PRACTICAL WIRELESS

NOVEMBER 1964

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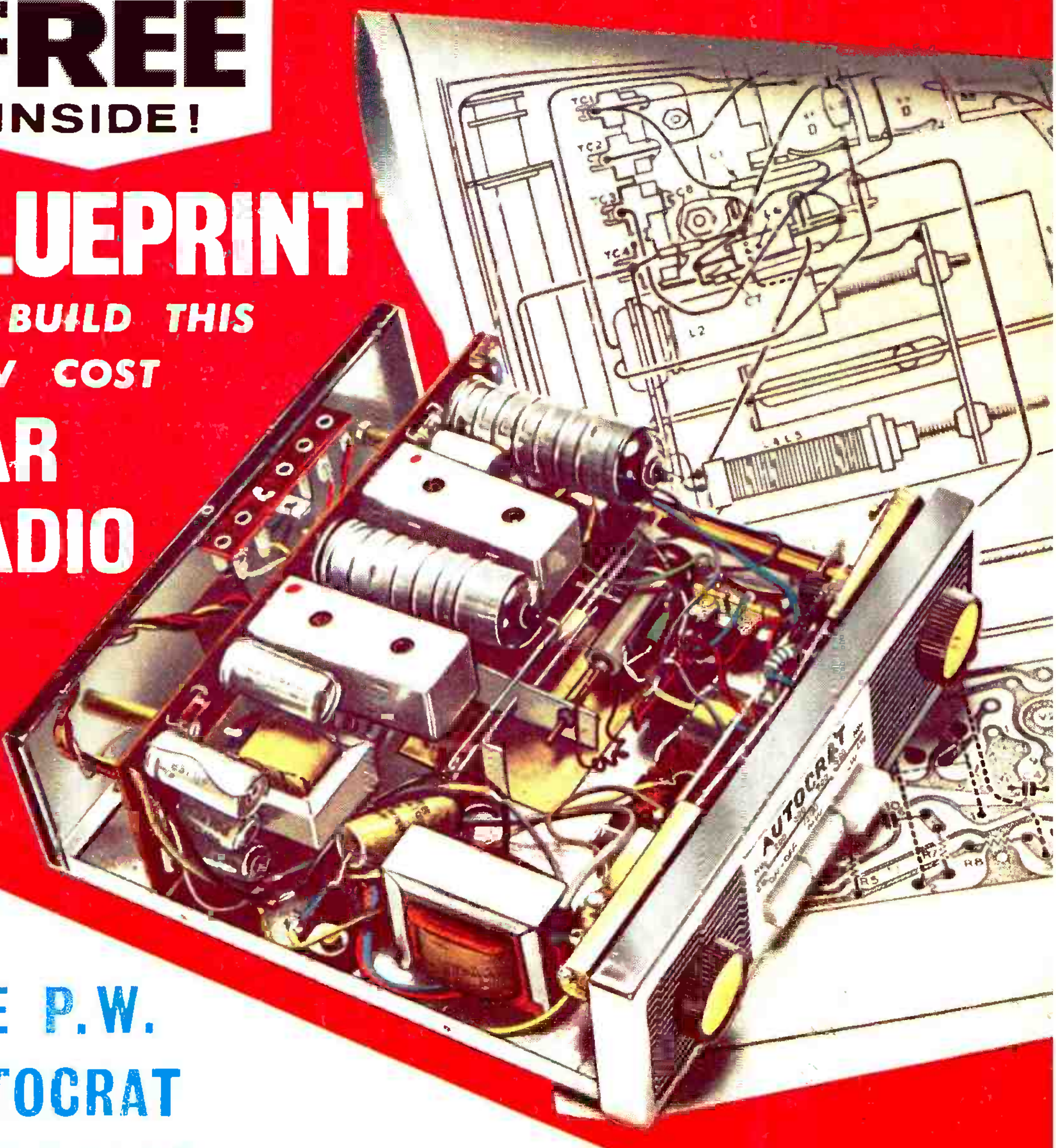
FREE INSIDE!

