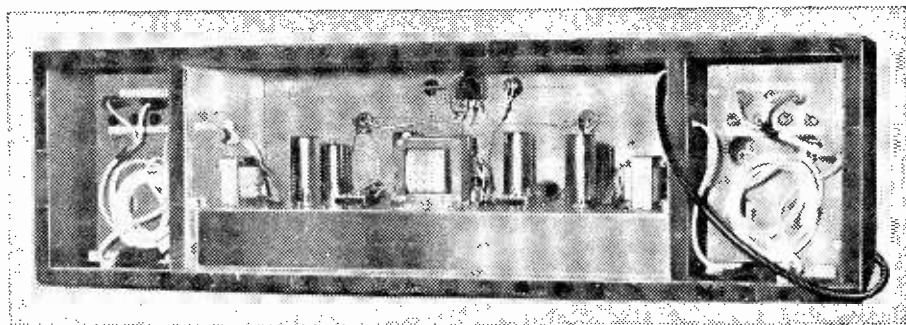
The Zener diode is to be connected with anode to chassis and cathode to the commoned cathodes of the PCC88. A bypass capacitor is not generally necessary.

Negative Feedback

The combination R3/R4 provides overall negative feedback for each amplifier. The values shown give relatively mild action, keeping the amplifier gain high enough for operation off low-input pick-ups. If the pick-up or other signal source used has ample output (VR2 and VR3 seldom operated anywhere near full gain) it may be of advantage to reduce the value of R4, possibly as far as down to about 1k Ω .

This increases negative feedback, reduces gain and reduces distortion. If R4 is made too small a high-pitched whistle may commence (this may be supersonic and only visible on an oscilloscope) due to phase-shift oscillation of the amplifier.

This condition should be checked and R4 made at least twice as large as that value for which such



A rear view inside the finished amplifier, with the two speaker units in place.

combination R18, C12 was added for safety to give a measure of stabilisation through additional automatic bias as the valve is being run very close to the tolerance limits.

As well as paying attention to the above-described question of correct anode voltage the total h.t. current should also be checked. It must not exceed 15mA at no-signal. Discrepancies are corrected by adjusting the value of R18; a higher value reduces anode current.

The circuit as shown provides a measured output power of 2.5W at about 1% distortion measured for a 1kc/s continuous signal and a 10 Ω carbon resistor as load in place of a speaker. If large and efficient speakers are used, where 1.5W

oscillation commences. If, upon drastically reducing R4 or short-circuiting it, an oscillation at medium frequency, or motor-boating, starts, the phasing is incorrect. The secondary winding of T1 should be reversed.

When making such alterations—and in general throughout the entire amplifier—observe closest possible equality and symmetry for the two amplifiers to maintain equality of response and phasing for the two channels. In particular use a pair of identical speakers and observe identical polarities of the speech-coils.

**TO BE CONCLUDED IN THE OCTOBER
ISSUE**

COMMUNICATIONS RECEIVER DESIGN CONSIDERATIONS

By R. N. Clasper

A GREAT design problem in communications receivers is that of producing a receiver with a large frequency coverage, consistent with low r.f. losses. With modern coil design, the greatest losses now occur in switching circuits.

The use of turret tuning greatly reduces these losses, and thus enables a much wider range of frequencies to be covered. Turret tuners capable of switching two sets of tuned circuits are readily available as television components. However, an amateur communications receiver worthy of the

If the tuners available have too short spindle extensions at the rear to enable couplings to be attached, the following method is effective.

A hole about $\frac{1}{4}$ in. diameter is cut in the backplate of the tuner chassis, with the coil drum bearing as centre. Thus the rear bearing of the first tuner is removed completely. Again, a $\frac{1}{4}$ in. I.D. bush is attached to the drum spindle. The second tuner shaft is coupled to this as before. When both tuner chassis are mounted rigidly to the communications receiver chassis, and the coupling between

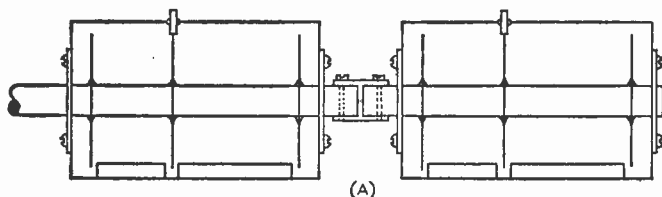


Fig. 1 (a and b): Two arrangements for combining turret tuners to provide extra switching-in of tuned circuits.

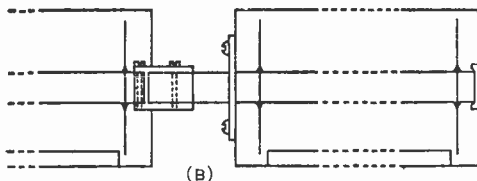
name will require at least three tuned circuits—*aerial r.f.*, and oscillator tuning—to provide good second channel rejection and improve signal/noise ratio.

Fortunately, it is a relatively easy matter to combine two television turret tuners, to provide switching for up to four tuned circuits. The type of tuner needed is that which carries sets of coils on "biscuits", on a revolving drum. Such tuners, which are generally fitted with two B9A valveholders, have a chassis 3 or $3\frac{1}{2}$ in. deep. They should not be confused with the permeability tuned units, which have a chassis only $1\frac{1}{2}$ or 2 in. deep; as these are useless for this purpose.

Tuner Modifications

On many turret tuners, the shaft carrying the coil drum extends a small way behind the tuner chassis. A $\frac{1}{4}$ in. coupling should be attached to this shaft, by drilling both shaft and coupling, and inserting a taper pin, or a bolt, after tapping both fittings. It is unlikely that a coupling bush attached by grub screws would be strong enough for the purpose.

The second turret is connected directly to the bush by the same method. Care must be taken to allow sufficient space between the turrets to provide access for a trimming tool during the alignment of the r.f. stages.



the two shafts is secure, the removal of one bearing does not affect the operation of the drum and coil contacts.

The Coils

Of the many coil designs available, it was considered that the "Weyrad" range was the most suitable, because of their physical size. They are mounted in the coil carrying "biscuits", already present on the drum, as follows:

The original TV coil, complete with former, is removed from the biscuit, and the connections unsoldered. The coil is generally held by two spring clips, which should be retained.

Modifications must now be carried out to the new coil, to fit it in the space available. The coil connection ring must be removed, taking care to be able to identify the wires remaining at a later time. A method suggested is to colour code the

wires, retaining the code used by the manufacturers for the solder tags. During this part of the work, take great care not to damage the wires, or unwind the coils even a small part of a turn.

The four leads from the new coil are attached to four of the contacts on the tuner biscuit, in a predetermined order, which must be maintained for each set of coils. When the oscillator coils are fitted, the padders (if any) should be connected between the coil and contacts. The coils should be orientated so that the trimming core is accessible through the holes provided in the drum.

It will fit reasonably well into the mounting brackets on the biscuit, in the position occupied by the previous coil. One of the original spring clips may be used to hold the coil in place. Wax

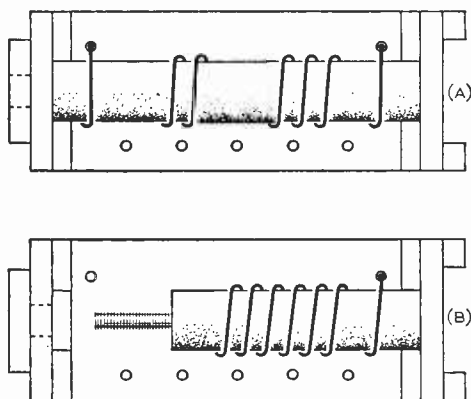


Fig. 2: Coil modifications; (a) before and (b) after.

poured over the mountings will finally secure it.

The completed coil selection assembly is mounted beneath the chassis of the communications receiver. Clearance holes are cut in the chassis for the B9A valveholders on the tuner assembly, which may be used for the r.f. and f.c. valves. The entire r.f. and f.c. circuitry can now be housed in the tuner chassis.

Variable Tuning

The use of a large value of variable capacitor in parallel with a low trimmer enables fine tuning to be carried out accurately, but this method is rather cumbersome in practice: the following method provides accurate, reliable tuning, without the difficulties, such as the inability to return quickly and accurately to a required frequency, inherent in the use of trimmers.

The frequency band is sub-divided into fixed bands, and only a small variable capacitor is needed for variable tuning. A rotary switch back-plate is attached to the 300pF, linear sweep, main tuning capacitor. This enables the main tuning capacitor to be locked in seven positions, at 50pF intervals, from 0pF to 300pF. Variable tuning was by means of a 50pF variable capacitor, in parallel with this, fitted with a good slow-motion drive and

calibrated scale. This system enabled tuning to be carried out rapidly and accurately.

Further Uses of the Tuning Head

Because of the reduced stray capacitance losses in the turret tuner, operation at much higher frequencies is possible. A proprietary make of tuning coils covers the range 30 to 200Mc/s in two ranges, using a 50pF tuning capacitor. A 5Mc/s i.f. frequency is used. These coils can also be fitted to the tuner assembly, as previously described. No modifications to the circuitry are required in the

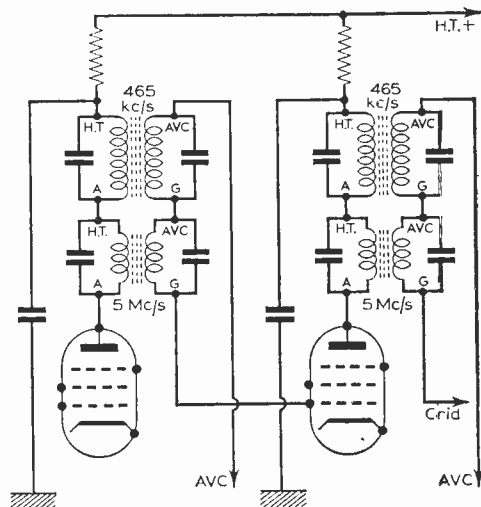


Fig. 3: Modifying the i.f. system by the inclusion of 5Mc/s. i.f.t.'s.

r.f. and oscillator stages, provided these are well designed. The main tuning capacitor is left switched to zero capacitance, and tuning is carried out by the 0 to 50pF variable capacitor.

The tuner now gives an i.f. frequency of either 465kc/s or 5Mc/s, depending on the coils in use. The i.f. stages can easily be modified to cater for this.

The only modification necessary to the original 465kc/s i.f. stages is the inclusion of 5Mc/s i.f.t.'s in series with the original ones. To keep losses to a minimum, they should be connected as shown in Fig. 3.

At 465kc/s the additional inductance provided by the 5Mc/s i.f.t.'s will not affect the i.f. resonant frequency by an appreciable amount. I.F.T. core adjustment will compensate for this. At 5Mc/s, the parallel capacitor present in the 465kc/s i.f.t. will effectively short-circuit this component.

In practice, the efficiency of the i.f. stages will be rather lower at 5Mc/s. This is surely a small price to pay for such a wide frequency coverage.

Thus, by the use of turret tuning, and the capacitor arrangement described, it is possible to obtain better performance over the normally used ranges, and also, reasonable performance up to 200Mc/s. ■

simple Noise generator

BY CHRISTOPHER P. GUY

MANY home constructors often find the need for some sort of noise generator when building or repairing their equipment, particularly those who haven't been "In the business" very long, and are consequently beginning to find the need for various test equipment.

The circuit to be described is that of the versatile multivibrator: it uses only a minimum of components, none of which is particularly critical. The unit can be used as an alignment aid, a fault

tracer in amplifiers and receivers, and as a Morse Code practice oscillator.

The circuit is straightforward and should present no difficulties even for the beginner. Layout is by no means critical, but wiring should be as direct as possible and the unit should be constructed on a four-sided metal chassis to avoid interference with nearby receivers. The unit emits an audio tone of about 10kc/s, this frequency being determined by the values of R1/R2 and C2/C3.

The waveform is very nearly square, but slight inequalities in the effective capacities of C2 and C3 and the resistances of R1 and R3 will produce a slightly unsymmetrical waveform which is rich in harmonics and may stretch up as far as 5Mc/s or further, and are spaced 10kc/s apart.

Hence, by injecting the output into the aerial circuit of a receiver and tuning the set over the medium or long waveband, a number of pips right across the band should be heard, all of which should be of equal amplitude. If the pips should fade in amplitude at either end of the band, then the set requires alignment.

When the unit is used as a fault tracer, the signal is first injected into the anode circuit of the output valve, then into the grid circuit, and similarly with the preceding circuits until the fault has been localised. For use as a Morse Code practice oscillator, a key (which must be normally closed until depressed) is connected across R3. This normally involves the use of a key with a backstop.

If for some reason a variable note is required, then R1 can be replaced by a 250k Ω variable resistor in series with a 68k Ω fixed resistor. The variable component should be wired on the earthy side of the fixed resistor to minimize hum pick up.

Although a 6J6 valve was

—continued on page 431

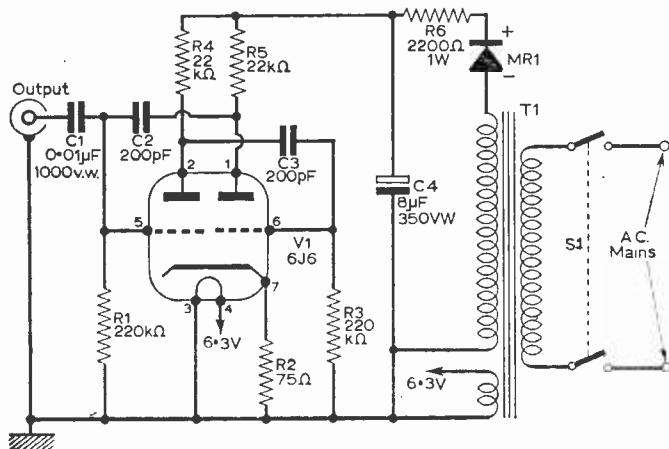
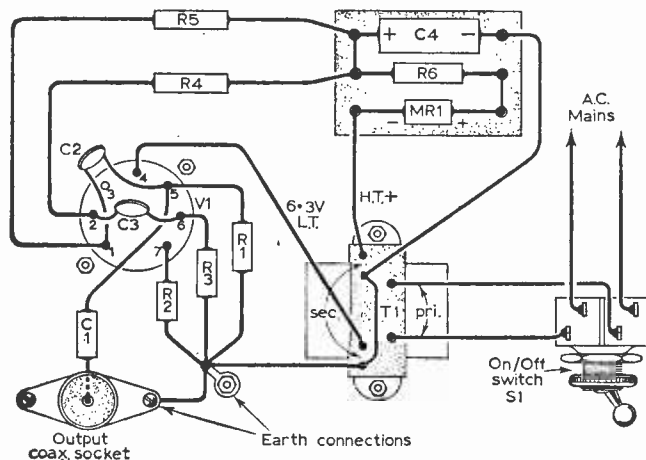
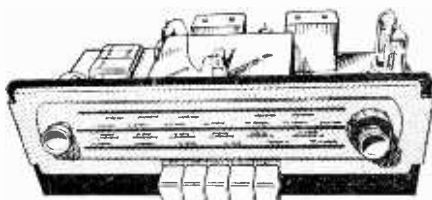


Fig. 1 (above): The circuit of the a.f./r.f. noise generator.

Fig. 2 (below): The practical layout and wiring of components.



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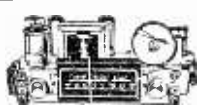
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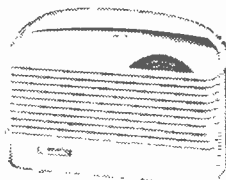
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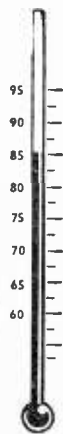
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on the Short Waves

A MONTHLY COMMENTARY BY J. GUTTRIDGE

AMONGST shortwave listeners, the most popular way of reporting on a particular signal is to use the SINPO code. As mentioned last month, the letters stand for Signal strength, Interference, Noise, Propagation disturbance and Overall merit. Each of these is marked out of five.

In the case of signal strength, the five grades are: 5 excellent, 4 good, 3 fair, 2 poor and 1 barely audible. If your set has an S-meter, determination is easy. On a set with a "magic eye" tuning device you can adopt an arbitrary measurement depending on the degree of closure of the eye. However, if your set has none of these devices you will have to estimate the signal by comparison with others. Remember when doing this leveling out effect of the automatic volume control.

Degrees of interference are, 5 nil, 4 slight, 3 moderate, 2 severe and 1 extreme. As a guide, 4 is often given by a station on the next channel (5kc/s away) although a very powerful neighbouring signal or jammer splash might rate 3. Where two stations of about the same strength are operating on the same channel, they often rate 2. Complete blotting out of a weak signal by a very strong one of course gives a rating of 1 for the weak signal.

Noise is rated on the same basis as interference, with which, however, it must not be confused. Two main types of noise affect the short wave listener. The first of these is "hiss". You will find this to be strongest on a band not supporting propagation—e.g. the 13m band after dark. The other is "atmospheric" or "static noise". This is produced by lightning. It can be quite strong even when there is no storm in your vicinity as it can be propagated over great distances like broadcast waves. Noise can also be man made. Examples of this are produced by car ignition and electric motors. However, as this is purely local it can be disregarded when reporting to stations.

Propagation is also marked on the same scale as interference and noise. Because of the difficulty for the listener of estimating this accurately, F for fading (SINPO) code is becoming used more and more here. Fading is rated 5, 0-1 fades per minute; 4, 1-5 fades per minute; 3, 5-20 fades per minute; 2, 20-60 fades per minute; 1, 60 or more fades per minute.

Finally we have overall merit which is really self explanatory and could almost be termed "listenability". Here the ratings are 5, excellent, 4 good, 3 fair, 2 poor and 1 unusable.

Jamming Relief

Further good jamming news from the BBC is that its Bulgarian transmissions are now free of deliberate interference.

28 Mc/s Opening

In the evenings the 10m amateur band is now opening up a bit, enabling European stations to break through. On a recent evening, hams in Germany, Hungary, Portugal and the Ukraine were audible in London.

BC News

A. M. Woodlands, of 7 St. Michaels Avenue, Clevedon, Somerset, has reminded me of La Voz de los Andes, Ecuador, and Radio 4VEH, Haiti, which I omitted from the list of stations having DX programmes. He says also that Radio Lisbon and the Korean Broadcasting System are to start such programmes. Peruvian stations he has logged recently around 2300GMT include Radio Universidad and 6,235kc/s, Radio Cuzco on 6,250kc/s and Radio Tuantisuyo on 6,265kc/s. Mr. Woodlands, incidentally, is the British representative of the Benelux DX club, which he says aims to cater especially for the newcomer to shortwave listening.

La Voz de los Andes, call HCJB, mentioned above, is one of the easiest South American stations for the newcomer. Try listening on 15,115/17,890kc/s from 1900-2030 when there is English, 2030-2100 when there is Swedish and 2100-2130 when there is German. Address of this station is Casilla 691, Quito, Ecuador.

Further North, in Cuba, Radio Habana Cuba, Apt. Postal 7026, Habana, has a programme in French from 2110-2140 on 17,855kc/s.

Most of the main American baseball games are transmitted by AFRS, New York, using Voice of America transmitters. The station's schedule is 1430-2245 on 15,225/15,280 kc/s and 1800-2245 on 17,845kc/s.

A lesser known North American station is WINB, P.O. Box 8828, Philadelphia. From 2000-2200 it is now using 11,795kc/s. Reception reports are being requested for this transmission.

A rearranged European service is now being aired by the Canadian Broadcasting Corporation, P.O. Box 6000, Montreal, Canada. English and combined English and French transmissions are at 1100-1230, 1515-1530, 1630-1700 on 17,820/15,320kc/s, 1230-1315 on 17,820/15,320/11,720kc/s and 2045-2100 on 15,320/11,720/9,630kc/s.

Because of interference, Radio New York World-wide is now using 11,800kc/s instead of 11,825kc/s from 1200-1815, and 15,440kc/s in place of 15,445kc/s from 1200-2154.

Readers' Reports

We welcome reports from readers on ham or BC DX for inclusion in this column. May we hear from you?

A MULTIMETER design incorporating an Electronic OHMMETER

BY
M. SAUNDERSON

THE meter to be described here was designed with a number of points in view. It had to be easily and fairly cheaply constructed and its accuracy had to compare favourably with commercial units of similar design. The finished meter has a sensitivity of $1,000\Omega$ per volt and has 24 ranges. It covers 0-3,000V a.c. and d.c.; 0-1A d.c., and can measure up to $10M\Omega$ on the resistance ranges.

Two circuits are given for the ohms ranges and the constructor may choose which circuit he

prefers. The electronic unit provides a linear, forward-reading scale and can measure up to $10M\Omega$ with only a small battery voltage applied. The other ohmmeter unit to be described is of the more usual variety and will read up to about $40k\Omega$ or so. This latter unit has not actually been constructed by the author but the circuit is included for the benefit of those who do not require the electronic version.

Layout and construction are not important and the meter may be built in any form the constructor chooses. For those who wish to follow the author's design, however, the accompanying diagrams give all the necessary measurements and information.

It will be seen that the wiring is done on a number of small panels, these should be of paxolin or some other plastic insulating material.

This sub-wiring method is adopted to simplify overall construction. In the prototype meter one long tag panel was used originally but this was found to complicate rather than simplify wiring and so this method has been abandoned in preference to the smaller units.

Electronic Ohmmeter Panel

In Fig. 1 details are shown of the panel on which the electronic ohmmeter is constructed. Those constructors who do not wish to use this unit will need to use a different instrument front panel layout to that shown in Fig. 3. No detailed wiring instructions are given for this unit as it is thought that anyone wanting a multi-meter would be able to wire it from the circuit diagram.

It is recommended that colour coded leads about 8in. long should be left "floating" for the input and output connections to the electronic ohmmeter panel. These will be wired to the function switch after the other panel and switches have been fixed in position. A recommended colour code is: Input positive—blue, Input negative—white, Output positive—red, Output negative—black.

The standard resistors, i.e. those marked Ra, Rb, etc. should preferably be 1% high stability types although this is not imperative.

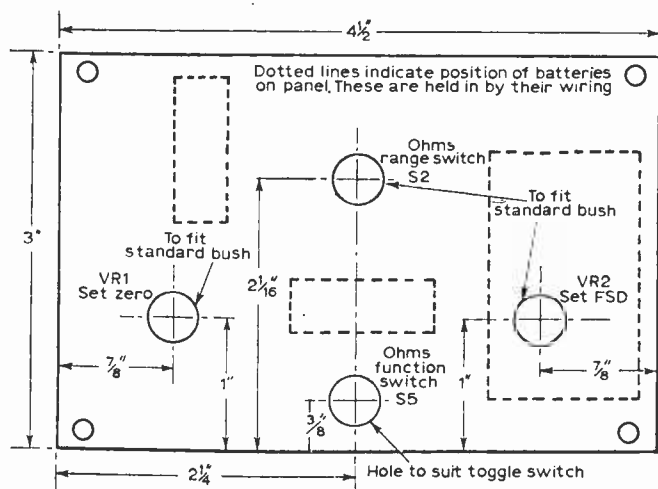
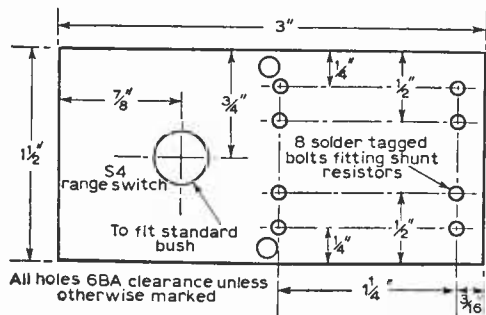


Fig. 1 (above): Details of the paxolin ohmmeter (electronic) panel.

Fig. 2 (below): The voltage and current ranges panel.



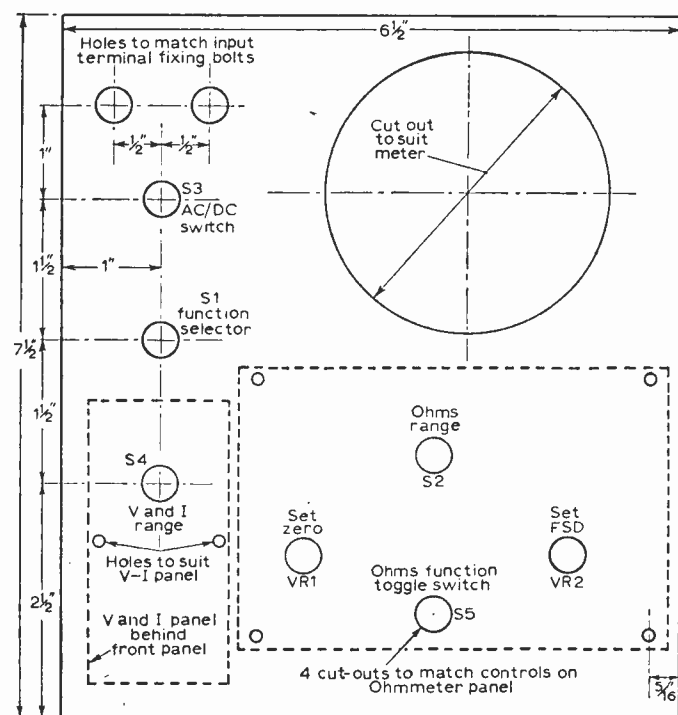


Fig. 3: Main front panel with positions of sub-panels.