BLUEPRINT TO BUILD THIS LOW COST CAR RADIO



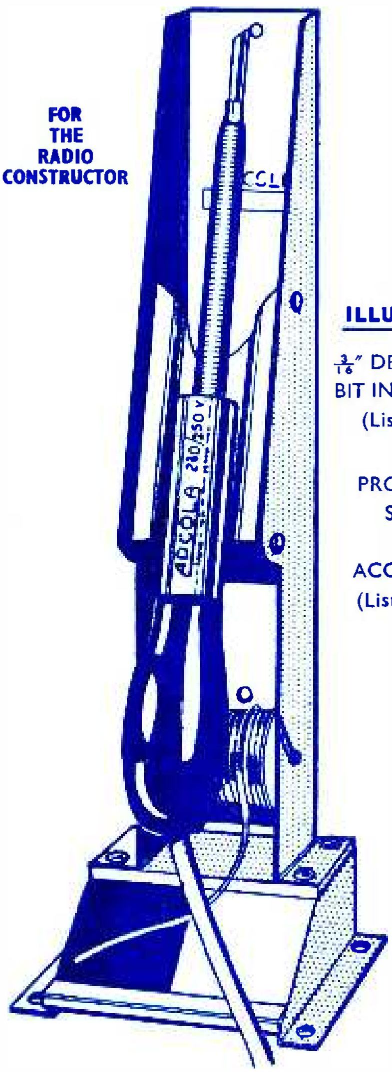
THE P.W. AUTOCRAT CAR RADIO

ADCOLA

PRODUCTS LIMITED
(Regd Trade Mark)

SOLDERING EQUIPMENT

FOR THE RADIO CONSTRUCTOR



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(List No. 64)
IN PROTECTIVE SHIELD WITH ACCESSORIES
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'SUPER SIX'

TRANSISTOR RADIO KIT

NOW ONLY £4.17.6 **(post 5/-)**

Owing to a fortunate bulk component contract the price of this model is now reduced to £4.17.6. Purchasers who have already paid the previous higher price will have the difference refunded on application.

- All new parts.
- 6 transistors and diode.
- 350mW output.
- Superhet circuit, Ferrite rod aerial.
- Weymouth Radio printed circuit board.
- Component positions and references printed on back of board.
- Nicely styled wooden cabinet, 11 x $7\frac{1}{2}$ x $3\frac{1}{2}$in.
- Vinyl covered in various colours.
- 6 x 4in. speaker giving good bass and treble response.
- Full instruction booklet 2/-. Free with kit.
- I.F. frequency 470 kc/s.
- Lining up service if required.
- All parts supplied separately. Write for list. S.A.E. please.
- Set can be supplied fully built for **£6.17.6** tax paid and carriage paid.
- 9v. battery required. VT9 or P.P.9 (3/9 with kit).

TRANSISTORS

Packet of 3 coded RF transistors (equivalent of OC44/5) **7/6** post paid. Trade supplied.
Set of 6 transistors and diode with circuit diagram. Neatly packed in foam-lined box; useful for presentation **15/-** post paid.

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Specialises in winding miniature coils and transformers of interest to bulk manufacturers in the industrial field. Manufacturers using up to 50 s.w.g. will find our service economical and reliable.

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Carr. & Ins. 12/6

HIGHEST QUALITY—COMPARE OUR PRICES

MOST MULLARD, MAZDA, COSSOR, EMITRON, EMI-SCOPE, BRIMAR, FERRANTI TYPES, PROCESSED IN OUR OWN FACTORY	GUARANTEED 6 Months	12 Months	NEW TYPES
12in.	£2. 0.0	£3. 0.0	MW 31/74 £3.15.0
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EKCO L.O.P.T. Unused replacements for Perspex cased 1954/7 models, complete with E.H.T. rect. unrepeatable. **39/-**

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

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

CONNECTING WIRE

P.V.C. Bright colours. Five 25ft. 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 feed-back, etc. Truly unusual value at **29/-**

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

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Table Models. Famous Makes. Absolutely Complete. These sets are unequalled in value due to huge purchaes direct from source. 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 offers. 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)............ £15

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 ½-3 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.

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GUARANTEED TOP QUALITY

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White Spot R.F........... **2/-**

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

R.F. Kits OC44, OC45 (2). 3 transistors. **12/6**

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AF117	7/-	OC81	5/6
AF127	9/6	OC81D	5/6
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General Purpose miniature detector, A.V.C., etc. or **6/6** doz. **8d.**

Gold Bonded highest quality. Individually tested. **9/6** doz. **1/-**

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

VALVE HOLDERS. B7G. **6d.** ea., with Screen **8d.** ea., B9A **6d.** ea., with Screen **8d.** ea. Int. Octal **6d.,** Mazda Octal **4d.** B8A **6d.** (less 15% in dozens).

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

COSSOR D.B. SCOPE TUBES. Type 09D Split Beam. Ideal for building your own quality oscilloscope whilst stocks last. **55/-**

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RECTIFIERS. 250 v., 80 mA, **5/;** RM2, **6/9;** RM3, **7/6;** RM4, **19/6;** RM5, **19/6;** 14A86, **17/-;** 14A97, **19/6;** 14A100, **19/6;** 16RC1-1-16-1 **7/9;** 18RA1-1-1-16, **6/-;** 18RD2-2-8-1, **14/-;** 14RA1-2-8-2, **17/-;** 14RA1-2-8-3, **20/-;**

ELECTRIC MOTORS. AC/DC 3-8 volts. Totally enclosed standard mounting, powerful V pulley, spare brushes, 2in. x 2in. **7/6**