Voltage and Current Panel

The second sub-stage is the voltage and current unit, and this should also have colour-coded leads as previously described. The series resistors in this stage must be 1% types, as it is on these components that the accuracy of the voltage ranges will depend. The shunt resistors need not necessarily be high tolerance types as they are used in the universal shunt arrangement. Of course, the higher tolerance components used, the greater will be the final accuracy of the completed instrument.

When these two sub-assemblies have been wired they may be mounted on to the front panel as shown in Fig. 4.

The next step is to wire the function selector switch S1. This is probably the most difficult part of the whole construction. The switch used in the prototype model had the connections to the four poles in the centre of the switch wafer. If this type

of switch is used connections may be made in the following way. Turn the switch anti-clockwise and carefully examine to determine which fixed contact the moving contact comes to rest on. The four fixed contacts thus identified will be referred to later as the "x" contacts.

Now turn the switch one position clockwise and note which fixed contacts are selected this time. These will be referred to later as the "y" contacts. The remaining four fixed contacts will be called the "z" contacts in later reference. The four poles will be called 1, 2, 3, 4, counting clockwise, in the wiring instructions, which follow: Short tag 1x to tag 2, and tag 4x to tag 3x. Solder the positive input lead to the V1 unit to tag 1y. Solder the negative input lead to the V1 unit to tag 4y. Next solder the output leads from the same unit, positive and negative to tags 2y and 3y respectively. This completes the wiring of the voltage and current assembly.

The next stage is the wiring of the ohmmeter section. Solder the input leads to tags 1z and 4z (the polarity of the connections is irrelevant in this case) and the output leads to tags 2z and 3z with the positive lead going to tag 2z. This completes the ohmmeter wiring.

The a.c./d.c. switch S3 is the next to be wired into the circuit. The operation of the switch should again be studied to see which fixed contacts are in circuit in which switch position. When the switch is turned anti-clockwise the two contacts selected should be marked in some way to facili-

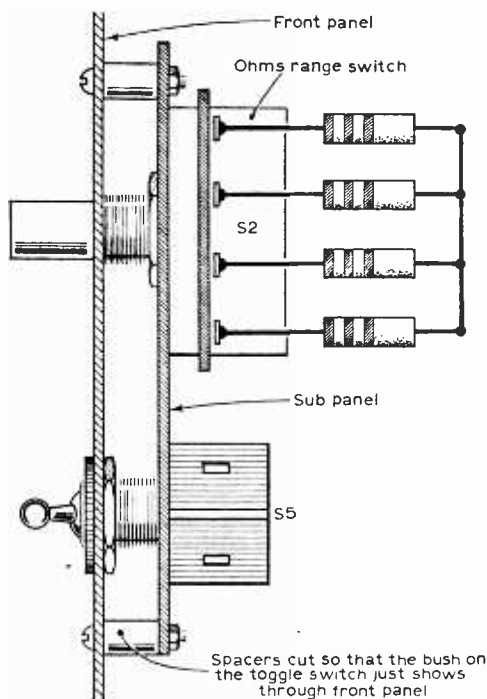


Fig. 4: Mounting details of the electronic ohmmeter panel.

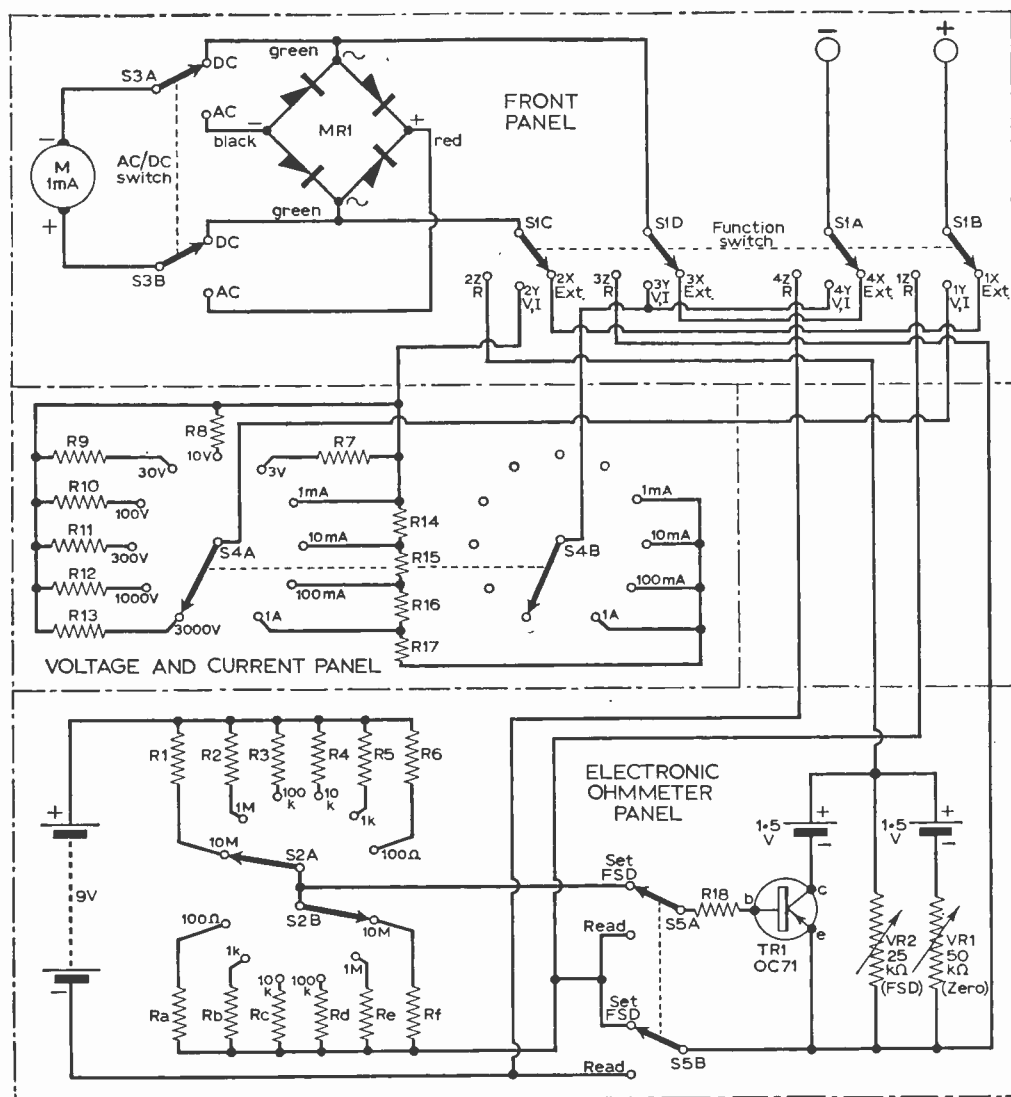


Fig. 5: The complete multimeter circuit.

tate identification later. The switch may now be wired.

If the constructor has a commercially made meter rectifier to hand this should be used; however an improvised rectifier may be made by wiring four germanium diodes in a bridge circuit. This will not be as accurate as a commercial component but it will function reasonably well.

Wire the a.c. sides of the rectifier to the two fixed contacts previously marked. Wire the positive and negative sides to the other fixed contacts. Study the switch again and see which moving contact makes on the positive side of the rectifier.

Wire this pole to the positive meter terminal and wire the other pole to the negative side of the meter. The a.c. side of the rectifier which connects to the positively wired pole should now be wired to pole 2 on the function selector switch. The other a.c. connection to the rectifier should be wired to pole 3 on the function switch. When the switch is turned so that the moving contacts are making on the a.c. side of the rectifier the meter is connected for d.c. measurement. All that now remains is to connect pole 1 on the function switch to the positive input terminal and pole 4 on the function switch to the negative input terminal and the meter

is complete.

When using the electronic ohmmeter a certain order of switching must be followed. This order is:

- 1 Switch function switch S1 to "R" and toggle switch S5 to "Set F.S.D.";
- 2 Short input and put toggle switch to "Read". Set zero by adjusting VR1;
- 3 Set toggle switch to "Set F.S.D." Remove short. Insert resistor to be tested and adjust VR2 potentiometer for F.S.D. on the meter scale;
- 4 Put toggle switch to "Read" and read off value of resistor directly on the scale;
- 5 Switch function switch from the "R" position, and remove test resistor.

This may seem long and complicated but in actual practice the setting up operations take only a few seconds and after operating the unit a few times one does it automatically anyway.

When reading un-marked resistors it is essential to start on the highest range and to work down, as a test resistance greater than the internal standard will cause a current greater than one milliamp to flow through the meter and damage may occur to the meter. If when testing a resistor a full scale reading is obtained when switched to "Read", this is an indication that either the meter is not switched to a high enough range or else that the resistance is open circuit. Similarly a reading of zero when switched to "Read" indicates that the resistor is short circuit.

When constructing the ohmmeter the values of the resistors in series with the standard resistors have to be found by trial and error as these will depend on the transistor used. To find the value required insert a test resistor of equal value to that of the standard resistor. Adjust the "Set F.S.D." control VR2 to its half-way position and vary the value of the series resistor until a full scale reading is obtained. It is best to start with a resistor about ten times greater than the standard and to work downwards in value until f.s.d. is obtained.

Overload Cut-out

It may be good idea to fit some form of overload cut-out to the meter. Although the author has

SIMPLE NOISE GENERATOR

—continued from page 424

used in the original design, there is no reason why other double triodes such as the octal based 6SL7, or the 6SN7 should not be tried. If required, a battery version could be built around a DCC90, or a similar valve, in which case, R2, R6, C4, MR, and T1 become unnecessary.

In the author's model, the unit was built into a wooden box 2½in x 5in. x 6in. with the tone control, on/off switch, sockets for key, and coaxial and jack output sockets mounted on a front panel made of "Formica". However, this was rather cramped, and a slightly larger cabinet is advised.

It is important that an isolated power supply is used, and not the "live chassis" type of power supply where one side of the mains is connected to the chassis. Such an arrangement would prove extremely dangerous if the unit were to be used in conjunction with a.c./d.c. set. Mains transformers

COMPONENTS LIST

Switches:

- S1 1 4p, 3w, wafer switch (see text)
- S2 12p, 6w, wafer switch (only for electronic ohmmeter)
- S3 1 2p, 2w, wafer switch
- S4 1 2p, 11w, wafer switch
- S5 1 2p, 2w, toggle switch (only for electronic ohmmeter)

Potentiometers:

- VR1 50kΩ Lin.
- VR2 25kΩ Lin.

Meter:

- 1mA, F.S.D. 100Ω

Resistors:

- Ra 100Ω, 1%
- Rb 1kΩ, 1%
- Rc 10kΩ, 1%
- Rd 100kΩ, 1%
- Re 1MΩ, 1%
- Rf 10MΩ, 1%
- R7 3kΩ, 1% high stab
- R8 10kΩ, 1% high stab
- R9 30kΩ, 1% high stab
- R10 100kΩ, 1% high stab
- R11 300kΩ, 1% high stab
- R12 1MΩ, 1W, 1% high stab
- R13 3MΩ, 3W, 1% high stab
- R14 9kΩ, 1%
- R15 900Ω, 1%
- R16 90Ω, 1%+
- R17 10Ω, 1%+
- R18 22kΩ, 20%

* see text

± wirewound

All resistors ½W unless otherwise stated

Transistor:

- Tr1 Mullard, OC71 or equivalent

Miscellaneous:

- Knobs, connecting wire, solder etc.

not actually tried this it is imagined that a relay designed to operate at 1mA could be utilised by wiring it as a switch in series with the coil in the instrument. This, of course, would be in effect a resistor in series with the coil and different series and shunt resistors would have to be used in order to counteract this.

A SIMPLE AF/F NOISE GENERATOR COMPONENT LIST

- V1 6J6, 6SL7, 6SN7, DCC 90 etc. (see text)
- C1 0.01mF 1000V paper
- C2, 3 200pF ceramic
- C4 8μF 350V electrolytic
- R1, 3 220kΩ (see text)
- R2 75Ω
- R4, 5 22kΩ
- R6 2.2kΩ
- MR Any metal rectifier with a rating of 250V 20mA (or higher)
- T1 Secondary: 175-250V, 20mA 6.3V, 0.6A
- S1 Double pole on/off switch
- Case, chassis, output sockets, etc.
- All resistors ± 20%, ½W carbon

suitable for the unit are often advertised as converter transformers in the columns of this magazine.

efficient HEAT SINKS for transistor work

By E. H. Green

ONE of the main difficulties encountered in soldering transistors and other semi-conducting devices, is ensuring that the device is not damaged by heat, either being radiated from the soldering iron, or conducted by the lead wires to the device. The former is easily overcome if the iron is held above the transistor and as far away from it as possible, as shown in Fig. 1.

It is usual, unless the leads are reasonably long and a low-power iron is used, to use a heat sink on the lead being soldered. The most commonly

used heat sink is a pair of thin-nosed pliers which are used to grip the lead being soldered as shown in Fig. 2. The disadvantage in using pliers is that it is difficult to hold the pliers and transistor steady while at the same time holding up a circuit board and applying the soldering iron.

The only commercial heat sink I have seen is the one made by X-Acto, USA, which clips on to the lead and is made of high-conductivity aluminium-copper alloy, as shown in Fig. 3. Although the force applied in holding the lead is not so great as that used with the pliers, it is nevertheless quite an efficient heat sink.

A simple, yet highly efficient heat sink can be made from a standard or miniature crocodile clip by first filing off the teeth and then gluing pieces of thick felt in the jaws, one on each as shown in Fig. 4. Bostik or any other similar glue may be used. In use the heat sink is dipped into water to soak the felt and then simply clipped on to the lead being soldered, as shown in Fig. 5. It thus provides intimate contact with the lead and cools by evaporation of the water as the lead heats up. Provided the pads are kept reasonably damp, the sink is many more times efficient than many of the usual devices.

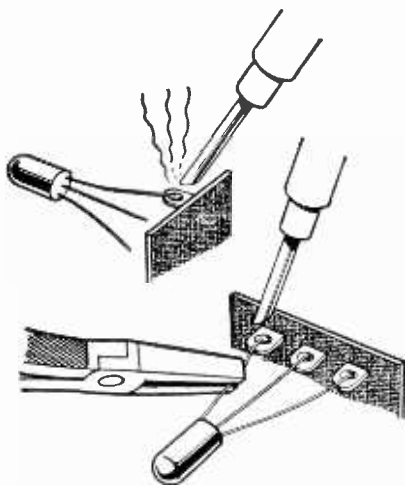


Fig. 1 (top): With an unprotected transistor, the iron should be kept as far from the body of the component as possible. Fig. 2 (bottom): Using pliers as a heat sink.

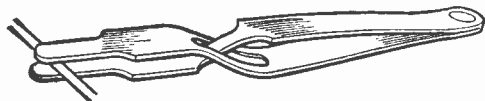


Fig. 3: A commercial heat sink.

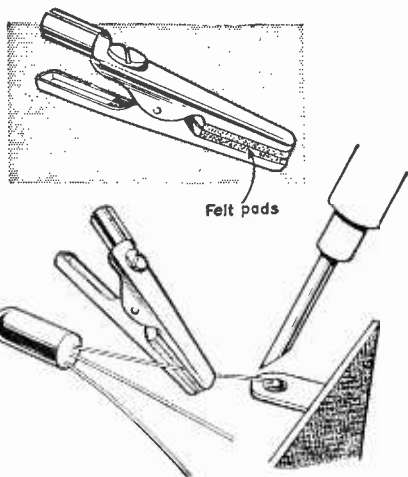


Fig. 4 (top): A crocodile clip fitted with felt pads. Fig. 5: The heat sink in use.

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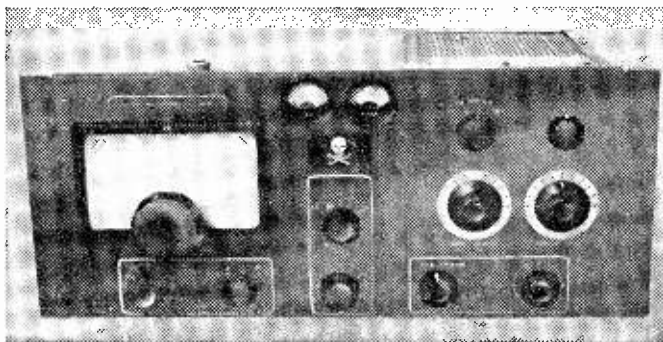
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The BUCCANEER

MULTI-BAND TRANSMITTER

By J. E. Alban G3JEA

AFTER many years of successful amateur operating, during which time the writer has had the opportunity to build and use transmitters from QRP to full 150W level, it was observed that little difference in signal strength reports received, existed between 25W rigs and those which ran at the maximum permissible level.

Commercial transmitter manufacturers, and kit suppliers, have recently arrived at the same conclusion, hence the popularity of the medium-powered transmitter now in use with a d.c. input to the final in the region of 60W. By keeping the power around this level, it is possible to produce a reasonably-priced TX, with unwanted harmonic output content reduced to an absolute minimum, obviating TV and BBC interference to some degree.

It was assumed that when built, the transmitter to be described would be used for a number of years, thus the valve types specified are in the main taken from the current lists, with the probability that they will remain popular for many years to come. The only exception to the rule is the 807, but here price was the governing factor and with these valves still available on the surplus market laying in a small stock should not prove any problem. The modern miniature 5B254M can, of course, be used in place of the 807 where the h.t. supply is not in excess of 700V. Octal based equivalents for the miniature valves quoted can be used satisfactorily, but more chassis space will be required to accommodate them.

Use of ex-government parts, or others of doubtful replacement has been deliberately avoided, all those listed are of standard manufacture and are readily available.

The photo depicts the Labgear Wide Band Multiplier Unit used in the current version of the transmitter, but equally good results have been achieved in prototype versions using home-made

wide band couplers wound on standard Aladdin $\frac{1}{8}$ in. formers.

CIRCUIT DESCRIPTION

V.F.O. and Buffer Stages—Fig. 1

The v.f.o. is of the standard Clapp pattern, output being taken to the buffer amplifier from the cathode via the variable capacitor TC2. Cathode coupled Clapp oscillators are of the most stable kind in the opinion of the writer, and variable coupling to the following stage allows adjustment of drive to the buffer and less "pulling effect" on the v.f.o. as the multiplier stages are tuned up. With the TC1 the 15pF bandspread capacitor, a nice open spread is obtained, facilitating good netting, but at the expense of a slight loss of coverage on the 80 metre phone band; v.f.o. drift is very slight during the warming-up period and soon settles down, a clean, sharp note should be heard in the monitor.

The second half of the buffer valve is used as a cathode follower stage giving greater stability and isolation to the previous stages. It should be noted that the oscillator stage is left running continuously, and is not audible in the station receiver at 7Mc/s and above. Even on its basic frequency it is barely detectable if the co-axial cable from the v.f.o. box to the buffer grid is kept down to absolute minimum. In the "net" position of the "Send-Receive" switch, anode volts (255 stabilised) are applied to both halves of the buffer/cathode follower valve, enabling the v.f.o. to be heard at a reasonable level in the receiver without depressing the key.

Frequency Multiplier Stages—Fig. 2

Drive to the multipliers and final stages is controlled by the potentiometer in the screen of the first 6CL6 stage. More than sufficient drive is

available on all bands (6BW6 and 6AQ5 can be used, but will result in slightly reduced drive to other stages). Keying is carried out in the cathode of this same stage, the only click filter found necessary being the usual 2.5 millihenry r.f. choke in series with the key contacts, and decoupled to earth by a 0.005 μ F disc ceramic condenser. Both should be fitted as close as possible to the actual key contacts.

It will be observed that the three multiplier stages do not have a d.c. potential applied to their screen grids, obviating the use of further dropping resistors and decoupling condensers. Feeding the screen grids with r.f. is an idea "borrowed" from a fellow amateur G3JAM, and, although published some years ago, does not enjoy the popularity one would expect. Having experimented for some years with various methods of frequency doubling and tripling, the writer is of the opinion that this method is by far the best so far as the elimination of unwanted harmonics is concerned. Experience has shown that a high level of unwanted harmonics is generated in the screen grid circuits of beam tetrode and pentode valves, and, unfortunately, appears in the anode circuits, despite the use of wide-band tuned couplers. The anode current taken by the switched-out multipliers is very low.

The unwanted harmonic content from the multipliers is so low that adjustments can be made to the final amplifier without the side and other screening covers being fitted, and no TVI was observed on a monitor, not two feet away.

The Philips trimmers in the grid stages of the multipliers are to compensate for the grid impedance changes between the following multiplier and p.a. stages.

P.A. and Modulator Stages—Fig. 3

The final stage follows normal practice, the stand-by anode current being held to a safe level by the clamper valve in the screen grid circuit. Output is via the conventional pi-network, and, although a TVI harmonic trap has been included across the antenna terminals, it has not been found necessary to use it in the London area, neither has it been found necessary to use a low pass filter, even on the 21Mc/s band.

At the writer's QTH the transmitter is run at 90W input, that is, 900V to the 807 anode at 100mA. Readers may have their doubts as to the life of an 807 under these conditions, but, if the tuning-up time is kept to an absolute minimum, and the key should not be depressed for more than

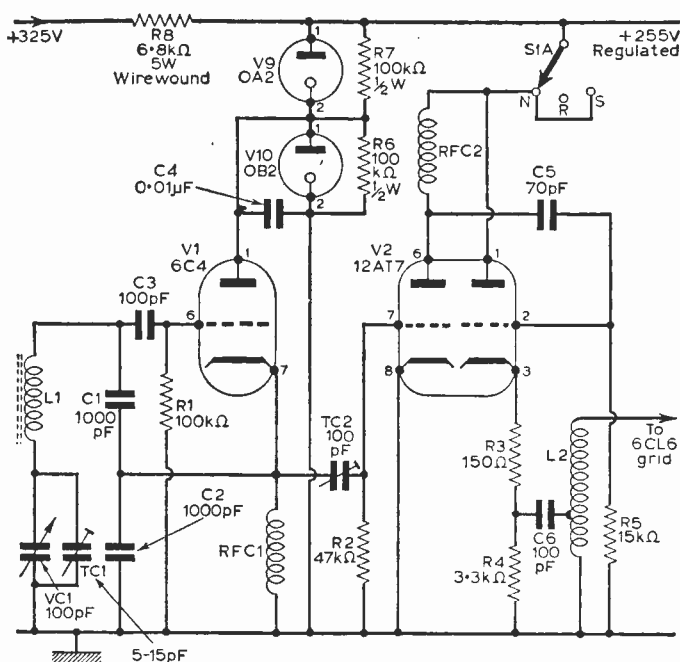


Fig. 1: The v.f.o. and buffer stages of the circuit. C6 is tapped into L2, nine turns from lower end.

COMPONENTS LIST FOR V.F.O. AND BUFFER STAGES

Resistors:

R1	100k Ω	R5	15k Ω
R2	47k Ω	R6	100k Ω
R3	150 Ω	R7	100k Ω
R4	3.3k Ω	R8	6.8k Ω , 5W w.w.