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

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5T4	8/-	6SL7GT	5/9	35W4	6/-	ECC40	9/6	L67	3/-	UABC80	7/-
5U4G	5/6	6SN7GT	4/9	35Z4GT	5/6	ECC81	5/6	LN152	6/6	UAF42	7/9
5V4G	7/6	6SQ7	5/9	35Z5GT	7/-	ECC82	6/-	MU14	7/-	UB41	7/-
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6A6	3/9	7B6	10/9	61SPT	11/-	ECH35	11/6	PC86	11/6	UCC85	7/3
6A7	9/-	7B7	7/9	62BT	13/6	ECH42	8/6	PC97	9/6	UCF80	10/6
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6A8GT	12/6	7C6	7/6	78	5/-	ECH83	8/6	PCC85	7/9	UCH42	7/3
6AC7	3/-	7H7	7/3	80	5/6	ECL80	6/6	PCC88	11/9	UCH81	7/9
6AG5	2/9	7S7	15/-	83	9/6	ECL82	8/-	PCC89	9/6	UCL82	9/-
6AG7	6/9	7Y4	6/-	185BT	19/6	ECL83	10/6	PCC189	12/-	UCL83	12/-
6AK5	5/-	7Z4	6/-	185BTA	19/6	ECL84	12/-	PCF80	6/9	UF41	8/-
6AL5	3/3	8D	3/-	807	7/6	ECL86	10/3	PCF82	7/-	UF42	5/6
6AM6	3/-	10C1	11/6	813	49/-	EF22	7/-	PCF84	12/-	UF80	3/-
6AQ5	6/-	10C2	14/6	832	14/-	EF36	3/3	PCF86	11/-	UF85	7/6
6AT6	5/-	10F1	4/9	866A	12/6	EF37A	8/-	PCL82	7/3	UF89	3/-
6AU6	7/-	10F9	10/6	954	3/9	EF39	7/6	PCL83	9/-	UL41	8/-
6AV6	5/9	10F18	10/-	955	2/3	EF40	11/-	PCL84	7/3	UL44	14/-
6B7	8/6	10LD11	14/6	956	2/-	EF41	8/-	PCL85	10/6	UL46	9/9
6B8G	3/-	10P13	8/6	1625	5/6	EF42	6/9	PCL86	10/6	UL84	3/-
6BA6	5/6	10P14	9/6	5763	7/6	EF50-BR	1/6	PEN25	3/9	UM80	3/9
6BE6	5/6	10P18	7/-	9001	3/6	EF50(A)	2/6	PEN45	8/6	UR1C	7/6
6BG6G	15/-	12A6	2/3	9002	4/9	EF54	3/	PEN46	4/6	UU6	11/6
6BH6	6/6	12AH8	11/-	9003	5/9	EF80	4/6	PL33	9/6	UU7	9/6
6BJ6	5/9	12AT6	6/6	ATP4	2/6	EF85	6/-	PL36	9/6	UU8	13/6
6BR7	8/6	12AT7	5/6	AZ31	7/6	EF86	7/6	PL38	15/-	UY1N	11/-
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6BW6	7/9	12AU7	6/-	B36	6/9	EF91	3/-	PL82	6/6	UY41	6/-
6BW7	5/-	12AV6	6/9	C1C	8/-	EF92	3/-	PL83	6/6	UY85	6/-
6C4	2/3	12AX7	6/6	CBL31	13/6	EF183	9/9	PL84	7/-	VP4B	9/-
6C5	5/6	12BA6	7/-	CCH35	13/6	EF184	9/6	PL820	8/3	VP23	2/9
6C6	3/6	12BE6	6/6	CL33	9/-	EK32	7/6	PM84	8/-	VP41	5/6
6C9	11/-	12BH7	8/9	CY31	7/6	EL32	3/9	PX4	12/6	VR105	5/6
6CD6G	19/6	12C8	5/6	D77	3/3	EL33	11/-	PX25	9/-	VR150	5/-
6CH6	6/6	12E1	17/6	DA30	11/6	EL34	11/6	PY31	8/-	W76	4/9
6D2	3/3	12H6	1/9	DAC32	8/-	EL35	6/-	PY32	10/-	W81	7/3
6D3	9/6	12J5GT	3/3	DAF91	4/6	EL38	12/6	PY33	10/6	X61M	11/-
6D6	3/-	12J7GT	8/-	DAF96	7/3	EL41	8/-	PY80	6/6	X63	8/6
6F1	4/9	12K7GT	4/9	DF33	8/9	EL42	9/6	PY81	6/3	X65	11/-
6F6	7/6	12K8	9/9	DF91	3/-	EL81	8/9	PY82	5/9	X66	7/9
6F6G	4/6	12K8GT	11/6	DF96	7/3	EL84	6/6	PY83	6/9	X76M	11/-
6F13	4/9	12Q7GT	4/9	DF97	7/6	EL85	9/9	PY88	8/9	X78	21/6
6F14	9/6	12SA7	7/-	DH63	5/6	EL91	3/9	PY800	7/9	X79	21/-
6F15	9/6	12SG7	4/6	DH76	4/6	EL95	6/-	PY801	7/9	X81M	9/-
6F19	6/-	12SH7	3/6	DK32	9/6	EM34	8/9	PZ30	9/6	Y63	6/-
6F32	4/9	12SJ7	5/6	DK91	5/6	EM80	7/6	R19	9/6	Z63	4/9
6F33	4/-	12SK7	4/6	DK92	7/-	EM81	8/9	RL18	11/-	Z66	8/6
6H6	1/6	12SN7GT	6/9	DK96	7/9	EM85	9/6	SP41	2/3		
6J5	4/3	12SQ7	8/6	DL33	7/6	EN31	16/-	SP61	2/-		
6J5G	3/-	13D3	6/6	DL35	7/6	EY51	7/6	SU25	16/-		
6J5GT	4/3	14S7	19/9	DL63	9/-	EY86	7/3	SU2150	4/6		
6J6	3/6	19AQ5	7/9	DL75	6/-	EY88	9/6	T41	6/9		
6J7	8/6	19BG6	14/-	DL82	9/-	EZ40	7/-	TDD4	8/6		
6J7G	4/9	20D1	8/9	DL92	5/-	EZ41	7/-	U14	7/6		
6J7GT	7/6	20F2	9/6	DL94	6/6	EZ80	5/9	U18	7/6		
6K8GT	6/-	20L1	16/-	DL96	7/3						
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Post: 2 lbs. 2/-, 4 lbs. 2/6, 7 lbs. 3/6, 15 lbs. 4/-, etc. (C.O.D. 2/- extra). ALL ITEMS LESS 5% AND POST FREE IN DOZENS.