All $\pm 20\%$ $\frac{1}{2}$ W carbon, unless otherwise stated

Capacitors:

C1	1000pF silver mica $\pm 1\%$
C2	1000pF silver mica $\pm 1\%$
C3	100pF silver mica $\pm 1\%$
C4	0.01 μ F disc ceramic
C5	70pF silver mica
C6	100pF silver mica $\pm 1\%$
TC1	5-15pF air spaced trimmer
TC2	100pF air spaced trimmer
VC1	100pF air spaced tuning

Valves:

V1	6C4	C9	OA2
V2	12AT7	C10	OB2

Other Items:

- L1, 34t, 28 s.w.g. enam. copper wire closewound on $\frac{3}{8}$ in. dia. Aladdin former
- L2, 42t, 32 s.w.g. enam. copper wire closewound on $\frac{3}{8}$ in. dia. Aladdin former—tapped at 9 turns from low end for C6
- RFC1, 2 1.5 mH r.f. chokes (Eddystone)
- Sl, 3-pole, 3-way rotary ceramic switch

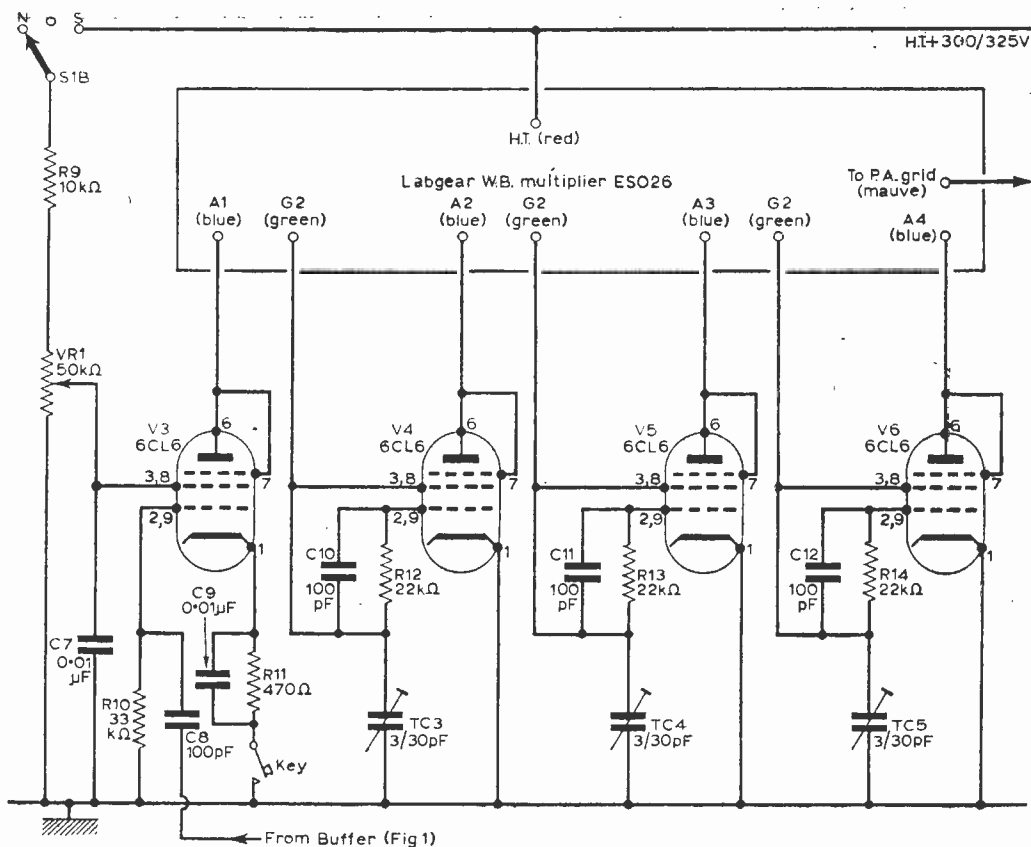


Fig. 2: Frequency multiplier stage.

COMPONENTS LIST FOR EXCITER STAGE

Resistors:

R9 10kΩ, 2W w.w. R12 22kΩ
 R10 33kΩ R13 22kΩ
 R11 470Ω, 1W R14 22kΩ
 All $\pm 20\%$ $\frac{1}{2}$ W carbon, unless otherwise stated
 VR1 50kΩ 5W w.w. potentiometer (drive control)

Capacitor:

C7 0.01μF disc ceramic
 C8 100pF mica
 C9 0.01μF disc ceramic
 C10 100pF tubular ceramic
 C11 100pF tubular ceramic
 C12 100pF tubular ceramic
 TC3 3/30pF Philips trimmer
 TC4 3/30pF Philips trimmer
 TC5 3/30pF Philips trimmer

Valves:

V3 6CL6 V5 6CL6
 V4 6CL6 V6 6CL6

Other Item:

Wide-band multiplier unit, type E5026 (Labgear)

10 seconds or so at a time, running the p.a. at 75W input under conditions of correct loading would mean that the life of the valve is considerably extended.

Series gate modulation is employed in the transmitter, mainly because of the ability to obtain a reasonably high level of modulation without the necessity of bulky modulating transformers and duplicated power supplies. In practice it has been found to be most satisfactory.

Using the gating method does allow the 807 to run at a full 90W input on peaks, whilst with the high efficiency methods this is reduced to 60W.

The audio pre-amplifiers are connected to the 255V stabilised line, and are unaffected by current drain on the main exciter h.t. rail. Although valve types 12AU7 or 12BH7 may be employed as clamper/gating controls, in practice the latter type has been found to be more effective, allowing 20% greater anode current swing on voice peaks.

The external power supply is not shown, but is quite conventional. Bias for the clamper stage is obtained from an instrument type transformer which has its 6.3V heater connections taken to the transmitter heater rail and is, in fact, run

COMPONENTS FOR P.A. AND MODULATOR STAGES

Resistors:

R15 4.7k Ω	R21 47k Ω
R16 2.2M Ω	R22 1.5M Ω
R17 4.7k Ω	R23 220k Ω
R18 470k Ω	R24 220k Ω
R19 470k Ω	R25 100 Ω , 1W
R20 47k Ω	R26 15k Ω

All $\pm 10\%$ $\frac{1}{2}$ W carbon, unless otherwise stated

VR2 500k Ω lin. potentiometer

VR3 25k Ω , 5W w.w. potentiometer

Inductors:

L3	Geloso, Codar or KW pi-coil
L4	TVI trap coil: 9t. 18 s.w.g. $\frac{1}{2}$ in. dia. $1\frac{1}{2}$ in. long

RFC3, 4 1.5mH r.f. chokes (Eddystone)

RFC5 P.A. r.f. choke (Labgear or Minimitter)

RFC6 5A TV suppressor choke (Radiospares)

RFC7 1A TV suppressor choke (Radiospares)

RFC8 V.H.F. choke (Eddystone)

Valves:

V7	12AX7	VII	807
V8	12BH7		

Capacitors:

C13	10pF ceramic
C14	25 μ F electrolytic 25V
C15	8 μ F electrolytic 300V
C16	8 μ F electrolytic 300V
C17	0.005 μ F moulded mica
C18	0.005 μ F moulded mica
C19	0.01 μ F disc ceramic
C20	470pF disc ceramic
C21	470pF disc ceramic
C22	0.002 μ F mica 2kV
C23	500pF mica 500V
C24	0.005 μ F disc ceramic
C25	500pF mica 2kV
TC6	60pF mica trimmer
VC2	200pF air spaced variable
VC3/VC4	500pF air spaced twin-gang variable

Other Items:

M1	0.5mA movement
M2	0.150mA movement
S2	3-pole, 2-way rotary switch

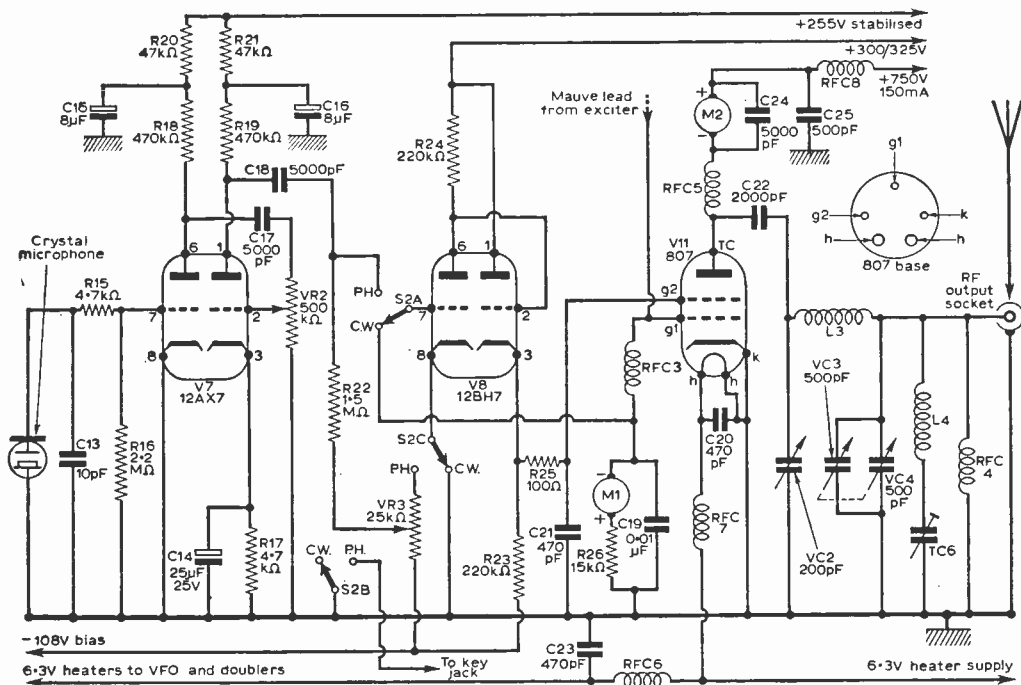


Fig. 3: P.A. and modulator section of the circuit.

"backwards". By so doing, it is not necessary to take a 240V a.c. line under the chassis. To avoid accidents, the mains primary windings should be disconnected and sealed off. Care should be taken to see that the bias smoothing capacitor is connected in the correct sense, that is positive end to chassis. The potentiometer VR3 in the bias voltage

rail, enables a variation to be made when lower anode voltages are used on the 807 p.a. valve. For normal 750 to 800V h.t. rails, the bias should be adjusted to give approximately 108V negative.

CONTINUED NEXT MONTH

A COMMENTARY BY HENRY PRACTICALLY WIRELESS

No. 1 Kitmanship

DO-IT-YOURSELF is the trend of the era. There is an ineffable thrill in seeing something one has lovingly fashioned reach a triumphant completion. No matter that one leg has to be propped with a telephone directory, that the patched-on panel conceals a mass of twisted wires, or even that the results do not sound as hi-fi as we wish. We have made it ourselves—our own Galatea, a darn sight cheaper than she could be bought.

Wireless began with the kit, but grew to the sort of complexity that demanded mass production. Mass production begat standardisation, standardisation begat simplicity, simplicity begat cheapness. Now we can construct as good a piece of equipment on the kitchen table as can be obtained in the shops.

It is certainly cheaper to build and the expectation of success is in direct proportion to our common sense. We have the kit designers to thank for that.

These boys not only know their opinions: they plant, water, dig, peel and cook them for us. Every smallest detail is considered. Each screw, each connection, each guide mark is vetted to make our labour easier. But behind the simplicity lies a complicated feat of organisation. The kit-maker's factory is as meticulously regimented as the Brigade of Guards. The buying department, which ensures that we can

obtain an immediate replacement of the part we ruined with our clumsy soldering, is as complex as in the works producing the "normal" commercial set.

In the immediate post-war days, kits were often thrown together from Surplus Government equipment. Those were the days of the ingenious modification. We built upon the basic contents of our spares box. The advertisement columns of *PRACTICAL WIRELESS* were avidly scanned for the elusive alternative spare part.

When some far-sighted gentry saw the renewed prospects of kit construction, we were offered some weird and wonderful bargains. Many atrocities were committed in the sacred name of "construction". A parcel of tatty pieces would plonk through the letter-box, they often bore small resemblance to the list of instructions.

Oh, those instructions! At times, they were apparently drawn up by hieroglyphic experts, translatable only by students of Coptic. The drawings, where hasty duplication had allowed the lines to be reproduced at all, seemed to have been scratched on the stencil by an art-loving chimpanzee.

But we soldiered on. Slowly, the conglomeric of components spread over the table assumed some sort of shape. Then came the catch.

Just as we were congratulating ourselves that success lay around a not-too-distant corner, the unbeatable snag would occur. "Fit member A from slot B to hole C, passing over spigot D and the three red wires X, Y and Z," the instructions said, dogmatically. But member A would not reach from B to C, and spigot D protruded half an inch more than we expected, and as for three red wires—all we had, at this stage, was a bunch of multi-coloured ends.

However, it was all good



Mrs Harry's seed pearls.

experience, and helped swell the contents of our spares box. It is interesting to resurrect some of those early attempts. Soldered joints had more quantity than quality about them. Capacitors had long since lost both identification and outer wax. Where wires had been too long, they were twisted into pretty coils. Common earth tags had been used as convenient anchor points. Paxolin strips were cracked, panels split, screw heads burred and threads stripped. In fact, the only strong part about the set was an irremovable mounting board, which had to be dismantled before we could reconstruct. Ah well, back into the spares box.

Back, to join some of those old essays into the mini-world of early transistor radios. These were utterly impossible for the Ham-Fisted Harry who had tried to build them, and passed them over to us. The kit supplier stinted on strength to scale down proportions. Harry had as much hope of finishing the construction as of threading Mrs Harry's seed pearls.

Today, we have a very different situation. Although a delicate touch is still necessary, the technique of kit preparation has reached a high level. It is almost literally true that "even a child could build it."



... by an art loving chimpanzee.

a 'high compression front end

THE mathematical approach to a practical problem can be extremely elegant, but there are occasions when incomplete data can lead to a discouraging conclusion. In particular, much of the available information about transistors suggests that they do not make efficient simple "front ends" for receivers, and perform best as superhets. Having tried out many published circuits, the writer must sadly agree that, despite considerable ingenuity in their design, reflex circuits tend to be unstable and to lack sensitivity in weak signal areas.

By prolonged trial and error, the writer has evolved a simpler circuit which is stable, smoothly controllable and gives excellent sensitivity over the medium wave-band. It may seem to fly in the face of accepted transistor practice, but its efficiency has been confirmed by several specimens giving consistent performance over a period of four years, throughout freezing and summer conditions alike.

Perhaps it should here be explained that the writer's principal interest in this field lies in really tiny receivers, driving an earpiece and working off a single cell, yet providing good volume with easily adjusted and *stable* controls. Using the basic circuit in question, the smallest complete set (so far) fits in a case considerably smaller than a matchbox. Yet with its ferrite rod aerial just over an inch long, it can get as many stations and as clearly as a typical commercial superhet.

Probably the most striking feature of this circuit is that its aerial does *not* have a step-down tapping into the base: the entire winding is used. This—contrary to expectations—provides a much stronger signal than the conventional tapped winding (which is designed for the different function of feeding into crystal, reflex or superhet circuits).

However, when the whole aerial is shunted in this way, tuning can be completely upset by changing transistor characteristics; especially those due to thermal drift or variations in the supply voltage. This is very marked with the early types of r.f. transistor—such as the familiar red and yellow spot—but much less so with the more recent surface-barrier or micro-alloy types (e.g. SB 305 or MAT 101).

However, with direct coupling, even these last

give far more thermal drift than is tolerable in a practical receiver. Not only does tuning alter; the gain varies so the regeneration ("reaction") cannot be set with any degree of stability.

The immediate essentials therefore are: (a) thermal compensation, and (b) voltage constancy. The first can be provided by a thermistor in a suitable voltage-dividing circuit to control the base bias. Thermal compensation is probably the most vital necessity for a "high compression" set to be carried in the pocket. Supply voltage can be kept adequately constant either by using an ordinary dry cell with capacity large in relation to the load, or by using a mercury cell.

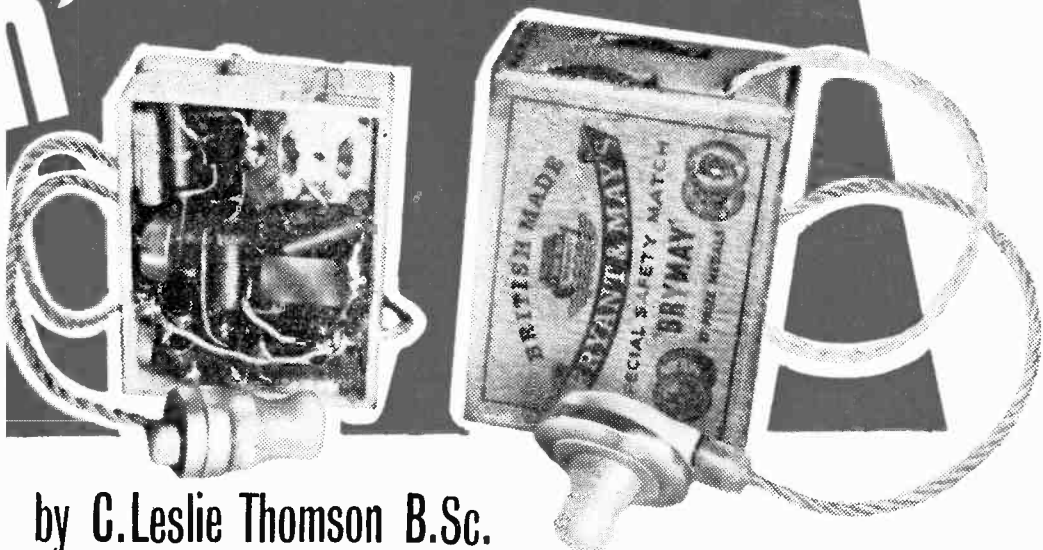
To obtain adequate sensitivity, without recourse to complex circuitry or to a second tuned stage, old-fashioned "reaction" proved to be far and away the most rewarding. It gives at the same time enormously increased gain and ample selectivity.

The reported failure of other experimenters to obtain useful degrees of regeneration with transistors may well be due to their use of step-down coupling of aerial to base. The writer has found a variety of control circuits, either using a variable resistor or a variable capacitor, to give excellent gain and thoroughly practical performance.

The regeneration characteristics can be varied over a wide range by adjusting and balancing the values of the components; the most important desiderata being "non-ploppy" action and uniform setting over at least the greater part of the tuning range. In addition, there should be no detuning as the reaction is varied.

The stronger the signal that can be obtained from the "detector" stage, the less the a.f. amplification necessary, and the less the background noise. However, if the "front end" is too complex, the bulk of the components makes a compact construction difficult or impossible, and stray capacity and induction effects make placing much too critical. This is especially true if more than one tuned circuit is involved, or if r.f. chokes are used.

This brings us to the next essential feature of the circuit—a transformer output. This provides an adequate impedance to r.f. signals, so allowing these to be by-passed into the reaction coil. It also effectively blocks the passage of r.f. into the ampli-



by C. Leslie Thomson B.Sc.

fier stages and allows one to reverse polarity so that a.f. feed-back can be kept negative overall, no matter how compact the set. (This eliminates the need for decoupling in multi-stage amplifiers, so keeping the number of components to a minimum.)

By no means least of its virtues, a transformer gives a much stronger a.f. signal than resistance capacity coupling with limited supply voltage. A suitable transformer—such as the Ardente D 1001—is only slightly bulkier than the smallest effective r.f. choke, which would otherwise be an essential component.

Regeneration control can be provided in two ways, depending on the particular needs. For maximum compactness, and combining on-off with volume control, a sub-miniature potentiometer with switch seems to be ideal. Taking a little more space, a variable capacitor (e.g. a 30pF trimmer) and a separate switch should give greater freedom from crackle over the years!

The process of adjusting the base bias and the reaction capacitors for optimum performance must be set about in a methodical fashion. It is well worth the seeming delay of assembling the entire circuit on a "bread board" (or should one say "biscuit block"?) before attempting to fit it into the eventual case. It takes only minutes to do so, and it is quick and easy to substitute various values of resistor or capacitor—with full-length wires and using tag-boards as anchorages—but tedious and wasteful to perform the same operation with trimmed and shaped component wires inside a tiny box.

The resistors shown are a good starting point, but individual transistors may give even better performance with slightly different values. The degree of thermal stabilisation is controlled by the shunting resistor R3; without it, the thermistor would "overcompensate". If, with the values shown, regeneration is stronger in a warm room than in the cold, R3 should be increased in value; if the converse, reduced. The thermistor—a Brimar CZ

10—has a resistance of about 15k Ω at room temperature; when colder the resistance is higher, and when warmer it is lower, thus altering the bias voltage. If R3 has to be less than half or more than double the value shown, R1 may also have to be altered correspondingly to maintain the same average value of bias.

When the bias is correct, regeneration is free from "ploppiness" and sensitivity is at a maximum. For sensitivity, the voltage is not critical, but for smoothness of control it is well worth spending a little time on preliminary checks.

The next requirement for practical regeneration is that it should be substantially uniform over the tunable range. This makes it possible to bring in all stations at the same setting of the gain control, near to the oscillation point.

Incidentally, one need have no fear of oscillation being a nuisance to neighbours: the very low power involved and the tiny size of the aerial limit the range of possible interference to a few feet.

It is usually enough to make regeneration equal on Light and Home, although local conditions may make a different arrangement preferable. For example, if Light—or Luxembourg—has a much weaker signal than Home, a greater sensitivity at the high-frequency end will give similar volume on each station without re-setting the control. With an SB 305 or MAT 101, uncompensated regeneration is stronger at the high frequency end, and this is reduced by the shunt resistor R2; if too high in value, Home will require a higher setting than Light or Luxembourg; if too low, the converse.

Depending on individual layout, it may be found that the regeneration coupling capacitor C2 may have to be larger or smaller than shown—due to stray feedback. This will be indicated by harsh control if it is too large, and inability to produce oscillation if too small. The thermistor should be mounted close to the transistor, so that they are warmed or cooled together. If there is a rapid change in temperature, the thermistor responds the

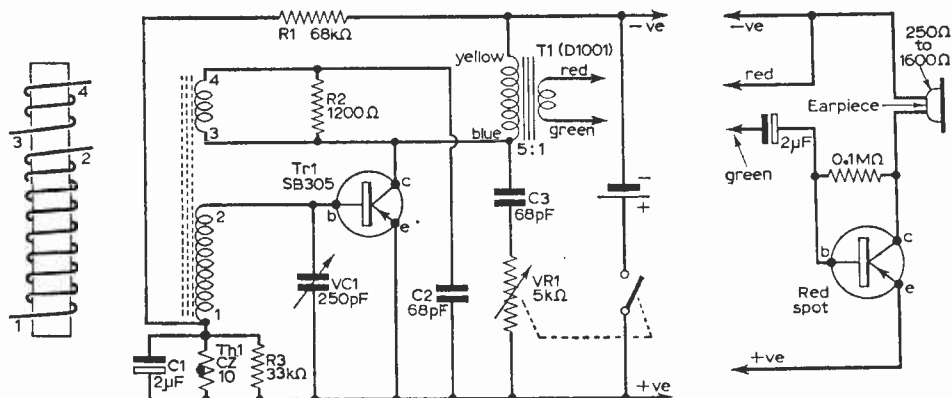


Fig. 1 (left): Windings 1-2=70-80t. 36s.w.g. enamelled wire; 3-4=25t. 36s.w.g. or 30t. 40s.w.g. depending on rod length. Fig. 2 (centre): Temperature-compensated regenerative receiver. With a good signal, it will drive a high-resistance magnetic earpiece, or it may be fed into an a.f. amplifier. Fig. 3 (right): Single-stage a.f. amplifier.

more quickly. This is most noticeable when soldering in trial components: radiant heat from the iron can knock the balance out for a full minute.

Patience is particularly called for in making adjustments to resistors R1 and R3, which have metallic links with the thermistor, and it may take two or three minutes for thermistor and transistor to drop back to the general temperature of the set.

The aerial is in no way critical as to dimensions or the placing of its windings, other than that they must be in the relationship shown in Fig. 1. With the smallest aerial rod— $\frac{1}{8}$ in. x $1\frac{1}{2}$ in.—the windings occupy the full length, in the form of a single layer, close wound, of enamelled wire.

The aerial winding consists of 80 turns of gauge 36, and the reaction of 30 turns of gauge 40. With a rod of between 2 and 3 in. in length, about 70 and 25 turns, respectively, of gauge 36 are suitable. These cover a range of at least 200 to 500 metres with a 250pF tuning capacitor.

The a.f. requirements depend upon locality and the volume required. The basic unit will happily feed into any form of amplifier, whether with one "earthed" input terminal or with both terminals "live". For most needs, a single stage is ample; that shown in Fig. 3 adds only a transistor, one capacitor and one resistor to the basic circuit. Using an earpiece of 250 to 1600Ω, good quality and volume to spare can be obtained with less than half a milliamp of battery current.

Audio negative-feedback is provided by biasing the base through a high resistance from the collector, as shown. This is probably the simplest practical circuit for an amplifier, and gives an excellent performance.

In favoured localities, fair volume can be obtained from the basic circuit alone, with a 250 to 1600Ω earpiece across the transformer secondary. The consumption then is only about one fifth of a milliamp, and this naturally limits the undistorted power output.

For really generous reserve—giving a daylight signal which is clearly audible even in high wind, and at many miles from the station—a two stage

amplifier (Fig. 4) takes about one milliamp. A 250Ω earpiece takes a little more current and gives rather less volume than a 1600Ω.