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DEFERRED TERMS ON ORDERS UK OVER £10. **ALL MODELS ALSO AVAILABLE ASSEMBLED**

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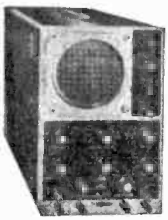

10-12U

5in. OSCILLOSCOPE Model 10-12U. Laboratory quality at utility oscilloscope price. Wide band amplifiers essential for T.V. servicing. F.M. alignment, etc. T/B covers 10 c/s -500 kc/s in 5 ranges.
£41.10.0 Assembled **£32.12.6** Kit

PORTABLE 'SCOPE Model OS-1 A compact portable oscilloscope, ideal for servicing and general work. Printed circuit board. Case: 7⅜ x 4¾ x 12½in. long. Wt. only 10½ lbs.
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ELECTRONIC SWITCH. Model S-3U. Converts a single beam oscilloscope into double beam operation at low cost.
£18.10.0 Assembled **£12.18.0** Kit

VALVE VOLTMETER. Model V-7A. The world's best selling VTVM. Measures up to 1,500 volts (d.c. and r.m.s.) and 4,000 pk. to pk. Res. 0.1Ω 1,000 MΩ. Centre zero dB scale, d.c. input resistance 11MΩ. 4½in. meter. Complete with test prods, leads and standardising battery.
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RF PROBE. 309-CU extends range to 100 Mc/s. Indication to 300 Mc/s. **£1.13.6** Kit

HV PROBE, HV-336 measures up to 30,000V d.c. **£2.19.6** Kit

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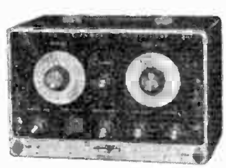
Accurate alignment of TV receivers achieved in minimum time at low cost. Covers 3.5 to 220 Mc/s on fundamentals. A must for the service man.
ONLY **£30.15.0** Kit
£44.10.0 Assembled



HFW-1

A wide range of other test instruments available including: **R/C Bridge C-3U £10.10.0. AF V/Voltmeter AV-3U £16.10.0. Wattmeter AW-1U, £17.5.0. (Capacitance meter) CM-1U £15.15.0. Power supplies. Decade boxes etc.** Many other instruments available under American Mail order scheme. Why not send for full details?

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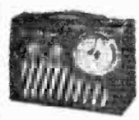
"OXFORD" LUXURY TRANSISTOR DUAL WAVEBAND RECEIVER. The ideal domestic, or personal portable receiver. 10 Semi-conductors. Solid leather case. Send for full details.
Incl. P.T. **£14.18.0** Kit



UXR-1

6 TRANSISTOR PORTABLE. Model UXR-1. Prealigned I.F. transformers. Printed circuit, 7in. x 4in. high flux speaker. Real hide case. Very easy to build.
Inc. P.T. **£12.11.0** Kit

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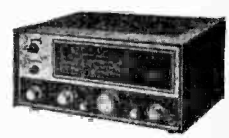
"MOHICAN" GENERAL COVERAGE RECEIVER. Model GC-1U. Excellent portable or general purpose receiver for "amateur" or short wave listening. See full spec. leaflets.
Assembled £45.17.6 **£37.17.6** Kit

GC-1U

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

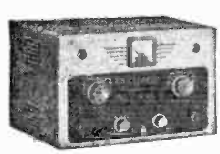
"AMATEUR" EQUIPMENT

AMATEUR BANDS RECEIVER Model RA-1. Covers all amateur bands from 160-10 m. Half lattice crystal filter. 8 valve, "S" meter, tuned R.F. amplifier stage.
£39.6.6 Kit
Assembled £52.10.0



RA-1

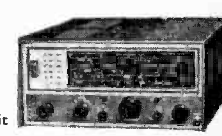
AMATEUR TRANSMITTER. Model DX-100U. Covers all amateur bands 160-10M. 150 w. d.c. input, self contained with power supply. Modulator, VFO
Assembled £104.15.0 **£79.10.0** Kit



DX-40U

AMATEUR TRANSMITTER
Model DX-40U. Covers 80-10 m. Power inputs 75 w. C.W., 60 w. peak C.C. phone. Output 40 w. to aerial. Prov. for V.F.O.
£33.19.0 Kit
Assembled £45.8.0