The physical size of the finished set depends mostly on the components one can obtain (or make) for tuning, switching and reaction control. The writer's three models are: Mk I, occupying the popular black-and-white plastic case measuring 2 in. x 3 in. x $\frac{1}{2}$ in. with $\frac{1}{2}$ in. square tuner and trimmer reaction control; Mk II, literally in a matchbox, with a compression-trimmer for tuning and resistance reaction control; Mk III, in a plastic box as sold for storing watchmakers'

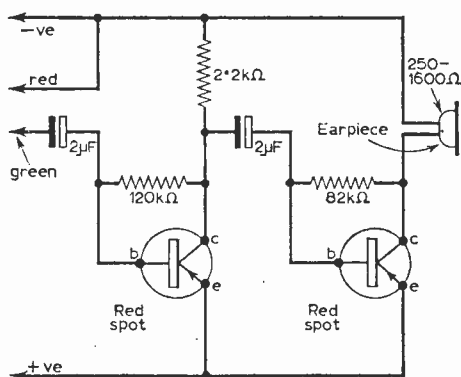
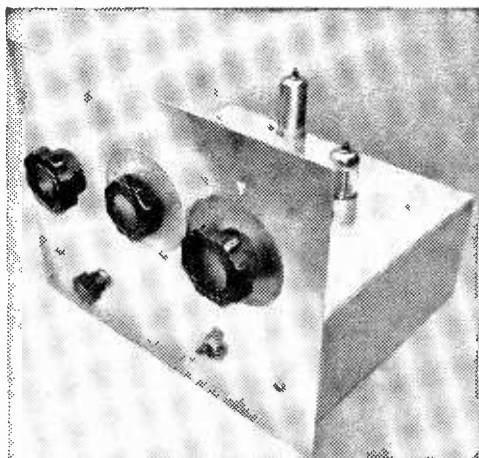


Fig. 4: Two-stage a.f. amplifier. Resistors between base and collector give negative-feedback and help to keep gain constant despite temperature variations.

materials, measuring $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in. x $\frac{1}{2}$ in. ($\frac{1}{2}$ in. square tuner, "pared down", and hearing-aid volume-control-and-switch). The first is powered by single pencil cell, the second by a Mallory 625 and the third by a 675.

As an alternative to the variable resistor gain control VR1 shown in Fig. 2, the fixed capacitor C2 may be replaced by a 30pF variable, and both capacitor C3 and VR1 omitted.



A Medium Wave and Short Wave Receiver

BY F. G. RAYER

THIS receiver is a 3-valver (plus rectifier) and covers approximately 19-60 metres, and 200-550 metres. It thus tunes the most interesting short wave bands, in addition to providing medium wave coverage. Bandspread tuning is fitted, and greatly eases operating on the SW bands. The whole receiver is quite compact, with a 7 x 8 in. chassis and 7 x 9 in. panel. The loudspeaker is not included, but is fitted in a separate cabinet, or to a baffle board.

Fig. 1 is the receiver circuit. Easily obtained miniature valves are used. The 6AM6, V1, is a high gain pentode. Regeneration is obtained by cathode taps on the coils, and is controlled by the screen grid potentiometer VR1. This is a very efficient and satisfactory method. VC1, of about 500pF, is the main tuning capacitor. VC2, of about 15pF, breaks up each tuning range into a number of small bands, and thus acts as the bandspreading capacitor. This simplifies tuning on the congested SW bands.

Two 6C4 valves are used as amplifier and output, with a 6X4 as full-wave rectifier. With this arrangement, a somewhat simplified smoothing circuit can be employed.

Chassis and Panel

Four holes $\frac{1}{4}$ in. in diameter are necessary for the valveholders, and these are in the positions shown in Fig. 2. A hole is drilled directly under the position to be occupied by VC1, for the lead to C1 and R1. Valveholders, tag-strips, and other items are fixed with 6BA bolts, and all holes are drilled before wiring begins. Valveholders have extra spacing between pins 1 and 7, and are arranged as shown in the under-chassis diagram.

The type of chassis listed can be used without a front runner, and the panel is then held to the side runners by short 4BA bolts through panel and side runner flanges. If a complete box type chassis is used, the two switches will secure the panel and chassis together, but bolts should also be used near the chassis corners, to add strength.

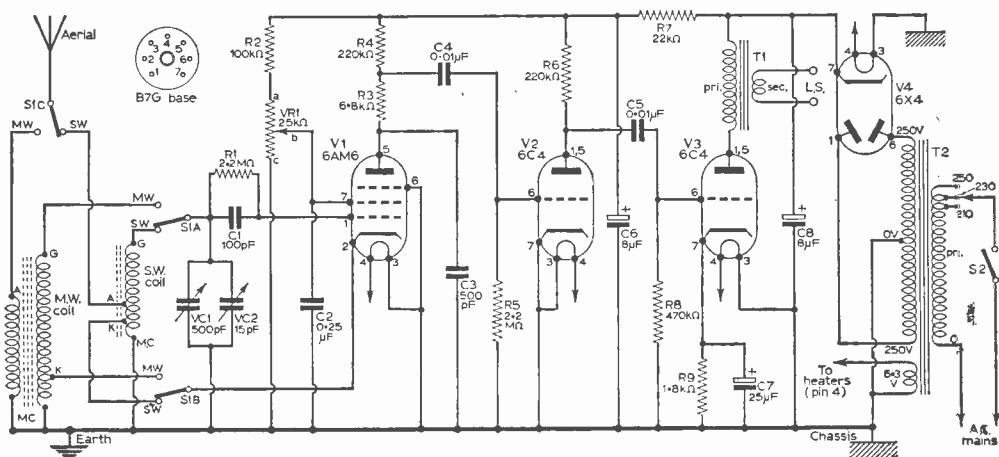


Fig. 1: The receiver circuit.

The panel has $\frac{1}{4}$ in. holes for VR1, VC1 and VC2. VC1 may be of the type which is screwed to the panel, or it may have feet and be bolted to the chassis. The lead for C1 and R1, and VC2, is soldered to VC1 before mounting the capacitor. Though VC1 is given as 500pF, any capacity from roughly 365pF to 500pF is suitable.

VC2 is about 10pF to 15pF maximum capacity. Here, 15pF is shown, but if a 10pF, 12pF or simi-

6AM6 holder by the shortest possible leads. The lead from VC1 passes down through the chassis, to C1 and R1, and to tag 1 of the wavechange switch. All wiring should be reasonably short and direct, especially in the detector, wavechange switch and coil circuits. Connections should run approximately as in Fig. 3.

Tag 7 of the 6AM6 holder is wired to tag B of VR1, Fig. 2. Tag A of VR1 is connected to R2, Fig. 3. Tag C of VR1 is wired to the chassis.

The ratio of the small output transformer T1 is not very critical, but best about 40:1 to 60:1 or so, as listed. The anode current is small, and a battery valve type transformer intended for currents of 10-12mA can be fitted, if to hand. A 2 to 3Ω speaker is required.

The total heater consumption is 1.2A, so a mains transformer (T2) with 6.3V 1½A heater secondary is satisfactory. HT consumption is under 20mA, so small transformers, as made for tuners preamplifiers, etc., are suitable. The h.t. secondary should be for full-wave rectification, and has 250/0/250V tags. If a 40mA, 60mA or other 250/0/250V transformer is to hand, it can be used, and if necessary it can be placed above the chassis.

Wavechange Switch and Coils

The wavechange switch has three poles. Pole 1 (Figs. 1, 3 and 4) is for the grid circuit, pole 2 is for cathode, and pole 3 is for aerial. The medium wave

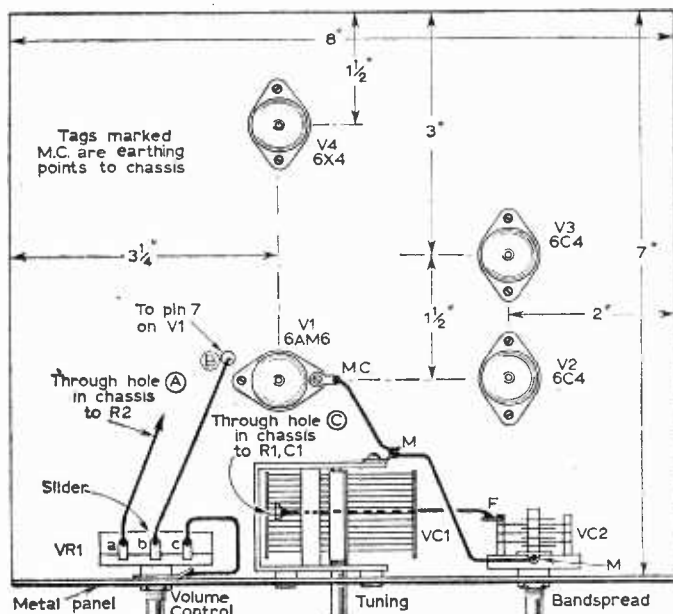


Fig. 2: Layout above the chassis.

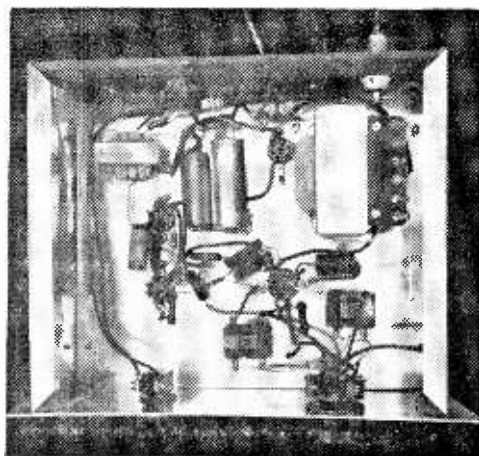
lar capacitor is to hand, this is equally satisfactory. The capacitors are connected in parallel with short leads, and earthed to a tag at the valveholder, as shown. The rear runner has speaker sockets, and an insulated aerial terminal, or sockets for aerial and earth. Earth is joined to the chassis. Mains leads pass through the rear runner, as in the underside diagram. A grommet should be fitted if the runner is metal.

Under Chassis

Wiring is shown in Fig. 3, coils and wavechange switch being left until last. All the points MC are 6BA tags securely bolted to the chassis. One strip with two insulated tags provides anchor points for the mains leads, connections passing to mains transformer primary and on/off switch. A similar strip anchors R7, C6 and C8. A strip with a single insulated tag provides a wiring point for R2, R4 and R6.

Heater connections, to tags 4 of each valveholder, are kept close against the chassis. With the 6C4 valves, pins 1 and 5 are both anode, so the most convenient tags are used in Fig. 3.

C1 and R1 should be connected to tag 1 of the



An underside view of the completed receiver.

Tags marked M.C. are "earthing" points to chassis

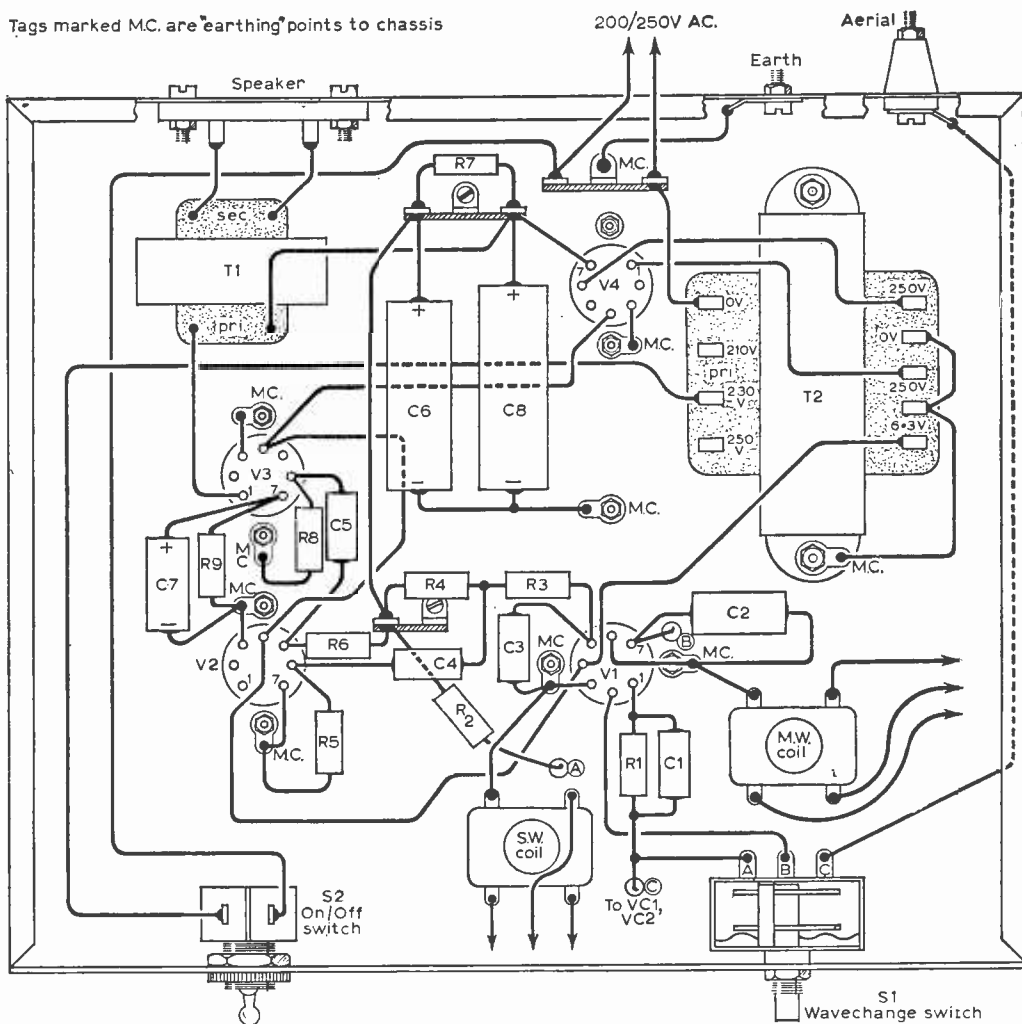


Fig. 3: The complete underchassis wiring diagram.

coil and s.w. coil are quite separate. The set may be wired up with the m.w. coil only, and tested, to avoid any confusion over coil connections. The s.w. coil can then be added afterwards.

Any dust cored or air cored m.w. coil, with aerial coupling winding, is satisfactory. The aerial coupling winding is connected from switch section 3 (aerial) to chassis. The grid end of the grid coil is taken to section 1 of the switch. A piece of 36s.w.g. silk covered or enamelled wire is soldered to the "earth" tag of the grid coil, and three turns are wound on top of the grid coil. These turns are in the same direction as the existing winding, so that they act as a continuation of the

grid coil. The junction of grid coil and extra turns is wired to section 2 of the switch. The end of the extra winding goes to chassis. Touches of wax or adhesive will hold the extra turns in place.

The s.w. coil is wound with 26s.w.g. enamelled wire, turns side by side on a $\frac{1}{4}$ in. diameter former with dust core. Winding is begun at the earthed end, marked MC in Figs. 1 and 4. One turn is put on, and the cathode tap K is made. After one further turn, the aerial tapping A is made. Winding is then continued for $7\frac{1}{2}$ turns, so that the whole coil has $9\frac{1}{2}$ turns. The end of the coil goes to section 1 of the switch.

If a home-wound m.w. coil is wanted, this can

use 38s.w.g. silk covered wire, pile wound on a $\frac{1}{2}$ in. diameter cored former. Ninety turns are wound from point G, and the tap K is made. A further three turns are then wound on in the same direction, the end going to chassis. Aerial coupling is 45 turns about $\frac{1}{4}$ in. from the grid coil.

If the receiver is wanted for s.w. reception only the switch can be omitted, and the s.w. coil may be permanently wired in. It is also extremely easy to provide other bands. A 3-way 3-pole switch would allow long, medium and short waves to be tuned. The L.W. coil will have to be modified as described, about 5 extra turns being added.

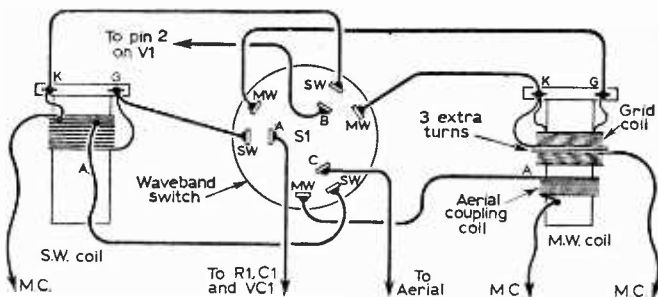


Fig. 4: Detailed wiring of the wavechange switch and coils.

COMPONENTS LIST

Resistors:

R1	2.2M Ω	R6	220k Ω
R2	100k Ω	R7	22k Ω
R3	6.8k Ω	R8	470k Ω
R4	220k Ω	R9	1.8k Ω
R5	2.2M Ω		
All $\pm 20\%$, $\frac{1}{4}$ W carbon			
VR1	25k Ω lin. potentiometer		

Capacitors:

C1	100pF mica or ceramic
C2	0.25 μ F 150V
C3	500pF mica or ceramic
C4	0.01 μ F mica or ceramic
C5	0.01 μ F mica or ceramic
C6	8 μ F electrolytic 350V
C7	25 μ F electrolytic 250V
C8	8 μ F electrolytic 450V
VC1	500pF or similar air spaced variable
VC2	15pF or similar air spaced variable

Valves:

V1	6AM6	V3	6C4
V2	6C4	V4	6X4

Transformers:

T1	Output transformer: between 40 : 1 and 60 : 1 ratio
T2	Mains transformer: Secondaries 250-0-250V; 6.3V, 1.5A

Miscellaneous:

S1 3-pole, 2-way rotary switch
 S2 Mains on/off toggle switch
 Medium wave and short wave coils (see text).
 4 B7G valveholders. Twin loudspeaker socket strip. Aerial socket strip or terminal and insulator. Tag strips, two with 2 insulated tags and one with 1 insulated tag. "Universal Chassis" parts: plate 9in. x 7in., plate 8in. x 7in., two sides 7in. x 3in., back runner 8in. x 3in. side or 8in. x 3in. paxolin, plywood or hardboard (Home Radio, Mitcham). Knobs, connecting wire, etc.

Regeneration

For long distance reception of weak stations, proper regeneration is essential. When VR1 is rotated, a point should be reached where oscillation is heard when tuning through a station. VR1 should then be turned back very slightly, so that the receiver is not quite oscillating. In these conditions, sensitivity is very high. Any ordinary coils are capable of good results in this type of circuit. The winding from G to MC must have turns all in the same direction, and the tapping K should be as near the earthed end of the coil as possible, provided oscillation can be obtained. The extra turns added in Fig. 4 are only necessary because it is generally difficult to tap a ready-made coil.

Operating Details

A reasonably large permanent magnet speaker, fitted in a cabinet will be most satisfactory. The transformer ratio mentioned is for 2/3 Ω speakers.

Reception over great distances is possible with a short, indoor aerial, though an efficient aerial system will naturally increase volume. If the aerial is extremely short (under about 3ft.) it can be taken directly to the fixed plates of VC1. If the aerial is long, a 50pF pre-set capacitor should be included between the aerial lead and receiver aerial terminal.

For strong m.w. signals, VR1 will act as a volume control. But for weaker signals, this control must be adjusted as explained. On the s.w. band, careful adjustment of VR1 is necessary, or weak signals will not be heard.

Coverage is modified to some extent by the positions of the coil cores. A coverage of about 200 500m on m.w., and about 19-60m on s.w., will be satisfactory.

VC1 and VC2 are best fitted with fairly large knobs, with dials. (This type is available from Bulgin, Eddystone, and other makers.) On medium waves, VC2 may be used for fine tuning. On short waves, the full 180 degree rotation of VC2 covers a narrow segment of frequencies. The positions of 19, 20, 25, 31, 40m, and other bands can be noted for VC1, and each band is then tuned with VC2. For best long distance reception, the band used will depend on the time of day, season, and other factors, in the usual manner.

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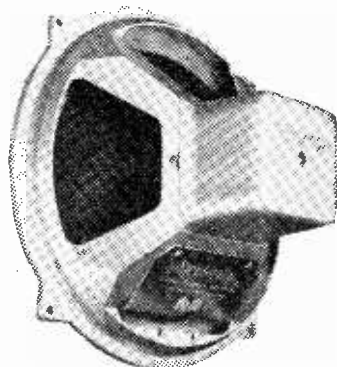
OA2	4/8	6BW6	6/8	8X5	4/8	20P5	12/3	ACHLDD8/-	EACB80	5/6	E137	12/3	KTZ41	5/6	Q8150/159/8	U50	4/6	AF125	10/8	
OB2	6/-	6BW7	5/-	6Y6G	6/-	25A6G	7/6	AC PEN	EAC91	3/3	E141	7/3	L63	3/-	R12	5/6	U52	4/6	AF126	10/-
024GT	4/8	6BX6	3/8	6Z4	5/-	25L6	4/8	(5)	EAC42	7/6	E142	7/6	L1N52	6/-	R16	29/-	U76	4/6	AF127	9/6
IA3	2/6	6C4	2/3	747	12/6	25A4G18	12/6	AC/PEN	E144	1/-	E181	8/3	LX309	7/8	R17	17/6	U78	3/8	BY123	11/6
IA3	5/-	6C5	4/-	748	12/6	25Y5	7/9	(7)	E141	4/8	E183	6/9	LX319	5/6	R18	9/6	U84	3/8	GD3	5/6
1A7GT	7/0	6C6	3/-	747	7/-	25Y5G	7/0	AC 8G 22/6	E181	2/3	E184	4/6	L12	9/6	R19	6/6	U101	1/9	GD6	5/6
IC1	4/-	6C8	3/-	753	7/3	25Z4G	6/6	AC/8G-V	E183	2/6	E185	7/6	LZ319	5/6	R22	9/-	U107	1/7	GD14	10/-
IC2	6/0	6C9	10/9	7C8	6/9	25Z5	7/3	12/-	E183	3/6	E186	7/3	LZ329	5/6	RG1/240A	U191	9/6	GT102	8/6	
IC3	6/3	6C10	7/6	7B3	15/-	25Z6GT	8/6	AC/TH1	E184	1/-	E187	4/6	ME11	13/-	54/-	U251	9/6	GT103	7/-	
IC5	5/-	6C12	6/-	7D6	14/6	25G5	23/3	AC/TP	E188	5/9	E189	5/6	ME91	12/6	RK34	7/6	U281	8/9	GT104	10/-
IC6	10/6	6C17	12/6	7D8	19/-	25D7	8/9	AC/VP1	E190	3/3	E192	5/6	ML360	27/-	M14	3/6	U282	12/3	GT106	17/6
IC10	6/6	6C18G	18/-	7H7	5/9	30C1	5/6	AC/P2	E191	5/6	E192	5/6	ML360	27/-	M14	3/6	U301	11/3	GT111	12/-
IC15	6/6	6C18G	5/-	7H7	12/6	30C15	9/-	ATP4	E192	5/6	E193	5/6	ML360	27/-	M14	3/6	U329	9/-	GT113	6/6
IC16	5/9	6C19	24/-	787	14/6	30C18	10/6	AZ1	E193	5/6	E194	5/6	ML360	27/-	M14	3/6	U339	9/-	GT114	8/6
IC2	2/3	6D1	1/6	7Y4	5/-	30C15	5/9	AZ1	E193	5/6	E194	5/6	ML360	27/-	M14	3/6	U403	9/9	GT122	10/-
IC3	2/3	6D3	9/6	7Z1	4/6	30C11	9/6	AZ1	E193	5/6	E194	5/6	ML360	27/-	M14	3/6	U404	6/-	GT123	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U401	16/3	GT124	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U402	16/3	GT125	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U403	16/3	GT126	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U404	16/3	GT127	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U405	16/3	GT128	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U406	16/3	GT129	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U407	16/3	GT130	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U408	16/3	GT131	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U409	16/3	GT132	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U410	16/3	GT133	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U411	16/3	GT134	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U412	16/3	GT135	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U413	16/3	GT136	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U414	16/3	GT137	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U415	16/3	GT138	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U416	16/3	GT139	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U417	16/3	GT140	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U418	16/3	GT141	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U419	16/3	GT142	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U420	16/3	GT143	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U421	16/3	GT144	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U422	16/3	GT145	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U423	16/3	GT146	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U424	16/3	GT147	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U425	16/3	GT148	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U426	16/3	GT149	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U427	16/3	GT150	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U428	16/3	GT151	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U429	16/3	GT152	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U430	16/3	GT153	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U431	16/3	GT154	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U432	16/3	GT155	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U433	16/3	GT156	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U434	16/3	GT157	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U435	16/3	GT158	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U436	16/3	GT159	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U437	16/3	GT160	9/6
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IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U439	16/3	GT162	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U440	16/3	GT163	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U441	16/3	GT164	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U442	16/3	GT165	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U443	16/3	GT166	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U444	16/3	GT167	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U445	16/3	GT168	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U446	16/3	GT169	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U447	16/3	GT170	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-	M14	3/6	U448	16/3	GT171	9/6
IC1D	5/9	6D6	3/-	8P2	2/6	30C11	5/6	B31	E193	4/9	E195	4/9	ML360	27/-						



Stentorian

MODEL H.F. 1016 'MAJOR'

This unit makes use of the high flux density available in the magnet system of the previous H.F.1016 unit. A curved diaphragm is used with a rigid centre section coupled to the voice coil. The rigid coupling and the design of the cone termination give a balanced response over the whole audio range. The unit is specially suitable for use in the smaller type of enclosure having a volume of approximately $1\frac{1}{2}$ cubic feet.