COMMUNICATIONS TYPE RECEIVER RG-1. A high performance low cost receiver for the discriminating listener. Freq.: cov. 600 kc/s-1.5 Mc/s and 1.7 Mc/s to 32 Mc/s. Send for details.
£53.0.0 Assembled **£39.16.0** Kit



Other kits in the amateur range include: **SSB Adaptor SB-10U, £39.5.0 Variable freq. Oscillator VF-1U, £10.17.6. Balun Coil Unit, B-1U, £4.15.6. Grid-Dip Meter GD-1U, £10.19.6. Q Multiplier QPM-1, £8.10.0.** Wide range of models under American Mail Order Scheme.

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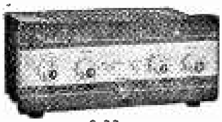
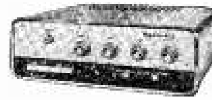
★ **You save money...** and get better performance at lowest possible cost.

HI-FI AMPLIFIERS



S-33

6W STEREO AMPLIFIER. Model S-33. 3 w/ch. Inputs for radio, tape and gram. Stereo/Mono, ganged controls. Sensitivity 200mV.
£18.18.0 Assembled **£13.7.6** Kit



18W STEREO AMPLIFIER. Model S-99. Ganged controls. Stereo/Mono gram, radio and tape recorder inputs. P/B selection.
£37.19.6 Assembled **£27.19.6** Kit

6W DE-LUXE STEREO AMPLIFIER. Model S-33H. An inexpensive stereo/mono amplifier with high sensitivity. Suitable for use with Decca Deram cartridge.
£21.7.6 Assembled **£15.17.6** Kit

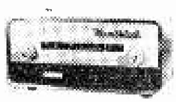
TAPE RECORD/REPLAY AMPLIFIER KITS. Will operate with most tape decks. Send for details.
TA-1M (Mono), £19.18.0 Kit **TA-1S** (Stereo), £25.10.0 Kit

5W HI-FI MONO AMPLIFIER. Model MA-5. A low priced amplifier based on the S-33. Printed circuit construction makes it easy to build
£15.10.0 Assembled **£10.19.6** Kit

HI-FI MONO POWER AMPLIFIER. Model MA-12. Ideal for use with Models USC-1 and UMC-1, 0.1% THD at 10 W. Wide freq. range.
£15.18.0 Assembled **£11.18.6** Kit

HI-FI TUNERS

Model FM-4U. Tuning range 88-108 Mc/s. Tuning unit (FMT-4U) with 10.7 Mc/s I.F. (£2.15.0 inc. P.T.). I.F. Amp. (FMA-4U) complete with cabinet and valves (£13.3.0).
Total **£15.18.0** Kit



FM-4U

AM/FM TUNER. Covers FM 88-108 Mc/s. A.M. 16-50, 200-550 900-2.000 m. Tuning heart (£4.13.6 inc. P.T.). and I.F. Amp (£21.16.6)
Send for leaflets. Total **£26.10.0** Kit

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American Catalogue sent for 1/- post paid.

PUBLIC ADDRESS AMPLIFIER, PA-1. 50 w. output. two heavy duty speakers, variable Tremolo. Ideal for use with guitars, etc.
£74.0.0 Assembled **£54.15.0** Kit
Legs optional extra 17/6. Set of 4.

50 W POWER AMPLIFIER, MA-50. Ideal for PA work, electronic organs etc.
£27.18.0 Assembled **£19.18.0** Kit

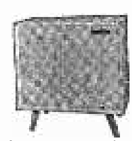
SPEAKER SYSTEMS

SSU-1 MODEL

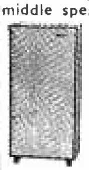
SSU-1

A practical solution to the problem of a moderately priced speaker suitable for Stereo/Mono amplifiers, where the equipment has to be compact. Two speakers, balance control, ducted port reflex cabinet.
Horizontal or vertical (without legs)
Inc. P.T. **£10.17.6** Kit
Horizontal or vertical (with matching legs)
Inc. P.T **£11.12.0** Kit

COTSWOLD STANDARD MODEL



Acoustically designed enclosure 'in the white' 26 x 23 x 15¼in. 12in. bass speaker, elliptical middle speaker, 2in. pressure unit. Covers 30-20,000 c/s.
Complete kit with all controls.