Type	Flux Density	Price	Type	Flux Density	Price
8" H.F.816*	16,000 gauss	£6.6.0	T.816	16,000 gauss	£5.19.3
8" H.F.812*	12,000 gauss	£3.16.6	T.12 tweeter	16,000 gauss	£13.17.9
8" H.F.810	10,000 gauss	£2.17.0	T.10 tweeter	14,000 gauss	£4.12.9
6" H.F.610	10,000 gauss	£2.7.3 Steel £2.9.3 diecast	T.359 tweeter	9,000 gauss	£1.12.3

*These two speakers incorporate a universal impedance speech coil.

Specification:

Chassis—die cast aluminium

Cone—graded pulp cambric surround; Cone dia.—10 ins.,

Pole dia.—1 in.; Flux density—16,000 gauss; Total flux—64,000 maxwells; Impedance—15 ohms.

Price: £9.8.6 (inc. tax)

WHITELEY ELECTRICAL RADIO CO. LTD. MANSFIELD, NOTTS.

Telephone: MANSFIELD 1762-5

London Office: 109 Kingsway, W.C.2

WA3

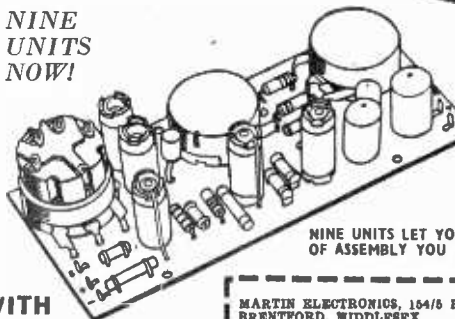
YOU CAN NOW USE VERY LOW OUTPUT PICK-UPS WITH MARTIN AUDIOKITS

Hi-Fi constructors have been quick to realise that the performance of Martin Audiokits is so good that it is well worth buying the finest possible accessories to use with them. In fact, the very modest prices of Martin equipment encourage this. UNIT 9/S is the latest addition to the range. It enables the very finest pick-ups such as Ortofon, Decca, Shure, etc. to be matched to Martin units in the twenty watt integrated stereo assembly. Price 55/-.

IN THE AUDIOKIT RANGE

Pre-Amps, Selector Units, 3-Channel Mixer, Tone Control Units, Power Amplifiers, Power Supply Units, Escutcheons. All for easy home assembly.

**NINE
UNITS
NOW!**



MONO OR STEREO

20 WATT HI-FI
ASSEMBLY

DE LUXE MIXER
& TONE CONTROL
ASSEMBLIES

NINE UNITS LET YOU HAVE JUST THE KIND
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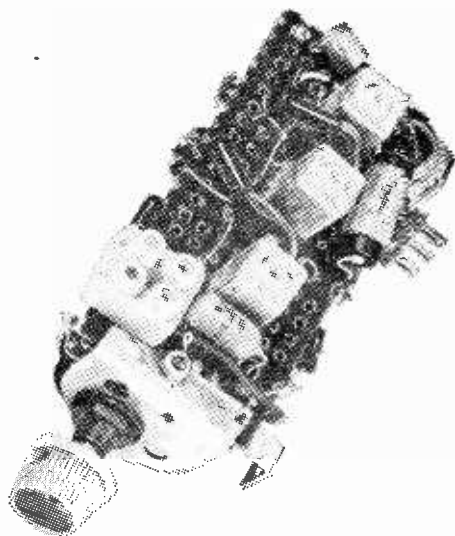
Transistor Tuner/Converter

1, 2 or 5 Transistors Optional i.f. Strip Plug-in Coils

BY F. NEVILLE HART

CONTINUED FROM PAGE 369 OF THE AUGUST ISSUE

THIS month the construction of the i.f. strip is described. This is made on a strip of paxolin screwed to double tag strip (18 tags). This measures 4in. by 1½in. The tag strip can be obtained at many dealers. On to this is screwed a blank Denco B9A coil former similar to those used for the coils. This forms the plug to fit the output valve holder on the tuner section, and is cut in half down to the pin rim and drilled for fixing to



The finished i.f. strip ready for mounting to the main tuner assembly.

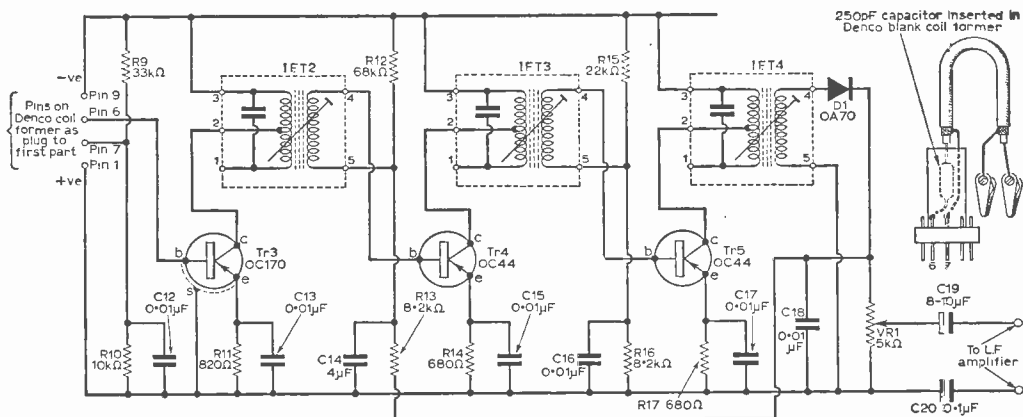


Fig. 4 (pictorial inset): The modified coil former for an output plug to the two-transistor tuner.

Fig. 5: The circuit of the i.f. strip.

the strip. The i.f. strip can be plugged into the tuner output socket at will, it only being necessary to slip the volume control through the hole on the front panel with the usual nut and knob.

In Denco's original circuit for this, three OC44 transistors are specified but the price of OC170's are much reduced now, and it was found that there is a great increase in amplification if one of these is used in the first i.f. position.

Cut the paxolin to the same size as the tag strip, making three square holes just a fraction smaller than the i.f. cans, i.e. ¾in. Drill holes, as shown in Fig. 6, for leads from the transistors.

These will lie on the reverse side to the capacitors and resistors.

Cut a bracket out of aluminium to hold the volume control so that the knob will be at right-angles to the i.f. strip and coincide with the hole for it in the front panel, at the same time ensuring that the Denco blank plug pins fall into the right position to plug into the output valveholder.

Drill the tag strip metal support to take this bracket. Mount the i.f. cans as follows: IFT2—IFT3—IFT4, this last being nearest the volume control.

Wire up in the order as before with positive

LASKY'S RADIO

Offer the Finest Value to 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 & SKYROVER DE LUXE

★ LONG WAVEBAND COVERAGE IS NOW AVAILABLE FOR THESE WELL-KNOWN SETS



The SKYROVER

Controls: Waveband Selector, Volume Control with on/off Switch, Tuning Control. In plastic cabinet, size 10 x 6 1/2 x 3 1/2 in. with metal trim and carrying handle. Can now be built for **£8.19.6** P. & P. built for 5/-.

H.P. Terms: 20/- deposit and 11 months at 16/6.

The SKYROVER DE LUXE

Tone Control Circuit is incorporated, with separate Tone Control in addition to Volume Control, Tuning Control and Waveband Selector. In a wood cabinet, size 11 1/2 x 6 1/2 x 3 in. covered with a washable material with plastic trim and carrying handle. Also car aerial socket fitted. Can now be built for **£10.19.6** P. & P. 5/-.

H.P. Terms: 20/- deposit and 11 months at 20/-. Data for each receiver 2/6 extra. Refunded if you purchase the parcel. Four U2 batteries 3/4 extra. All Components Available Separately.



The "Sixteen" Multirange METER KIT

This outstanding meter was featured by *Practical Wireless* in the Jan. '64 issue. Lasky's are now able to offer the complete kit of parts as specified by the designer.

RANGE SPECIFICATION: D.C. volts: 0-2.5-25-50-250-500 at 20,000 Ω/V . A.C. volts: 0-25-50-250-500 at 1,000 Ω/V . D.C. current: 0-50 μA . 0-2.5-50-250 mA. Resistance: 0-2,000 Ω . 0-200k Ω . 0-20M Ω . Basic movement: 4 μA f.s.d. moving coil. With universal shunt full scale deflection current is 50 μA . Size/finish: Black plastic case, 3 1/2 x 5 1/2 x 1 1/2 in. Controls: 12 position range switch; separate slide switch for A.C. volts-D.C. ohms; ohms zero adjustment pot; meter, meter zero. External connections: Two 4mm. rock-ets for test lead plugs. Power requirements: One 15V. and one 1.5V. batteries. Complete with all parts and full construction details.

Data and circuit available separately 2/6 refunded if all parts bought. Pair of Batteries, 2/5 extra.

LASKY'S PRICE £5.19.6

P. & P. 5/-

H.P. Terms: 21/- deposit and 5 months at 21/-.



Ready Built BOY'S TRANSISTOR RADIO

2 transistor pocket radio. In attractive plastic case. Size only 4 in. x 2 1/2 in. x 1 1/2 in. Fitted with 21in. loudspeaker. Socket for personal earpiece and telescopic aerial. Works from single PP3 type battery. Fully tunable over full medium waveband. Supplied complete with earpiece, telescopic aerial, carrying purse and 9-volt battery. Ideal Birthday present.

LASKY'S PRICE 42/- POST FREE.

6 transistor pocket radio fully built in plastic case. 4in. x 2 1/2 in. x 1 1/2 in. with 21in. speaker. Uses single PP3 type battery. Supplied complete with personal earpiece and leather case. Tunable over full medium waveband.

LASKY'S PRICE 69/6 POST FREE

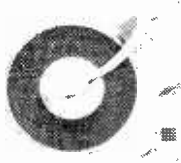


E.M.I. 4-SPEED RECORD PLAYER

New, unused and individually boxed fitted with lightweight pick-up with ACOS G.P. 732 stereo cartridge. Cabinet space required 13 1/2 x 12 1/2 x 4 1/2 in. A 9in. metal turntable is fitted. For use on 200/250 volt A.C. Mains, with Auto-stop. The stereo cartridge will play all types of Mono Records, 78's, L.P.s etc., but it desired a G.P. 67 1/2TR Mono cartridge will be supplied in lieu of the G.P.32 at no difference in cost.

LASKY'S PRICE 79/6

P. & P. 3/6 extra



The "REALISTIC" Seven

★ 7-transistor Superhet. ★ 350 milliwatt output into 4in. high flux speaker.

★ All components mounted on a single printed circuit board, size 5 1/2 x 5 1/2 in. in one complete assembly.

★ Plastic cabinet with carrying handle, size 7 x 10 x 3 1/2 in. Blue/Grey or all Grey. P. & P. 4/6.

★ Easy to read dial.

★ External socket for car aerial.

★ I.F. frequency 470 Kcs. Operates from PP9 or internal battery.

★ Full comprehensive data supplied with each receiver.

★ All coils and I.F.'s etc. fully wound ready for immediate assembly.

★ Outstanding Receiver. **LASKY'S PRICE for the complete parcel including Transistors, Cabinet, Speaker, etc., and Full Construction Data. Can be built for £5.19.6**

P. & P. 4/6

PP9 Batt. 3/6. Data and instructions separately 2/6. Refunded if you purchase the parcel.

REALISTIC Seven DELUXE

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

FOR ONLY £1 EXTRA

P. & P. as std. model

RECORD PLAYERS

45 r.p.m. 6 volt Batt. operated. Complete with pick-up fitted crystal cartridge. Size only 7 1/2 in. x 6 in. Fitted auto. stop and start. New and perfect.

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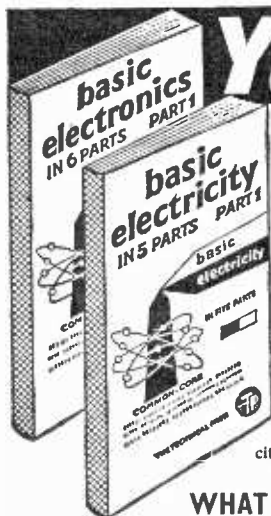
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Miscellaneous:

One blank Denco 9-pin coil former; Paxolin ($4'' \times 1\frac{3}{4}''$); Double 18-way tag strip 4" long on 2" metal brackets; two miniature clips or plugs for output.

Alignment with a signal generator, on 1.6Mc/s should start with IFT4 and work back, and should be done through a 1k Ω resistor. If the generator has no incorporate series capacitor, one should be used. Usually, however, it is only necessary to lay the generator output lead near the collector lead of the IFT being aligned, for sufficient note to be heard.

If it is required to try the complete unit as the front portion of a double superhet into an existing radio, the output would be taken from pins 4 and 5 of IFT4, disconnecting the diode and thereby the volume control.

Final Notes

When alignment of coils is satisfactorily completed, it is as well to put a drop of Durafix on the screws of the coil slugs, as it is found that if the unit is shaken about much, such as in a car, at the end of the journey they have screwed themselves down to the bottom! Should it ever be desired to alter them again, brush them with a little acetone solution which will melt the Durafix.

Since the white coils are much alike, it is a good plan to mark each with small spots of paint or the appropriate figures of the range. Also a blob on one side of each trimmer top will be of some assistance in alignment.

Performance

The tuner section feeding into a radio, is perhaps noisier than both sections into an audio amplifier. The latter arrangement is more accurate, being independent of the tuning of some

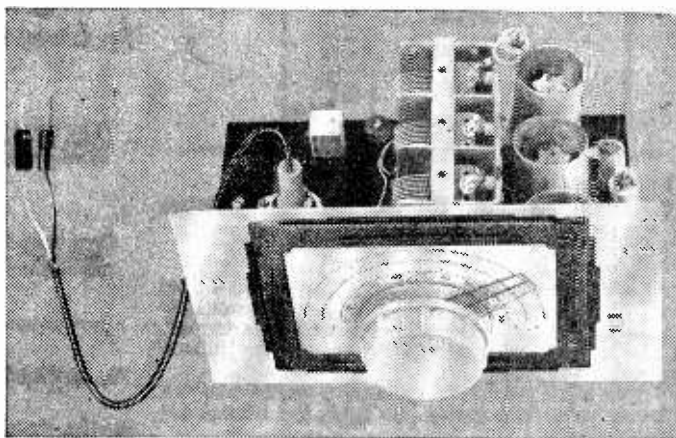
leads and the first transistor to the tuning unit.

Use and Alignment of I.F. Strip

If a signal generator is available, after plugging unit into place and fixing up volume control and connecting to an audio amplifier, align the cores of all IFT's to 1.6Mc/s. If the tuner has been used on its own do not forget to realign IFT1 on the main baseplate. If the latter was working on a frequency other than 1.6Mc/s the aerial and r.f. coils and possibly the mixer coil of all ranges, particularly 3 and 4, will have to be realigned. The lower the frequency the greater the difference caused by a change in i.f. between mixer and signal frequency.

If no signal generator is available and the first part has been aligned to match a radio, it will be easier to line up the i.f. strip to match the IFT on the tuner unit, since little adjustment will be needed to the tuning coils. As these will have been aligned already, a signal will be probably found on which to adjust the i.f. strip.

other radio. But the tuner section, when used in the double superhet manner, is so selective and powerful, that it is hard to say that, apart from the quieter background, the i.f. strip into audio amplifier is much more sensitive. However, as a result of making this unit, the writer's valves have been finally banished to the junk box! ■



The tuner, which was described in last month's issue.

MODIFICATIONS TO THE VOICE-OPERATED Baby ALARM

By J. L. Moughton

IN its present form, the "Voice-operated Baby Alarm", featured in the July issue of P.W., is unsuitable for connection to certain TV receivers such as the Murphy V134C and some Ultra models. In these models the neutral side of the mains supply is not connected to the TV chassis.

In the Murphy model a centre-tapped mains transformer is used (Fig. 1) the tap being connected to chassis and the mains connections being disposed symmetrically about this on each side. Thus, whichever way round the mains plug is inserted, the chassis is always live to the extent of about

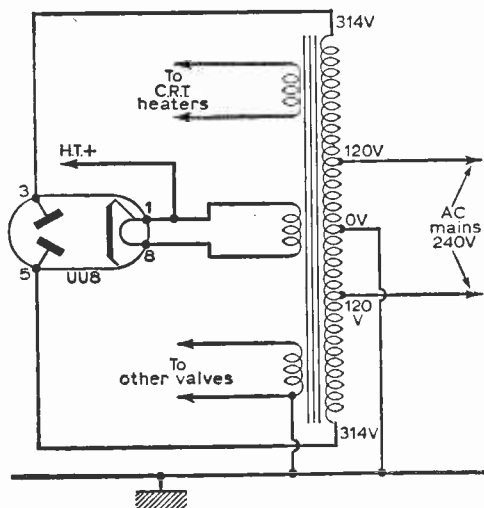


Fig. 1: The power pack of the Murphy V134C somewhat simplified.

120V. The winding continues beyond the mains connections on each side to form an auto-transformer from which a full-wave h.t. supply is derived. The heaters are connected in parallel to isolated secondary windings.

The Ultra models incorporate a rather complex voltage-doubling system and again the heaters are in parallel.

In these and in similar cases, it would be necessary to use a mains transformer with isolated h.t. and heater secondaries or else it might be possible to run the alarm off the TV power-pack, if the heaters were parallel connected.

In some receivers, the volume control is at a d.c. potential above that of the chassis, e.g. some Ferranti models. Here it would be necessary to isolate the output from the alarm as shown in Fig. 2.

A few models (e.g. Ekco T164) have a different kind of volume control—a variable h.t. potential divider feeding the cathode of a sound i.f. valve; like a vision contrast control. In such sets the output of the detector is via the noise limiter and a capacitor to the grid of the sound output valve. A suitable circuit is shown in Fig. 3.

While on the subject of volume controls it might be mentioned that if the output of the alarm is too great and overloads the sound output valve, it can be reduced by substituting a $1M\Omega$ preset potentiometer for R9, the slider being taken to RLA1.

If the television set and/or alarm are fed from separate reversible two-pin plugs, it is possible for the chassis of one to be connected to mains neutral and that of the other to mains live. Since the two chassis are connected together, one can either use the circuit of Fig. 2 with a 1,000V d.c. capacitor

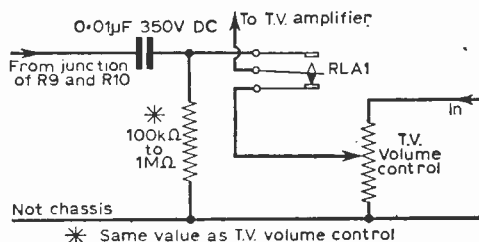


Fig. 2: Suitable circuitry for a set with a volume control above chassis potential.

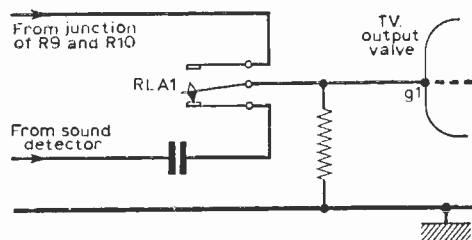


Fig. 3: Circuit for set with unconventional volume control

in the signal lead and a similar one in the earth lead and fuses in the mains leads to the alarm, or better still, connect both alarm and receiver correctly to the same two pin plug.

Since it is possible to have the chassis of the alarm at mains live potential it is also advisable to include a $0.01\mu F$ 1,000V d.c. capacitor in each microphone lead.

Finally it is suggested that the receiver circuit diagram be obtained before constructing the alarm, so that the above points can be checked.

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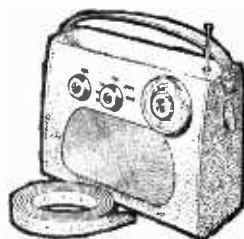
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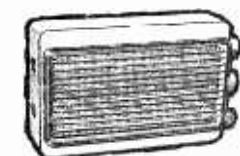
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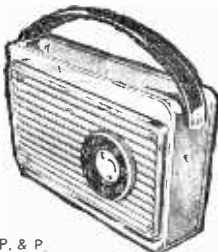
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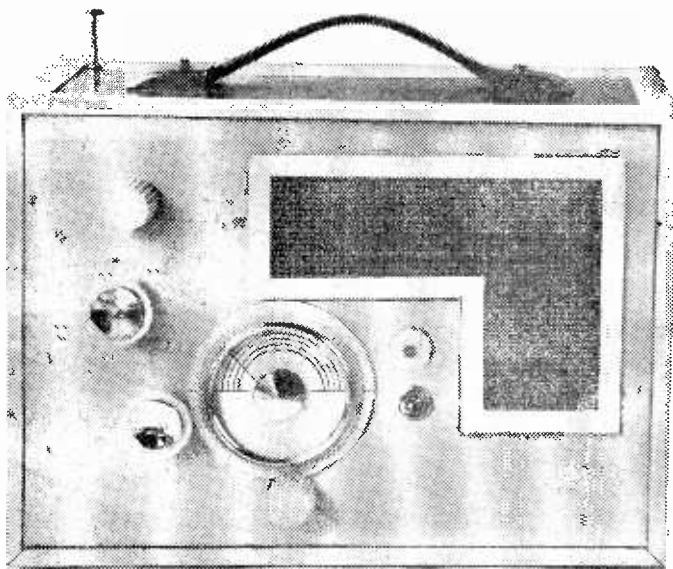
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CONTINUED FROM
PAGE 369 OF THE
AUGUST ISSUE



The CHELMER 4

THE frame aerial has been made in the form shown to permit quick modifications to the windings during experimental work.

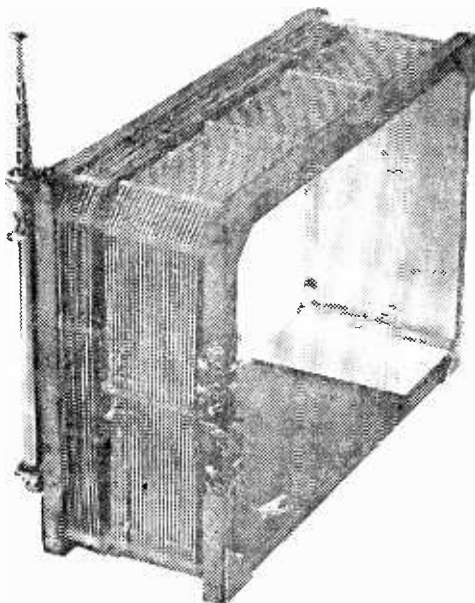
The windings have been made to match the Osmor oscillator coils, and as the wire used may differ in gauge the constructor will also have to do a little experimenting. As a basis, however, the medium wave winding has approximately 21 turns, and these should be spaced, not too widely, by use of the perspex strip spacers. These are quite easily cut out, but the grooving is difficult unless a suitable tool is made up.

The author has a Litz-wire winding, but care is required as regards soldering this wire, each strand having to be carefully cleaned before solder is applied.

The photograph shows the completed frame aerial unit. Formica is a light and strong material, and the two outside surrounds of $\frac{1}{8}$ in. square strip-wood allow the windings to be recessed and protected from damage during experiments. When this frame is inserted in the cabinet, the frame aerials are, of course, completely enclosed and hidden.

The top, bottom and end pieces of Formica can be dovetailed, and this is worth while for a good job. Evo-stik contact adhesive is the adhesive to use. Make certain that the framework is truly square, using a small set square to check. When this is ascertained the small Formica angle pieces can be fixed on.

The perspex spacer strips can then be glued as



The finished frame aerial, ready to be connected to the rest of the receiver.

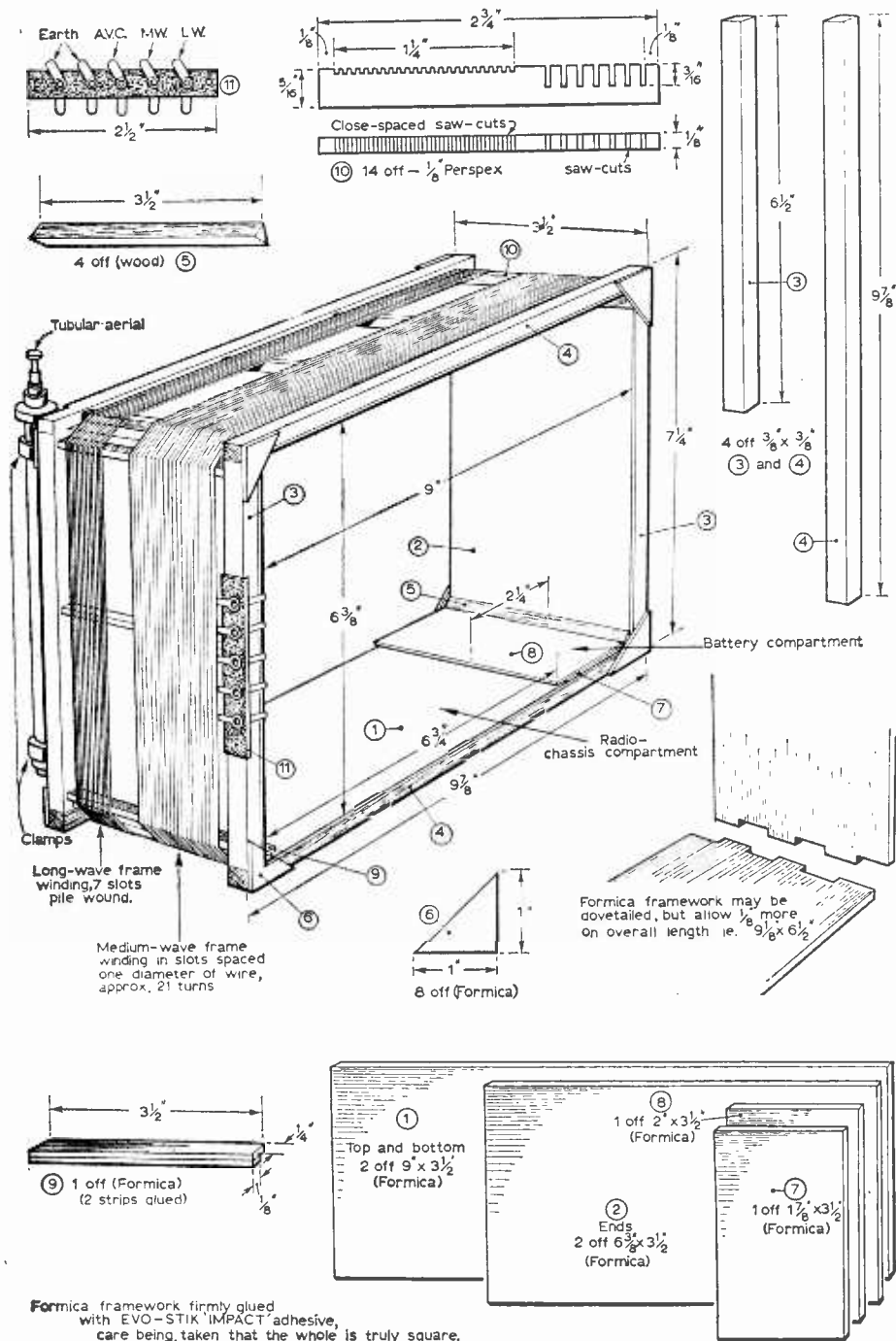


Fig. 6: The frame aerial. Component parts and assembly details of the aerial.

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shown, making sure the eight end ones are close enough to the ends to avoid wire turns touching the square ends of the box.

The long wave winding is pile wound in the slots arranged. The number of turns is approximately 25 in each slot, making a total of 175 approximately, but the reader should experiment for best results. Frame aerials are, of course, directional, and should be rotated until the best results are obtained.

All four ends of the frame windings are soldered to the tag board (11). The two earths "E" are for convenience (one would do), and go to the chassis via C2. It is best to make rough experiments with the frame windings outside the set by short temporary wires.

It is a good plan to drill a number of holes across the end formica panel, to allow several points for the wire of the frame aerial to go

through. These should be approximately in line with the tags on the small tag-board. Plenty of holes are better than one or two, and allows a free choice when winding the frame without having to delay work for drilling.

The Cabinet—Fig. 7

The drawing, which is an exploded view, is self explanatory, but there are one or two points of construction worth special mention.

The material chosen for strength, as well as thinness was Formica. It is cut quite easily with a fret-saw, and the material is available in a wide range of colours. And it is easily cleaned.

To give added stiffness, the bottom, was formed from two thicknesses stuck together. Similarly, the top (as lifting with handle fitted will take the full weight) was strengthened by three wood strips. Top, bottom and end pieces can be dove-

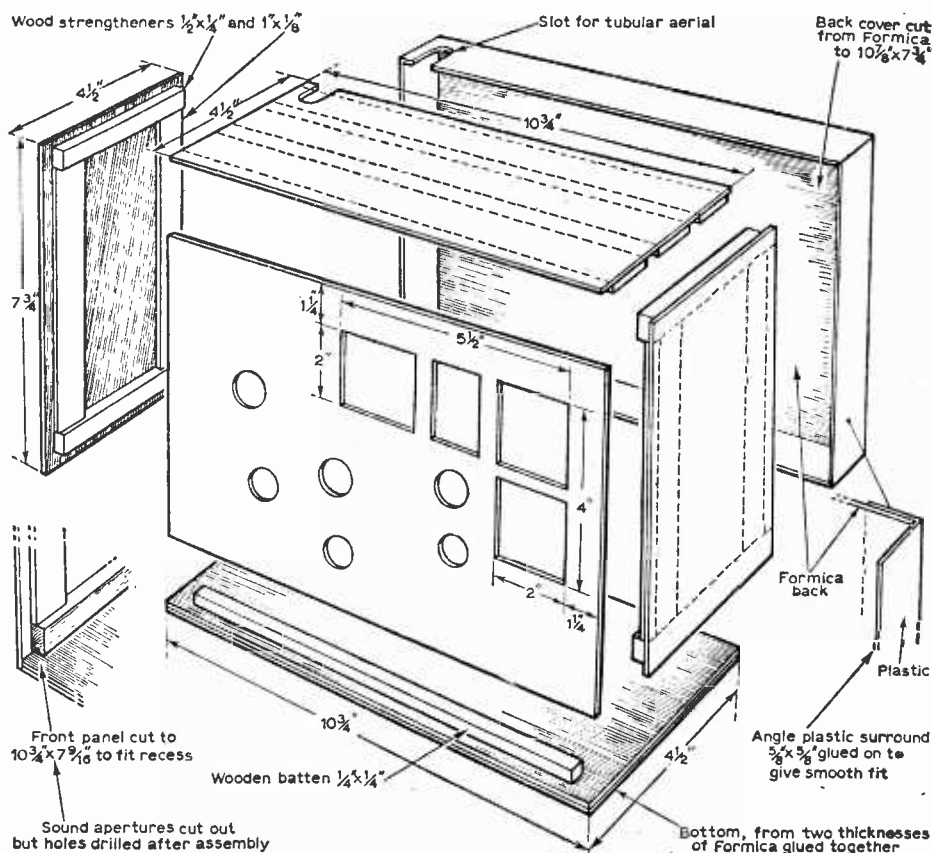


Fig. 7: An exploded view of the Chelmer 4 cabinet, giving dimensions.

tailed, if extra strength and neatness, is desired. Dovetailing does, indeed, help in the assembling into box-form. Evo-stik should be used as adhesive.

The front wood strips on end pieces and top, are slightly set back from the front edge, and with the bottom batten ($\frac{1}{4}$ in.) also set back, form a slight recess for the front panel to fit into. This, in effect, ensures that the whole cabinet is truly squared up when finally fixed.

However this front panel should be merely inserted for the moment. With all the spindles free of knobs, push the chassis along its slide, or grooves until the spindles *touch* the inside of the panel. If the spindles have previously been spotted with white or black drawing ink, they will clearly leave their marks. This gives the exact centres.

The panel can then be lifted out, the various diameters described by a compass, and then drilled out. The potentiometer and toggle switch positions may have to be measured.

If the back panel is made to fit a similar recess, the plastic surround can be fixed to it when the

back is on, and allows a very snugly fitting back. A small slot will have to be cut in the top plastic surround afterwards to allow clearance for the tubular aerial fixed to the set.

The sound aperture holes can be cut to any shape one fancies, and covered with the speaker fabric as a final finish.

Another very effective but simple method of finding the exact centres for drilling the holes in the front panel is as follows.

Obtain a sheet of ordinary tracing paper as used by draughtsmen. Cut slightly larger than the cabinet size (now in box form) and stick over the opening. If the chassis is now pushed into its grooves until spindles touch the paper, a very accurate "tracing" can be marked out, including toggle and pot button.

Be careful that corners of the box form (inside distance) are marked, and that the "tracing" is used the correct way round for marking out!

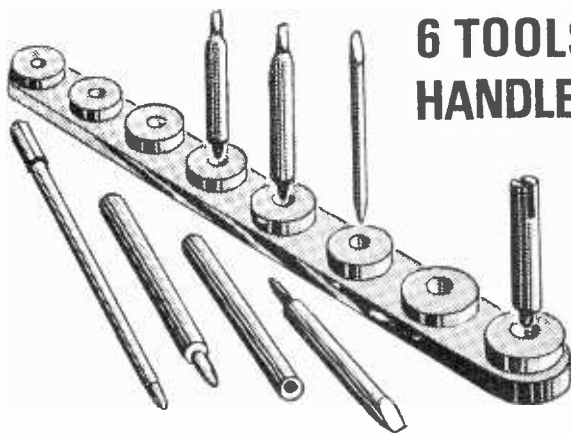
A lifting strap can be fixed, provided this has strong brackets (preferably non-metallic) to the central wood strip which will hold this firmly. ■

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2 1/2	7000	50	8/6	3 1/2	9500	35	8/8	5	6000	3	8/-	5	9000	3	10/6
2 1/2	7000	80	8/6	3 1/2	9500	50	10/8	5	6000	3	8/-	5	8500	35	10/8
3	8500	3	10/-	4	7000	25	11/8	5	7000	3	8/8	5	9500	35	11/8
3	9000	5	9/6	4	7000	35	11/-	5	7500	3	9/6	6 1/2	7000	3	11/-
3	7000	35	9/-	4	9500	35	11/8	5	8500	3	9/6				
Elliptical Size in inches	Gauss in lines	Imped. in ohms	Price	Elliptical Size in inches	Gauss in lines	Imped. in ohms	Price	Elliptical Size in inches	Gauss in lines	Imped. in ohms	Price	Elliptical Size in inches	Gauss in lines	Imped. in ohms	Price
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6 x 4	7000	3	9/-	7 x 4	10000	3	12/6	8 x 2 1/2	9500	3	10/-				
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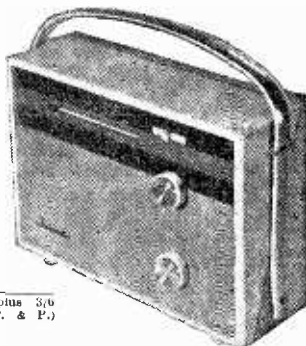
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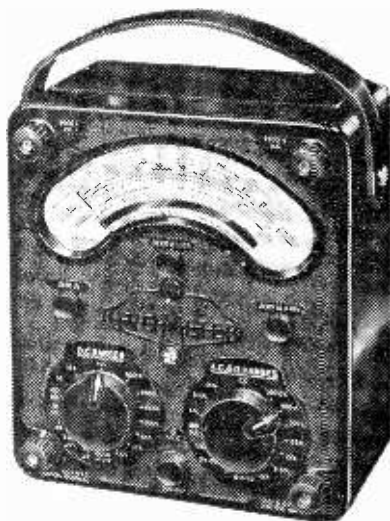
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7in. Long play, 1,800ft. 19/6	MESSAGE TAPES
7in. Double play, 2,400ft. 25/-	3in.—150ft. 3/6
3in. Triple play, 450ft. 12/6	3in.—225ft. 4/11
4in. Triple play, 900ft. 22/6	3in.—300ft. 7/6
5in. Triple play, 1,800ft. 42/6	P.V.C. BASE
5 1/2in. Triple play, 2,400ft. 55/-	5in. Standard play, 600ft. 8/6
7in. Triple play, 3,600ft. 75/-	5 1/2in. Stand. play, 650ft. 11/6

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

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Saturday. Opposite Paddington General Hospital.
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Boy's 2 Transistor Pocket Radio



Ready made as illustrated—complete with personal earpiece, telescopic aerial, battery and carrying case! Wonderful value and performance—full medium waveband coverage—built in 2in. speaker gives full tone reproduction. Works on single PP3 9 v. battery. In attractive plastic case—size only 4 x 2 1/2 x 1 1/2 in. All accessories included in the price. Not a toy.

WIRECOMP'S PRICE COMPLETE 42/- POST FREE

Also 6 transistor model. Full medium waveband cover. Fully built complete with earpiece, battery and leather carrying case. **69/6** Post Free

IT'S FABULOUS !!

THE TRANSISTOGRAM

A portable battery operated fully transistorised Record Player—for the music of your choice—any time any place! Made by famous British manufacturer, fully guaranteed. Size only 6 1/2 x 12 x 10 1/2 in. weight 10 lbs. Operates on 6 U2 torch batteries. 4 speeds—16 2/3, 33 1/3, 45 and 78 r.p.m. Goldring Sygnet record player unit with light weight pick-up fitted with CM-60 turn over ceramic cartridge. Output 500 mw to 5 in. ceramic magnet loudspeaker fitted into lid for maximum sound distribution. Cabinet constructed of wood, covered in two tone (pale blue/gray) leather cloth. Fitted carrying handle and strong lid catches. High quality amplifier with tone and vol. controls gives excellent reproduction at all speeds. Plays 7, 10 and 12 in. records. Today's value 12 Gns.



WIRECOMP'S £6.19.6 PRICE Carr. & Ins. 7/6 New, boxed and guaranteed—exc. batts.

Transistor TELEPHONE AMPLIFIER

A must for business or pleasure. This neat little transistorised amplifier powerfully amplifies the incoming call and at last leaves you with both hands free while continuing your conversation normally. The pick-up is suction fixed to phone. Battery-operated at negligible cost. Fitted on switch for private conversation. Size 4 1/2 x 3 x 1 1/2 in. Complete with battery.

WIRECOMP'S PRICE 69/6 P. & P. 2/6.

T rade N ews

Transformer Design Kits

BELCLERE Transformers announce their Transformer Design Kits, which enable designers to make their own prototypes. Nineteen sizes (in three lamination materials) are available as kits of parts. From these, transformer designers can produce their own prototype windings. Each kit is packed separately, and includes a bobbin, sufficient laminations and, where applicable, a mounting clamp.

Belclere will produce small or large quantities developed on these materials, or will design transformers and similar windings on receipt of circuit details. Delivery can normally be effected from stock. *The Belclere Company Limited, 385/387 Cowley Road, Oxford, England.*

Heathkit Guitar P.A. Amplifier

THE Heathkit Public Address/Guitar Amplifier, Model PA1, is a multi-purpose, high power amplifier for general public address work and is particularly suitable for vocal and instrumental groups. This amplifier, say the makers, is designed so that a complete novice can easily build it.

The features include 50W output, two heavy duty 12in. Goodmans speakers, "Magic-eye" volume indicator, variable tremolo speed and depth controls and an elegant cabinet covered with black and gold vinair material.

The amplifier is split into two separate sections: one incorporates two inputs, volume control and simple but effective tone control to produce bass boost; the other incorporates two inputs, volume control and a more complex tone control circuit consisting of separate bass and treble controls, which make possible an infinitely variable selection of tonal effects. Also added is a tremolo oscillator which can be switched in or out as required.

This piece of apparatus is easily transported, being fitted with two carrying handles, and is available in kit form at £54 15s. or assembled at £74. *Daystrom Ltd., Gloucester, England.*

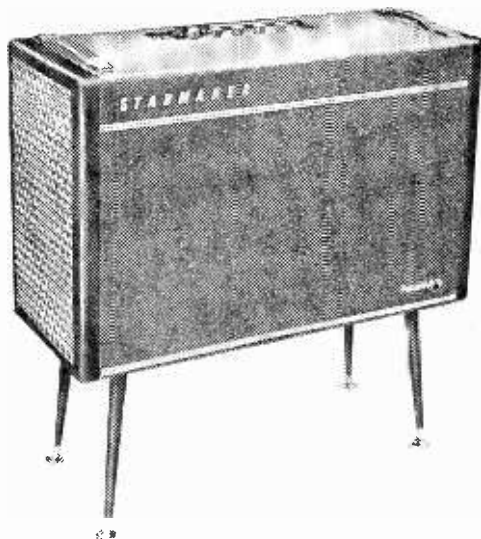
Automatic Record Player

BAIRD have announced the release of their latest automatic record-player. It has a four-speed autochanger with turnover pickup cartridge and manual control if required. Model 288 is a mains portable record-player and will play ten intermixed-sized records at one loading and in any order.

The cabinet is fitted with snap fasteners and carrying handle, and measures 18½in. x 8½in. x 14½in. Weight is 13½lbs., and the price is fixed at £16 5s. 6d., including purchase tax. *Baird TV Distributors, 414 Chiswick High Road, London, W.4.*



The latest record player from Baird.



This is the Heathkit guitar amplifier, which can be built from a kit costing £54 15s.



ACTON, BRENTFORD AND CHISWICK RADIO CLUB
Hon. Sec.: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London W.3.

During August the Club will meet at its headquarters, to see a demonstration of two metre equipment. This will be on the 18th and begin at 7.30 p.m.

CHESTER AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: P. J. Holland, Field House, 19 Kingsley Road, Great Boughton, Chester, Cheshire.

"Antennae, Mobile and Otherwise", was the title of the talk given by H. Morris (G3ATZ) on July 14th. A week later members enjoyed a radio quiz. The lecture for the meeting of July 28th was delivered by G3DRB.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: F. C. Ward, G2CVV, 5 Uplands Avenue Littleover, Derby.

Under discussion at the Meeting for July 8th, was a forthcoming mobile rally. On 15th of the month, the fourth d.f. practice run was held.

R. Chambers (G3RTG) gave the talk at the July 22nd meeting, his subject being "Vehicle Electrics". Junior members enjoyed the opportunity to seek answers to their problems at the open evening of July 29th.

The following month began, as usual, with a sale of surplus gear.

GUILDFORD AND DISTRICT RADIO SOCIETY
Hon. Sec.: H. Mead, G3OXI, Egley Road, Woking, Surrey

Stoke Park was the venue for a direction finding contest, organised for members on 10th July. Later in the month, "Test Equipment" was the topic for discussion at the meeting for July 24th.

This Society has been asked by the organisers of the Guildford Town Show (which is being held later this year), to arrange an exhibit depicting amateur radio activity and to run the club station. This matter will form the subject for discussion at a forthcoming meeting.

HUDDERSFIELD RADIO SOCIETY
R. Ellis, G3BKM, 24 Pymroyd Lane, Cowlersley, Huddersfield, Yorkshire.

This Society was formed at the beginning of this year and has already attracted a membership of 45 with 25 licensed amateurs on the list. Talks on R.A.E. and Morse classes are currently being given for beginners and a programme of lectures has been arranged. Visits of technical interest are also planned for the future.

Any local enthusiasts who are interested in joining the club are invited to attend the next meeting which will be on 13th August. Meetings are held at the Lockwood Conservative Club in Huddersfield and begin at 7 p.m.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY
Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorkshire.

During July, groups of members made two further visits to the BBC transmitting station at Moorside Edge. These visits were on the 15th and 29th of the month, both following the Civil Defence talk and demonstration given to members on the 8th. A ragchew night on 22nd July was also the date of a Committee meeting.

After a whole month free of commitments to provide demonstration stations, this Society began August by planning transmitting and receiving equipment at Warley Charity Gala held on the 1st. This was followed a few days later by an "Any Questions?" night.

ROYAL AIR FORCE AMATEUR RADIO SOCIETY

This year sees the 25th anniversary of RAFARS and on the weekend of July 4th and 5th members, past members and amateurs from many parts, travelled to Weston-super-Mare to take part in the various celebration activities which had been arranged. The main event for the Saturday was a celebration dinner held at the Grand Hotel Atlantic at which the No. 5 Regional Band of the Royal Air Force provided the music.

On the Sunday visitors travelled out to RAF Locking (No. 1 Radio School of the Air Force) where a mobile rally and contest and tours of the camp were highlights among a host of events and entertainments which had been arranged for the XYLs and children as well as the licensed amateurs.

READING AMATEUR RADIO CLUB

Hon. Sec.: R. G. Nash, G3EJA, "Peacehaven", 9 Holybrook Road, Reading, Berkshire.

This society's first mobile picnic of the year was held on July 12th in conjunction with the Mortimer and District Motor Cycle

Club's Scramble. The venue for this occasion was Padworth Common, near Aldermaston.

At a meeting later in the month, G5TP, G5HZ and G3OLA led the discussion on "Simple S.S.B. Gear", which formed the topic for the evening.

SCARBOROUGH AMATEUR RADIO SOCIETY
Hon. Sec.: P. B. Briscoe, G8KU, "Roseacre", Irton, Scarborough, Yorkshire.

This Society has announced that it has moved to new club rooms at the rear of 7 Trinity Road, Scarborough, where its weekly meetings continue to be held on Thursdays.

SLADE RADIO SOCIETY
John Smith, G3JZF/T, 53 Woolmore Road, Erdington, Birmingham, 23.

On 18th September, members of this Society are presenting an evenings entertainment at their headquarters, to be relayed over a closed circuit television system. Local organisations have promised support for the programme material which will be seen by visitors either in a large "studio" or in a separate viewing room. Telecine and three- or four-camera coverage has been arranged for the show.

The Society is looking forward to welcoming many visitors to their headquarters at The Church House, High Street, Erdington, Birmingham. Further details may be obtained from G3JZF/T—see above.

WEST KENT AMATEUR RADIO SOCIETY
Hon. Sec.: H. F. Richards, 17 Reynolds Lane, Tunbridge Wells, Kent.

At the meeting for July 10th, members were entertained by a selection of films, and on the 24th they took part in discussions on audio when demonstrations of equipment were also given.

TRANSCIVERS - A WARNING!

From time to time, various advertisers offer for sale transceivers (or "walkie-talkies"). We must point out to prospective purchasers that (a) it is illegal to operate this or any other type of transmitting equipment without having first obtained a transmitting licence, and (b) in any case, these transceivers are often crystal controlled at frequencies not allocated in the U.K. for amateur transmitting, such as those operating at 27Mc/s. Such equipment must, therefore, be modified to operate on legitimate frequencies even if the user holds a transmitting licence.

SHORT WAVE ONE

This article, which appeared in the March 1964 issue, omitted the connections to the Osmor coil SWQ2. These are as follows; 2 aerial; 3 earth; 6 reaction anode; 5 reaction capacitor; 4 grid; 1 earth.

Also in Fig. 4 of this article, the 955 base connections are shown correctly from the underside but the valve has a flat top. The 954 is shown correctly from above.

A.B.C. TRANSISTOR GUIDE

This comprehensive reference guide published by Messrs Newmarket Transistors Ltd., covers the essential characteristics of their wide range of transistors. This publication is a tabular presentation of their current range of devices in sufficient detail to provide users with all information they would normally require to select units for a given project.

For further information, write or telephone Sales Office Manager, Newmarket Transistors Ltd., Exning Road, Newmarket, Cambs.

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VALVES

AC/RL 4/8	DL09 5/8	EF85 4/8	K3A 30/	QP25 5/	VR105/305/	5A173G 5/	6H1 6/	9D2 3/	53A 7/8	40K3 8/
AC/4 6/	DL819 15/	EF86 6/	KT32 8/	QP230 5/	VR150/305/	5A174G 5/	6H6M 1/8	11E3 37/8	58 5/8	5704 9/
AC/6P5N 5/	DL810 8/	EF89 3/8	KT330 6/	Q150/15 10/	VT40 20/	5B257/M 20/	6J4 9/	12A6 2/8	59 5/8	5726 6/
AL60 5/	EL08 23/	EF91 2/8	KT44 5/8	Q9510 5/8	VU33A 4/	5C4 19/	6J4WA 10/	12A7H 5/	57 5/8	6064 7/
AR 4/	EL148 2/8	EF92 2/8	KT83 4/	Q1302 8/	VU38 5/	5C4 19/	6J5 3/8	12A7H 11/	57 5/8	6065 6/
AR 3/8	EL152 30/	EF95 5/	KT66 12/8	QV04/7 8/	VX3256 4/	5T4 7/	6J5G 2/	12A7H 4/	57 5/8	6065 22/
AR/3 3/	EL153 8/	EF98 3/8	KT67 15/	R3 8/8	W21 5/	5U4G 4/8	6J6 3/8	12A7H 5/	57 5/8	6065 1/8
AR/12 2/8	EL154 30/	EF184 8/	KT78 22/	KT8C 18/	YF 1/	5V4G 8/	6J6W 3/8	12A7H 6/	57 5/8	6065 2/8
AR/21 7/	EL154 12/8	EH1 300/	KT8C 22/	RG4/1250 10/	YF 1/	5X40 8/8	6J7G 5/8	12A7H 10/	51 5/8	6013A 25/
AR/34 3/8	EA30 1/	EL132 3/8	KT8C 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
AR/34 3/8	EA73 7/	EL134 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
AT/1 6/	EA80 5/	EL135 5/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
AT/4 2/8	EA91 3/8	EL138 12/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
AT/7 5/8	EA92 8/	EL141 7/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
AU 55/	EB34 1/8	EL142 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
BL63 10/	EB91 3/	EL150 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
B84 8/	EB93 3/	EL151 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
B85 20/	EB94 1/	EL153 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
B88A 47/8	EB95 5/	EL154 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
B1234 16/	EB96 5/	EL155 8/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
RT19 25/	EB98 7/8	EL161 4/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
RT35 25/	EB99 8/	EL165 5/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
RT45 150/	EB99 8/	EL165 5/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
RT83 35/	EL53 12/8	EM81 7/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CC3L 2/	EL70 4/	EM84 6/8	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CL33 9/	EL90 20/	EM85 9/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV1 3/	EL91 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV7 6/	EL91 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV102 1/	EL92 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV103 4/	EL93 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV4014 7/	EL94 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV4015 4/	EL95 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV4025 10/	EL96 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CV4048 40/	EL97 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
CY31 5/8	EL98 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
D1 1/8	EL99 3/	EN31 10/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
D41 3/3	EL101 5/	F6057 5/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
D61 6/	EL103 3/	F6063 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
D71 3/3	EL104 3/	F6064 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DA30 12/8	EL105 3/	F6065 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DA69 75/	EL106 3/	F6066 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DAF96 8/	EL107 3/	F6067 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DD41 4/	EL108 3/	F6068 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DE73 3/	EL109 3/	F6069 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DET30 2/	EL110 3/	F6070 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DET25 15/	EL111 3/	F6071 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DF73 5/	EL112 3/	F6072 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DF91 3/	EL113 3/	F6073 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DF92 3/	EL114 3/	F6074 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DF96 6/	EL115 3/	F6075 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DK92 6/8	EL116 3/	F6076 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DK96 5/8	EL117 3/	F6077 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DL92 6/	EL118 3/	F6078 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DL93 6/	EL119 3/	F6079 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/
DL94 6/	EL120 3/	F6080 4/	KT83 18/	KT83 18/	Y63 5/	5Y3G 4/	6K5G 5/8	12A7H 5/	52 5/8	6029 8/

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Frequency coverage 2-60 Mc/s in 5 bands. Two l.f.s. 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 bandspread. Metering and visual tuning indicator. Bandpass from 100 c/s to 10 kc/s in 5 stages. Acoustic filter associated with 100 c/s. Bandpass position for CW reception. Facilities for diversity reception. Excellent checked condition. £49. 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.15. Price £35. Carriage 30/-.

P.C. RADIO'S mains P.S.U. for above, 90/-.

R.209 RECEPTION SET.

A 10-valve high-grade superhet Receiver with facilities for receiving R/T (A.M. or F.M.) and CW frequency 1 Mc/s-20 Mc/s. Hermetically sealed. Built on miniature valves and incorporating its own vibrator power supply unit driven by a 6 v. battery (2) point connector included. The set provides for reception from rod, open-wire or dipole aerial with built-in loudspeaker, or phone output. Dimensions: Length 12in., width 8in., depth 9in. Weight 23 lb. In as new, tested and guaranteed condition, £23.10.0, including special head-phone and supply leads. Carr. £1.

ROTARY TRANSFORMER. 11.5-

12.5 v. D.C. Input 300 v. 200 mA DC Output, 30/-, P. & P. 15/-.

RECEIVER TYPE R.206.

Frequency 0.55 Mc/s to 30 Mc/s in 6 bands, 100-250 v. A.C. or 12 v. D.C. Loudspeaker in power supply unit. High performance superheterodyne, eleven valves including a separate local oscillator valve, beat oscillator valve and two valves (Amplifier and Detector) in the A.B.C. system. In very good condition, £20.10.0, including power pack. Carriage and Packing 15/-.

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In excellent, fully checked, and tested condition (without coils and power pack), £15.10.0. As above but rack mounted model, £14.10.0.

Original mains power pack for H.R.O.

110/220 v. A.C. Brand new in original packing, 45/-, P. & P. 4/-.

CONNECTORS FOR TCS RECEIVER, TRANSMITTER AND REMOTE CONTROL, with original plugs on both ends. New £1.17.6 each, P. & P. 2/6.

TRANSMITTER RECEIVER. TYPE 68T.

3-5 Mc/s netting facilities. Low power consumption. Requires 150 v. h.t. and 3 v. l.t. dry batteries. In good condition, 35/-, Carriage 8/-.

CARBON INSET MICROPHONE.

G.P.O. type, 2/6, P. & P. 1/6.

EVERSHED MEGGER CIRCUIT TESTER.

2 ranges 0 to 1000 Ω , 100 Ω to 200,000 Ω . With test leads, leather carrying case. Tested £4.19.6. P. & P. 3/6.

AR88D RECEIVERS. Fully reconditioned, £55; rebuilt models, £85; brand new, £95. Carriage paid U.K.

CHR HIGH RESISTANCE HEAD- PHONES. New, 16/-, P. & P. 1/6.

32/44ft. AERIALS each consisting of ten 3ft., 7/8in. dia. tubular screw-in sections, 14ft. (7 section) whip aerial with adaptor to fit the 7/8in. rod, insulated base, stay plate and stay assemblies, pegs, reamer, hammer etc. Absolutely brand new and complete, ready to erect, in canvas bag. £2.19.6. P. & P. 10/6.

PANEL METERS (round)

0-20 microamps 2 1/2" D.C. 79/-

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0-100 microamps 2 1/2" D.C.** 40/-

0-100 microamps 2 1/2" D.C.** 35/-

0-200 microamps 2" D.C.** 35/-

0-500 microamps 2" D.C. 32/6

0-500 microamps 2 1/2" D.C. 30/-

0-1 mA* 2 1/2" D.C. 19/6

0-1 mA 3" D.C. 35/-

0-1 mA 3" D.C.** 35/-

0-5 mA 3" D.C. 45/-

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LETTERS TO THE EDITOR

CONSOLE COLOSSUS

SIR,—I am enclosing some photographs of my hi-fi stereo console, built mainly from P.W. designs. You will note at top left the P.W. Short Wave Two. That is the original piece of equipment that started me off on this giant! It has quite a few extras now, however, including twelve sets of coils all wired in with a 12-way coil selection switch, which can be seen on the front panel to the right of the on-off switch. There is also a signal strength meter mounted on the first amplifier.

The only two pieces not built by me are the TV set and the stereo amplifier (right). The TV is covered by my first attempt at a roller blind type door, which works very well and was made from 1/2 in. half-round beading and varnished in its natural state to match the surrounding beading on the speaker cabinets and main gram unit.

The end speaker units are hinged and swing out to obtain optimum stereo effect and can also be lifted off to be placed wherever required. Record storage spaces are provided, as can be seen.

The latest addition is a kit-built f.m. tuner. There is also an a.m. tuner built into the lower preamplifier unit, converted from an old transistor portable radio. Everything, including the deck and all amplifiers, are fed from their own power supplies, a stabilised power pack is seen under the stereo amplifier (top right). Lighting is provided for the player deck compartment and a remote control unit is available selecting TV, f.m. and amplifiers, or record deck to amplifiers. The transcription arm is home-made, too.

It has taken me about 12 months to build all this and put it together. Thirty-eight feet of solder has gone into it! A tape deck is to be added as soon as possible. During the construction I think I must have run into just about every conceivable kind of teething trouble and I have had to redesign a great deal and I have learned a lot from this.

Beginners will be interested to know that I have very little theoretical knowledge and, in fact, all I have learned has come from PRACTICAL WIRELESS in the last year. I felt so confident from reading your articles and building some items, that I decided by trial and error to build a composite

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. **WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE.** If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of the cover.

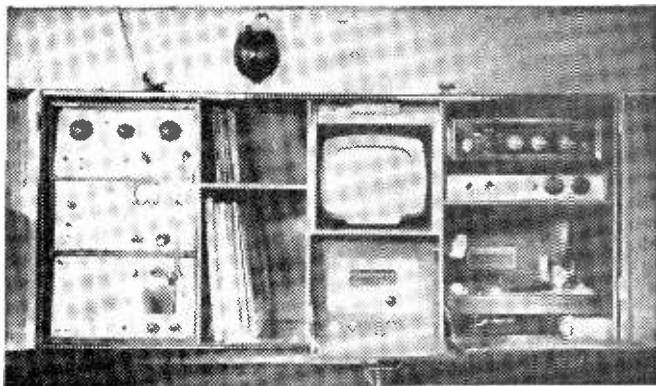
The Editor does not necessarily agree with the opinions expressed by his correspondents.

unit using mainly P.W. amplifiers, etc and ideas. Thank you for all your help (although you were unaware of it). Without P.W. I could not have made it—J. F. B. OSBORNE (Shootash, nr. Romsey, Hampshire).

VOLUNTARY SERVICE

SIR,—I am hoping this letter will interest any radio and television repairmen among your readers, who feel they would like to help old and disabled folk by servicing their radio and television receivers free of charge.

It was seven years ago when, after a serious operation had left me with deafness and a throat disability, a district nurse asked me to repair the



Mr. Osborne's mammoth stereogram-cum-television.

television set of a very old invalid lady. After I had repaired the set free of cost, I began to think of the many other elderly and disabled people for whom servicing charges must preclude their listening or viewing, and subsequently I began offering my spare time services free to local people. I wrote to welfare services and the local newspaper of my intentions, and the orders have been coming in ever since.

During these seven years I have, at the time of writing, completed repairs to 688 sets and reconditioned for the use of old folk more than 100 radio and TV receivers, hearing aids, etc., which have been given to me by Bristol people after hearing of my service.

Although I receive no payment for this work, I have received many hundreds of letters of thanks

over the years, which makes it seem to me, a very worthwhile occupation for my spare time and if there are other readers who feel they could help provide a similar service in their own towns, I would be pleased to hear from them with a view to forming an organised service throughout the country, to exchange ideas, help out with component parts, etc. I'm sure it would be a great asset. —STEPHEN FREETH, (6 Buxton Walk, Horfield, Bristol, 7).

RELAY ECONOMIES

SIR,—I was interested in the article you published on relay circuits. I should like to comment that for those, who, like myself, are permanently short of cash and have nearly empty junk boxes, the idea of a separate power supply for each relay circuit is rather alarming. There are probably ways round this however.

Some of your readers may be interested to know that in the June 1953 issue of P.W. there was an article describing a "Valveless Radio Control Receiver". (No transistors then, remember). This was a crystal set tuned to the 27Mc/s band, the output of which fed a sensitive relay. The part of the article relevant at the moment concerns the relay. This consisted of a 50 μ A meter movement to which small silver contacts were attached. As the contacts were very small they would only handle sufficient current to switch a slave relay. This receiver has the merit of consuming no power until a signal is received, though the range is not very great.

This leads me to another idea for making sensitive relays. If a small mirror is attached to a meter movement, it can be used as a spot galvo. The light beam is made to cross a photo-transistor, light-dependent resistor or similar device, which is arranged to trigger a bi-stable circuit and this switches the slave relay. When a suitable current is passed through the movement, the slave circuit is triggered. When the current is removed, the light beam again crosses the photocell and again triggers the slave circuit which returns to its original condition. This circuit would have at least four merits. Firstly, it could be very sensitive, depending on the movement used and the optical design. Secondly, the switch-on and switch-off currents would be very close, depending again on the optical design. Thirdly, if provision is made for manually triggering the bi-stable circuit, the slave relay may be normally off or normally on as desired. Fourthly, the actuating current can be altered by changing the position of the photocell. —J. N. MANN (High Wycombe, Buckinghamshire).

NUMBER FACTORS FOR NIM GAMES

One of our readers, Mr. Leonard Andersen, has produced a chart showing the factors of 2 for all numbers to 500 (even numbers). This design is related to an electrical apparatus for the game of "NIM" which appeared in the October, 1963, issue of PRACTICAL WIRELESS.

The chart also gives the complementative factors at a glance. For chart and instructions send 2s. to L. Andersen, 127 Alexandra Road, London, S.W.19.

COMMENTS ON THERMION'S CAROLINE VIEWS

By what right does Thermion so aggressively condemn these "pirate" radio stations? Why can't the BBC stand some competition for a change and then maybe the public will get what it wants—not what a few think it wants!—J. GRIFFITHS (South Benfleet, Essex).

My good Thermion, get your head out of the sand. Does every taxi driver working in a radio-cab hold an RAE licence for radio communication with his depot? You describe us as "weak-willed and disgruntled" just because we think that the P.O. regulations on transmitting should make room for people who have not passed the RAE etc. If piracy is on the increase as you say, don't shut your eyes to the need for this revision, but get a sense of proportion, as your Editor says on Page 125.—W. JENKINS (Dymock, Gloucestershire).

I can only think how right Thermion's article is in every detail, as it shows how outdated we are in this country in the field of wireless communication for the man in the street.

In the USA any person over 18 can get a licence permitting him to use Citizen's Band equipment. Why should we be denied it in this country. Ironically, such equipment is becoming available over here, but apparently anyone buying and using it lays himself open to prosecution. If America, with a population of over 150 million has enough air space, so surely have we!—A. SIDI (Guiseley, Yorkshire).

The answer to these "Pirate" radio stations seems to me to be in the hands of the Postmaster General himself. I think everyone will agree that the annoying thing about these stations is their frequency and their proneness to fading. Surely then, all the Postmaster has to do is to make use of a frequency less prone to fading, and broadcast competitive "pop" programmes. He already has a frequency available in the Third Programme, and could open broadcasting at 6 a.m. instead of 6 p.m. yet still use this station for the interesting programmes that it relays in the evenings.—D. BARRINGTON (Leyton, London, E.10).

[We have received many letters on the subject of Radio Caroline and her sister ships—most of them in favour. But against any arguments, one way or another, the following observations should be considered:

(1) The wireless receiving licence issued in this country permits the holder to listen only to authorised broadcasting stations (and, incidentally, only to licensed amateur stations).

(2) The International Telecommunication Union Radio Regulations (1959) state—*vide* Article 7, Section 1, ¶1, (422): "The establishment and use of broadcasting stations . . . on board ships, aircraft or any other floating or airborne objects outside national territories is prohibited".

It becomes clear, therefore, that transmissions such as those emanating from Radio Caroline are illegal, as is the act of listening to such programmes (though this would indeed be virtually impossible to enforce). However, whether such regulations are justified or not, so long as they exist we have no option but to take the view that these floating stations are illegal.

As to amateur radio pirates and licensing, we will be having something to say on these subjects in a forthcoming issue.—Editor.]

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Plays down tunnel!

From Abbey Wood, London, S.E.2

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(Signed) D.B.P.

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"I am delighted with reception. Last night I was surprised to hear the Light Programme and Luxembourg. The volume of the Third Programme and Midland Home Service is such that the receiver must be turned on edge to ensure comfortable listening. Once more I must congratulate you on this excellent set which I put together with no trouble at all in less than an hour and a half."

(Signed) J.L.P.

Good reception in Bristol

"Was very pleased with the performance, the local stations coming in loud and clear with a fair sprinkling of foreign stations as well as including Luxembourg."

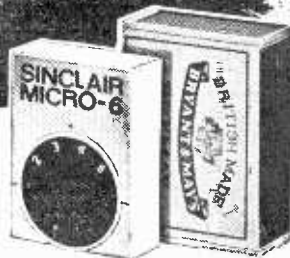
(Signed) L.W.A.

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When you have built your Micro-6, slip it into your pocket or on your wrist by means of the special "Transista" strap available. No matter where you take your Micro-6, you will be staggered by its performance. In fact it will be so powerful and dependable, you will find yourself using and enjoying it more and more each day. After dark, as you tune by means of the unique vernier-type control, stations simply pour in from all over Europe, and with bandspread tuning at the high frequency end of the medium waveband, Luxembourg comes in like a local station. **THE SINCLAIR MICRO-6 IS A GREAT TRIUMPH OF BRITISH DESIGNING FAR AHEAD OF ANYTHING PRODUCED IN JAPAN, U.S.A., GERMANY OR ANYWHERE ELSE. IT MEASURES ONLY 1 1/5 x 1 3/10 x 1 1/2 ins.**

All parts, including 8 page instructions manual and ear-piece come to

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"Transista" Nylon Wrist-strap with special fitting for holding Micro-6; well-made in black or grey nylon

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Mallory Mercury Cell, type ZM312 (2 required), each

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The Secret is in the Circuit
See next pages

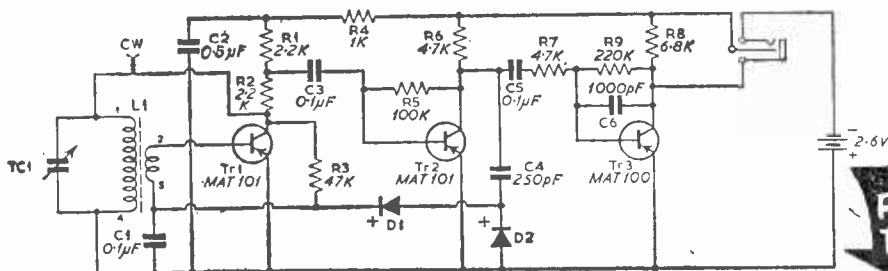
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MICRO - 6

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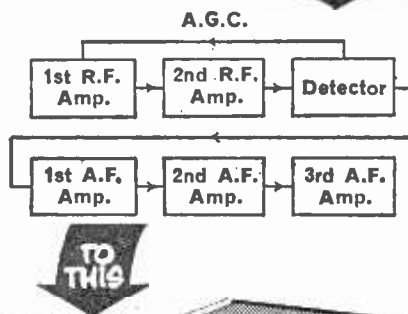
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The Micro-6 uses three Micro-Alloy Transistors (MATs) in a unique double reflex circuit. The signal selected by L1 and TC1 is amplified at R.F. by Tr1 and Tr2. The output from Tr2 is rectified by the detector stage D1 and D2, and the resultant A.F. signal passed back to Tr1. Tr1 and Tr2 then amplify the signal again—this time at A.F. Thus both Tr1 and Tr2 have been used twice and give a gain normally only obtainable with four transistors. The output from Tr2 drives Tr3, the output stage, which feeds into the featherweight earpiece (or the TR 750 power amplifier). Tuning is over the medium waveband with bandspread for easy reception of Luxembourg and A.G.C. eliminates fading. It is important to realise that the Micro-Alloy Transistors which the Micro-6 uses not only give extremely high gains and low noise levels, but they consume only a fraction of a mA from the two minute batteries used to power the set. Battery working life is over 70 hours!



YOU CAN BUILD THIS SET IN AN EVENING!

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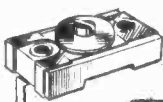
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THE MICRO-6 uses the smallest components ever

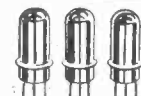
We show here some of the components (apart from case, dial and earpiece) required for building the Micro-6, drawn to actual size. They include the smallest ever to be made available to domestic set constructors, being of the kind used in space and computer electronics, so they have to be reliable. The tuning system has ingenious vernier control for easy station separation. 8 page fully illustrated instruction manual and all parts including case, vernier dial and ear-piece, come to

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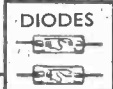
TRANSISTORS



RESISTORS



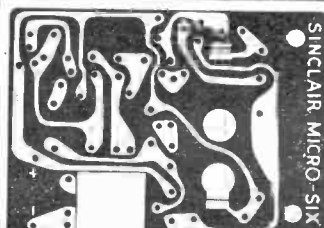
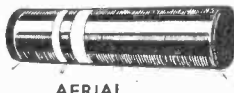
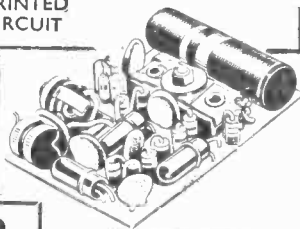
DIODES



BATTERIES

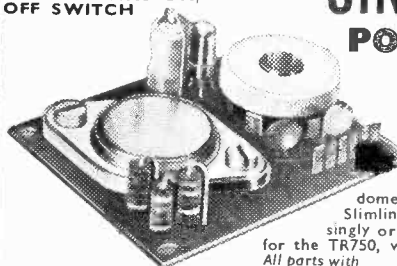


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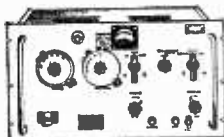
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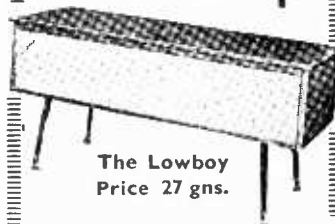
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Frequency range 1.5-30 Mc/s. Substantially improves the performance of any superhet receiver.

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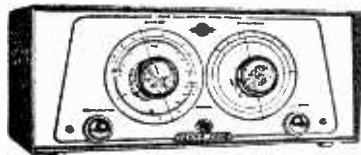
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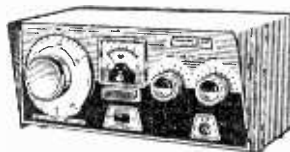
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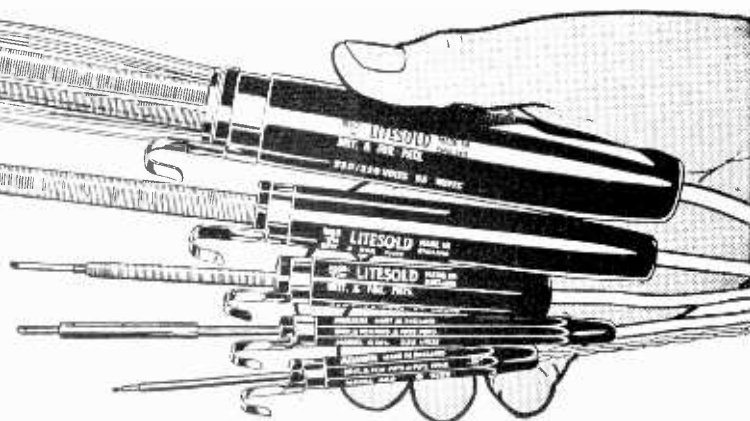
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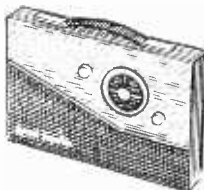
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Good Companion

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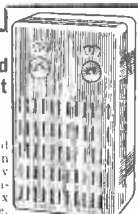
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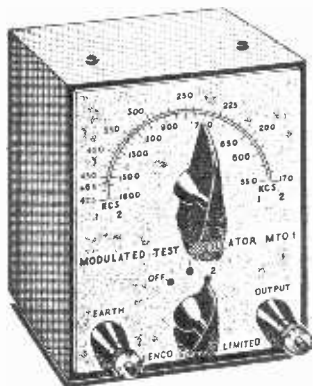
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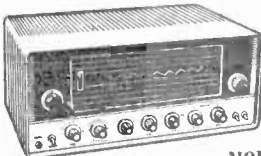
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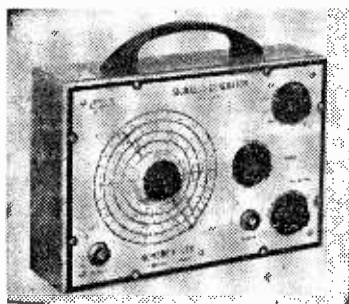
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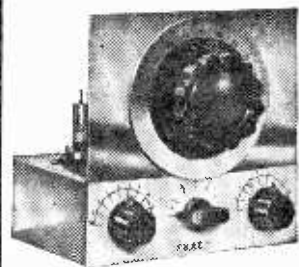
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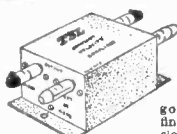
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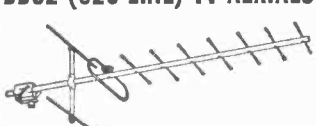
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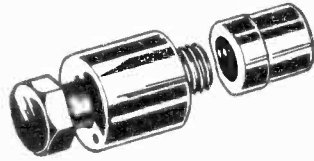
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1A7GT	7/-8A16	5/-7F8	8/-29C1	20/-C1C	5/-ECC92	7/-EN81	10/-PCF86	9/-U261	12/8	6/8W4	4/-XCW4	5/-VHF							
1A7D	7/-8A16	5/-7F8	8/-29C1	20/-C1C	5/-ECC92	7/-EN81	10/-PCF86	9/-U261	12/8	6/8W4	4/-XCW4	5/-VHF							
1C6GT	7/-8B7	5/-7Z4	4/-30C17	12/-C/31	8/6-EC91	9/-EN92	6/-PL38	16/-U282	12/-	6/8W4	4/-XCW4	5/-VHF							
1G6GT	7/-8B8	5/-8HW6	7/-30F5	8/-DAF91	4/6-ECH35	10/-EY51	7/-PL81	7/-U301	11/-	6/8W4	4/-XCW4	5/-VHF							
1H5GT	7/-8B8	4/6-10C1	10/-30L17	13/-DAF92	6/-ECH42	7/-EY81	7/-PL82	5/6-U403	7/-	6/8W4	4/-XCW4	5/-VHF							
1H5	5/-8B8	5/-10D1	7/-30P12	10/-DAF96	5/6-ECH81	6/-EY83	8/6-PL83	6/-U401	20/-	6/8W4	4/-XCW4	5/-VHF							
1B4	4/6-8B9	6/-10F9	9/-30P19	14/-DF33	5/-ECH83	7/6-EY84	7/6-PL84	6/8-U402	5/-	6/8W4	4/-XCW4	5/-VHF							
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1T4	3/-8B36	8/-10H1	7/6-35L6GT	6/8-DP96	5/6-ECL82	6/6-EZ40	6/6-PL84	6/8-U403	5/-	6/8W4	4/-XCW4	5/-VHF							
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1U5	5/-8B4K	20/-10P14	12/6-35Z3	10/-DK40	11/-ECL86	8/-EZ80	6/6-PT33	10/-U406	6/8	6/8W4	4/-XCW4	5/-VHF							
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1X2B	7/-8B7	7/6-11D5	7/-35Z6GT	6/-DK92	6/6-EF36	4/6-EZ30	10/-EY81	5/6-U401	11/-	6/8W4	4/-XCW4	5/-VHF							
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3B4	5/-8C10	6/-12A07	5/-80A2	8/-E911	12/-EY85	6/-KT82	7/-QV09	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
3V4	6/6-8F13	6/8-12A07	5/-150B3	12/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
5R4GY	9/-8F17	6/-12A07	10/-150B3	8/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
6U4G	5/-8F23	5/-12A14	9/-22D10	5/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
5U4G	6/-8F3	9/-12A06	4/6-80T	5/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
5V4G	8/-8F3	9/-12A06	4/6-80T	5/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
5V3GT	5/-8F3	9/-12A06	4/6-80T	5/-E88C0	10/-EY80	6/-KT81	17/6-PX35	10/-U401	7/-	6/8W4	4/-XCW4	5/-VHF							
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9A4B	6/8-8L6	6/-12K7	6/-865	3/-E88C1	6/8-EL38	17/6-PCC88	10/-T41	10/-U401	5/8	6/8W4	4/-XCW4	5/-VHF							
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9A4G	5/-8N7	6/-19A05	6/-957	7/-E88C1	6/8-EL39	10/-T41	10/-U401	5/8		6/8W4	4/-XCW4	5/-VHF							
9A4H	11/-8N7	6/-19A05	6/-957	7/-E88C1	6/8-EL39	10/-T41	10/-U401	5/8		6/8W4	4/-XCW4	5/-VHF							
9A4K	5/-8N7	6/-19A05	6/-957	7/-E88C1	6/8-EL39	10/-T41	10/-U401	5/8		6/8W4	4/-XCW4	5/-VHF							
9A4L	5/-8N7	6/-19A05	6/-957	7/-E88C1	6/8-EL39	10/-T41	10/-U401	5/8		6/8W4	4/-XCW4	5/-VHF							
9A4M	5/-8N7	6/-19A05	6/-957	7/-E88C1	6/8-EL39	10/-T41	10/-U401	5/8		6/8W4	4/-XCW4	5/-VHF							

GERMANIUM MINIATURE POWER RECTIFIERS									
GJ3M	200 p.i.v.	500/1000 mA.							
D.C.									
GJ3M	80 p.i.v.	500/1000 mA.							
D.C.									
Silicon Power Rectifiers									
Net of four									
SILICON POWER RECTIFIERS									
Hall Valve									
Mullard BY100	700 p.i.v.	450 mA							
Mullard BY210	500 p.i.v.	6 amps unmounted							
In mounted									
Low Loss Substrates DD058									
800 p.i.v.	500 mA								
TRANSISTORS									
OC26	81	OC75	61						
OC28	17/6	OC76	61						
UC35	15/6	OC78	71						
UC42	81	OC78D	71						
OC43	81	OC138	12						
OC44	81	OC138	12						
OC70	5/6	OC174	81						
OC71	5/6	OC201	10/6						
OC72	81								
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OC159	81								

All our valves carry full manufacturers' guarantee. Any faulty item is replaced immediately free of charge. Please add 2/6 in & for postage and handling

SUMMER CLEARANCE SALE - PRICES SLASHED

MAKE 5 DIFFERENT TRANSISTOR RADIOS FOR 30/-



Amazing Radio Construction Set! Become a radio expert for 30/-! A complete Home Radio Course. No experience needed. Parts and Radio book, instructions for each design. Step-by-step Plan. All Transistors, loudspeaker, personal phone, knobs, screws, etc., all you need. Box size 14 x 2 x 2in. (parts avail. sep.). Originally 26, 30/-, plus 2/6 P. & P.



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AMAZING CIGARETTE RADIO ONLY 18/6 NO MORE TO PAY



Amaze your friends! This highly sensitive TRANSISTOR "CIGA-RADIO" receives all medium wave stations clear and crisp—holds ten cigs—weighs less than 3 ozs. with cigs! Tiny battery inside costs 3d. lasts over 3 months. This brilliant little novelty personal phone radio is ideal for Bedside, News, Sports, Office. Can be built by anyone from pictorial diagrams in an hour or two. All parts supplied for 18/6 (add 1/6 P. & P.). (Parts sold separately).

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This exciting little speed camera is a professional-grade instrument in chrome steel and leather with multi-magnifying Lens—each 14mm. film takes 10 pics. Size 1 1/2 x 1 1/2 x 2in. only 19/6. P. & P. 1/6 extra. FREE Leather Carry-case. Six Rolls of Film.

"VOLKSRADIO" POCKET VALUE RADIO ONLY 15/-

Take-over Bid makes this Fantastic Offer possible—the beautifully compact "5 Star Volkradio" measures 4 1/2 x 2 1/2 x 1 1/2in. receives perfectly—in the bedroom, office, garden—over all M.W. incl. Luxembourg. Under 10. hour running cost. Anyone can assemble it in 10. 2 hours, using our simple A.B.C. plan. 15/-, plus 1/6 P. & P. (Parts can be bought sep.).

Fabulous ST. TROPEZ MK. 6 The Sensational Pocket Radio

This fantastic offer will amaze you—the beautifully compact ST. TROPEZ, measuring 4 1/2 x 3 x 1 1/2in. receives perfectly in the bedroom, office or garden—over all medium waves including Luxembourg. Under 10. per hour running cost. ANYONE can assemble it in one or two hours using our simple A.B.C. plan. 25/- (P. & P. 2/6 extra). (Case extra). Parts can be bought separately.

Brand New, Boxed, AUTOMATIC CAR CIGARETTE LIGHTERS. Heavy chrome finish, holding 10 cigs. and carries ready-fit cig. Works off 6 or 12V. Special Clearance Price 10/6, plus 1/6 P. & P.

STOCK ROOMS MUST BE CLEARED TO MAKE WAY FOR NEW STOCK

Our New 4-Stage MINUETTE

Build this newly designed "MINUETTE" 4-STAGE transistor set in very strong ready drilled 1/4" L.T.R. MODERN CASE, size only 6 x 3 x 1 1/2in. Uses three transistors and diode and 25V-0-25V TAPPED LOUDSPEAKER. Very sensitive, ideal for office, bedroom, holidays, etc. Mouths and mugs of listening at 1/2 battery. Can be built FOR ONLY 30/- including Proper Case, miniature speaker etc. Simple as A.B.C. Pictorial Step-by-Step Plans etc., plus post and packing 1/6. Parts sold separately.

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BULK PURCHASE ENABLES US TO MAKE THIS FANTASTIC OFFER—AND WITH MONEY BACK GUARANTEE!! The "MINUETTE" is so tuned that it brings the voices of stars, entertainers and vocalists dramatically to life—in your home, office, etc. Only 4 1/2 x 2 1/2 x 1 1/2in. Fits easily into your pocket or handbag. Works for months off 1/2 battery. Should be a life-time, anyone can assemble it in an hour or two with our easy plan. Miniature speaker, carrying case—everything only 25/6, 2/6 P. & P. (Parts can be bought separately.)

READY TO PLAY

TRANSISTOR RADIO FULLY TRANSISTORISED SKYROMA Mk. 7. This latest 1964 model is cheered by experts for its fantastically low price. Built in two-tone case, size 4 1/2 x 2 1/2 x 1 1/2in. Receives M.W. stations loud and clear. Every radio is fully tested before despatch. Price ready built 25/-, P. & P. 1/6 extra. Free carrying case with set. No more to pay

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We supply from stock most of the components and items specified or circuits published in this and other magazines and radio books. Let us quote for your circuit, first grade components at realistic prices.

DEAC RECHARGEABLE BATTERIES

18 volt 100mA/H 4 x lin. diameter. Brand new sleeved, 30/-
3.9 volt 450mA/H, 12/6.
All types easily split into any multiple of 1.2 volt. Brand new.



MULTI-METERS

Multi-range test meters featuring easy to read scales and provided with full operating instructions, lead and batteries. Suitable for amateurs, designers, repair shops, all domestic uses. Full details and specifications in our catalogue.

★ PT34	1 Kohm/volt	£1 19 6
★ M1	2 "	£2 9 6
★ THL33	2 " (illus.)	£3 15 0
★ EP10K	10 "	£4 9 6
★ ITI-2	20 "	£5 19 6
★ TP55	20 "	£5 19 6
★ EP30K	30 "	£6 19 6
★ 500	30 "	£8 19 6
★ EP50K	50 "	£9 19 6

* Leather Cases available.

NOMBREX TEST EQUIPMENT

LEAFLETS ON REQUEST

All transistor portable units supplied with full instructions.

- ★ 150 Kc/s to 350 Mc/s generator. RF, Mod., AF. 8 ranges. Leads, batt., instructions. £9.10.0
- ★ Resistance/Capacitance Bridge. £8.5.0.
- ★ Transistorised Power Supply. £6.10.0.
- ★ Audio Generator. £16.15.0.
- ★ Inductance Bridge. £18.

HI-FI SPEAKERS

CX300 12 inch 25 watt	12 Gns.
CR12AE 12 inch 20 watt	8 Gns.
CR30AE 12 inch 20 watt	
triple range	10 Gns.
8A7 8 inch 6 watt	79/6
10 watt Horn Tweeter	29/6
20 watt Rect. Horn Tweeter	69/6

MINIGRAM TRANSISTOR PORTABLE RECORD PLAYER



Strong moulded two colour cabinet with handle. Plays anywhere on long life 9 volt battery. Requires less than half an hour's work to connect up using ready built units and easy instructions.
TOTAL 79/6 P.P.
COST (Battery 3/9).
Or Amplifier with volume control and 5 x 3 inch Speaker, 4-Transistor, 35/-, P.P. 2/-.
9 volt Starr Player with Pick-up 39/6, P.P. 2/6. And Two Tone Case 5/-, P.P. 2/-.

TRANSISTOR TRANSCEIVER

Two way Trans./receivers. 9-Transistor superhet circuit, crystal controlled on both transmit and receive. Push-pull output. Range up to 5 miles under best conditions. Supplied complete with batteries, Telescopic aerials and leather cases. Overall sizes: 6½ x 3 x 1½ inches. Sold in pairs.
PRICE PER PAIR £25. P.P. 3/-.

QUARTZ CRYSTALS

100 Kc/s 3 Pin	15/- ea.
500 Kc/s 2 Pin	15/-
455 Kc/s (AR88)	12/6
5000 Kc/s 2 Pin	10/-
10 Mc/s 2 Pin	15/-
27 Mc/s Radio Control	15/-
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Over 600 Frequencies in Stock for all purposes. Catalogue on request.

MAINS AND BATTERY RECORD AND TAPE DECKS

All Decks Complete with Cartridges	
★ BSR UA14 4-speed Auto	£5 16 6
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★ Garrard Autolism Auto	£6 10 0
★ Uniplugable Hdd. Versm. Auto	£6 19 6
★ Stereo Version Auto	£7 19 6
★ SRP10 4-speed Single Player	£5 5 0
★ BSR GU7 4-speed Single Player	£5 0 0
★ Garrard AT6 with Stereo Cartridge Autochanger	£10 19 6
★ AT6 Mono	10 gns.
★ Collaro 2-track Studio Deck	£10 10 0
★ 4-track Deck	£13 19 6
P. & P. 3/6 any type above.	
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★ 45 or 33 r.p.m. Starr 9V	92/6
★ 45 r.p.m. Garrard, 6V	35/-
★ 4-speed B.S.R. 9V	5 gns.
★ Garrard 9V. 2-speed, 2-track Tape Deck with cassette	£11 15 0
P. & P. 2/6 any of above.	

SUBSTITUTION BOXES

- Capacitor Box. 0.001 to 0.22 mfd., 29/6.
- Resistor Box. 15 ohms to 10 meg., 37/6.

TO BUILD YOURSELF

Sinclair TR750 Amplifier	39/6
Sinclair Micro-6	59/6
Sinclair Micro Injector	27/6

Leaflet and details on request.
All parts in stock for 9 volt mains power pack, PW Inverter (Total Cost 75/- pp 2/6) and Build and Learn series. Please send full list of parts required for quotation.

ALL PARTS IN STOCK FOR PW SHORTWAVE TRANSISTOR CONVERTER. As per Feb. and AUGUST Editions 1964.

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Acos 39-1 Stick Microphone	32/6
Acos 60-1 Stick Microphone	27/6
Acos 40 Desk Microphone	15/-
Acos 45 Hand Microphone	22/6
Lapel/Hand Microphone	12/6
100C Stick with Stand	39/6
BM3 Stick with Stand	49/6
Lapel/Hand Magnetic	8/6

MINIATURE PANEL METERS

*0/50µA (D.C.) 39/6	*0/5mA (D.C.) 27/6
*0/500µA (D.C.) 32/6	*0/300V (D.C.) 27/6
*0/1µA (D.C.) 27/6	"S" Meter 35/-

All Brand New Boxed. *Available Clear Plastic Front or Black Moulded.
2000Ω D.C. Edge meter.....69/6
1 mA D.C. Edge meter.....59/6
3½ x 1 inch Front Panel.

POCKET SOLDERING IRON. 30 watts. 220/250 volts A.C. Complete with pointed bit, mains plug, carry pouch. 14/6. P.P. 1/6.

RECORDING TAPE

5in. 600ft. 12/6	5in. 900ft., 15/-	7in. 1,200ft. 18/6	7in. 1,800ft., 25/-	7in. 2,400ft., 27/6
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Excellent quality.
● 3 inch square 3 ohm Speaker, 12/6.

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Latest Edition with 86 pages fully detailed and illustrated with hundreds of new items and bargains.
PRICE 2/6. Post Paid.

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- Mono Stethoscope Types. Crystal 10/6. Magnetic 12/6.
- Fully Retractable Car Aerial—Thief Proof, 39/6.
- PP3 Battery Eliminator, 18/6.
- Tape Demagnetiser, 29/6.
- 1K ohm Dynamic Microphone, 12/6.
- 8+8ohm Stereo Headphones, 62/6.
- Transistor Signal Injector, 39/6.
- Crystal Ovens, 6/12 volt, 22/6.
- 12 inch 15 ohm Speaker, 35/-.
- DFI dynamic Mic. 50 k. with stand, 52/6
- New range in stock. See catalogue
- 5-Piece Hole Cutter for all chassis work 3in. to 1½in. with pouch, 49/6.
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- 4-Channel Transistor Mixer Unit.....59/6 P.P. 1/6.
- Tape Jack Radio Tuner.....29/- P.P. 1/-.

MARTIN RECORDAKIT BUILD A QUALITY PORTABLE TAPE RECORDER

Complete in every detail. ● Pre-built units—Collaro Studio Decks—Portable Cabinets with speakers. 6 valve designs.
TWO TRACK Total £26.0.0 P.P. 8/6.
FOUR TRACK Total £30.0.0 P.P. 8/6.

ALL AUDIOKITS IN STOCK

- Leaflets on Request ●
- 4 Transistor 9 volt, 3 ohm, 1 watt. Amplifier.....Built 49/6 Kit 39/6
- New 3-Transistor. Xtal controlled Transceivers. Up to ½ mile. Price per pair, £8.19.6. P.P. 2/6.

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Five channels cover 1 Mc to 200 Mc/s. Fitted 200 microamp meter for CW or RF. Indication and Earphone for A.F. Monitoring. Designed for checking all types of transmitters. Size 4 x 2½ x 2½in. Complete. Ready to Use, with instruction and telescopic aerial, 69/6. Post Free.

PP3 9 volt Battery Eliminator.....18/6

- 3 Transistor MW Superhet Tuner 82/6
- 4 Transistor MW/SW Superhet Tuner.....£7.9.6
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- 100 C Stick Xtal Mic with Stand 39/6
- 8A7 15 ohm 6 watt Hi-Fi Speaker 79/6

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● EMI 2½ inch Plastic Cone Tweeter 3/5 ohms, 17/6. P.P. 9d.
● New 6 pole 2 way Miniature Push Switch, 6/-.

HEADPHONES

2000 ohms 12/6	4000 ohms 14/-
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Henry's Radio Ltd.

PADddington 1008/9
303 EDGWARE RD., LONDON W.2
Open Monday to Sat. 9-6. Thurs. 1 o'clock.

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Practical Wireless

BLUEPRINT SERVICE

ALL of these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, constructional details are available free with each blueprint except for those marked thus (*).

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-SIDED BLUEPRINTS

Each blueprint in this series contains details of two separate instruments or items of equipment.

The Strand Amplifier ...	...	...	}	*	5/-
The PW Signal Generator ...	...	...			
The Savoy VHF Tuner ...	...	...	}	*	5/-
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The Berkeley Loudspeaker Enclosure ...	...	...	}	*	5/-
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The PW Troubadour ...	...	...	}	*	7/6
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The PW Britannic Two ...	...	...	}	*	6/-
The PW Mercury Six ...	...	...			
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The PW International Short Wave Two ...	...	...			

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The Citizen *	...	...	...	...	5/-
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Modern One-valver	...	...	...	PW96	2/6
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MISCELLANEOUS

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The PT Band III TV converter ...	...	...	1/6
The Mini-amp *	...	...	5/-
The PT Olympic *	...	...	7/6
The PT Multimeter *	...	...	5/-

SOME EARLIER DESIGNS

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Experimenter's Short Wave ...	...	PW30a	2/6
Midget Short Wave Two ...	...	PW38a	2/6
Simple S.W. One-valver ...	...	PW88	2/6
Pyramid One-valver ...	...	PW93	2/6
BBC Special One-valver ...	...	AW387	2/6
A One-valver for America ...	...	AW429	2/6
Short-Wave World Beater ...	...	AW436	3/6
Standard Four Valve S.W. ...	...	WM383	3/6
Enthusiast's Power Amplifier ...	...	WM387	3/6
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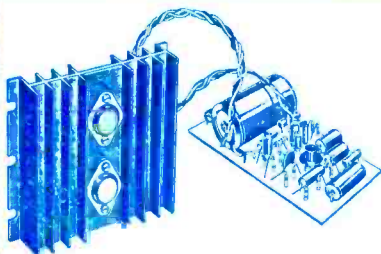
This coupon is available until 4th September, 1964, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.

PRACTICAL WIRELESS, SEPTEMBER, 1964.

TRANSISTOR HIGH FIDELITY EQUIPMENT

MAINS OR BATTERY OPERATION. 3 AND 15 OHMS.

10 WATTS MONO
OR 20 WATTS STEREO



● 10 WATT POWER AMPLIFIERS. Two versions. ± 1 dB 40 c/s to 20 kc/s. 60dB Feedback 100mV input and less than 0.25% distortion for 10 watts output. 3 and 15 ohm versions. Very low current. 6-Transistors and Rectifier. 3 ohm version (with reduced output) suitable for 12 volts. Also for 3/5/8 or 15 ohm speakers.

● 3 ohm 10 Watt. ● 15 ohm 10 Watt.
BUILT £5.10.0 BUILT £5.19.6

P.P. 2/6.

P.P. 2/6.

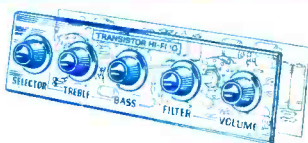
★ MAINS UNIT—will run 2-amplifiers for 3 ohm and 15 ohm. 69/6, P.P. 2/6. Each type.

★ Mains Unit for single amplifier. 59/6, P.P. 2/-.

● Preamplifier Built.

£5.10.0 P.P. 2/-.

COMPLETE CIRCUITS
WITH FULL DETAILS
ON REQUEST



- Low Distortion.
- High Performance.
- Mains or Battery.
- Low Noise Design.
- Mono or Stereo.

Dark Brown and Gold Panel Plate. 8/6.

GUARANTEED HIGH PERFORMANCE UNITS.

● Trade Discounts Available. Send For Details.

● MONO PREAMPLIFIER AND CONTROL UNIT.

For use with either of above amplifiers or valve amplifiers — Hum Free — High Sensitivity — 8 Inputs between 1.5mV and 300mV. For all pick-ups — Microphones, Tuners — Tape Replay. Separate treble and bass with cut and boost — 4 position Low Pass Filter — Volume etc. Panel size 9 x 2 1/2 in. Battery operated or from power supply.

MULTI-INPUT PREAMP



Simplified version of Mono Preamp above. 8 inputs as above. Input selector, Tone and Volume Controls. Size 5 x 2 1/2 x 2 in. Ideal as a Preamp for any valve or Transistor amplifier.

● PRICE BUILT **65/-** P.P. 1/6

● Dark Brown and Gold Panel Plate 6/6

● HIGH PERFORMANCE — LOW DISTORTION
— LOW NOISE — HI FI ●

STEREO TRANSISTOR INTEGRATED PRE-AMPLIFIER AND CONTROL UNIT

- Low noise printed circuit design developed from above mono equipment.

- Ganged controls, 8 inputs per channel for all types of input. Treble, bass, volume selector, on/off mono-stereo, etc.

- Designed for use with either of above 10 watt amplifiers.



● PRICE BUILT

£10.19.6 P.P. 3/6

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"CONVAIR" PUSH-BUTTON PORTABLE/CAR RADIO



- New printed circuit 6-Transistor superhet design. Over 700mW push-pull output.
- Push-button selection of MW and LW with full tuning on both wavebands.
- A new design with amazing performance at a realistic price.
- New attractively designed portable cabinet size 10 x 7 x 3 1/2 in. with horizontal tuning and all stations marked.

ALL PARTS SOLD SEPARATELY
(Batteries 6/- extra).

Total Cost of ALL Parts

£7.19.6 P.P. 3/6

● FOLLOWING A LINE OF QUALITY AND VALUE IN PORTABLES ●

7-TRANSISTOR RECORD/PLAYER/RADIOGRAM AMPLIFIER



- Mains or Battery operation.
- 4 watt peak output.
- Full Treble and Bass boost and cut
- 40 c/s to 20 kc/s ± 3 dB.
- Inputs for Pick-ups, Radio Tuners, Microphones, mixers.
- 9/12 volt for 3 ohm speakers (mains unit 49/6 extra).

Built Ready To Use **£5.19.6** P.P. 2/-

● Size only 6 x 2 1/2 x 2 in. Ideal for mains or battery, portable or domestic record player, grams, etc. Or car.

Latest 86-page fully detailed and illustrated catalogue. Components, accessories, Hi-Fi equipment, etc. 2/6 post paid.

VHF FM TRANSISTOR TUNER

- 5-Transistor.
- Superhet Design
- 4 Diodes.
- Full coverage 87 to 105 Mc/s.
- AFC and AVC.
- Up to 1 volt output.

Printed circuit design of high sensitivity and quality.

Output for valve or transistor amplifiers.

Size 3 1/2 x 2 1/2 x 4 in. Simplified building instructions.

All parts sold separately.

Detailed Circuit Book on Request.



TOTAL COST **£7.19.6** P.P. 2/6

(Cabinet assembly 20/- extra.)

SPECIAL OFFERS

- SCOTCH BOY TAPE. 3 1/2 in., 300ft. L.P. complete with spare spool. 5/6. P.P. 9d.
- MARRIOT TAPE HEADS. Type R/RP/3. 1/2 track. Complete with Mullard P MAG. erase ring. 15/-. P.P., 1/-. The pair

HENRY'S RADIO LTD. PADddington 100B/9.

303 EDGWARE ROAD, LONDON W.2.
(Open Monday to Saturday all day 9 a.m. to 6 p.m. Half-day Thursday 1 p.m.)

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