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SPEAKERS FOR YOUR OWN ENCLOSURE

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(both as used in the Cotswold systems)
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Two Speakers + Cross-over System. SCM-1.
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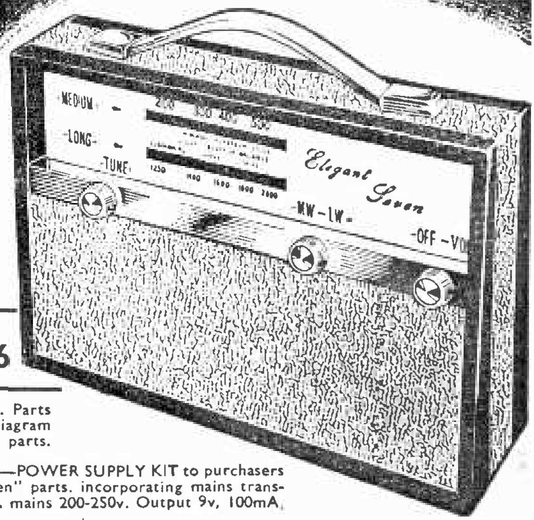

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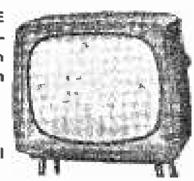

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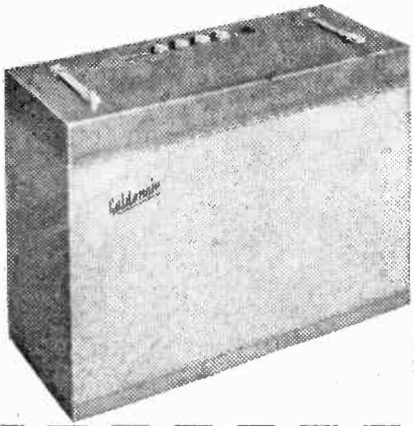
The Goldenair GROUP-MASTER 30 WATT GUITAR AMPLIFIER



A VERSATILE UNIT FOR INSTRUMENTALISTS AND VOCAL GROUPS

being suitable for clubs and public address

Ideal for bass, lead or rhythm guitar, and all other musical instruments.

- ★ The two 12 inch 25 watt heavy duty loudspeakers are specially designed for this type of amplifier, and give outstanding reproduction.
- ★ Robust attractive two-tone finished cabinet of compact size, 28" x 20" x 10½" fitted with carrying handles.
- ★ For standard AC mains 50 c/s operation.
- ★ Four inputs provided can be used simultaneously with instrument pickups or mikes.
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- ★ A polished black control panel is fitted to the amplifier with distinctively marked control indications set in gold relief.

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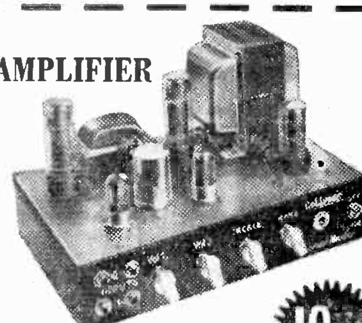
TWICE THE QUALITY AT HALF THE PRICE

Customers are invited to see and hear this amplifier at our shop premises in Lambert's Arcade. *Send S.A.E. for leaflet.*

42 GNS

or deposit of £4.12.0 and twelve monthly payments of £3.12.5.
Carriage and insurance 17/6 to be sent with deposit.

The Goldenair "THIRTY" HI-FI AMPLIFIER



A high quality 30 watt amplifier developed for use in large halls and clubs etc. Ideal for bass, lead or rhythm guitars, schools, dance halls, theatres and public address. Suitable for any type of mike or pickup.
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Send for leaflet of suitable loudspeakers that we can supply.

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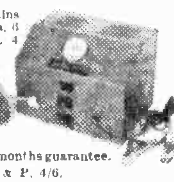

For all A.C. mains 200/250 v., 50 c/s. 6 and 12 volts at 4 amps. Fitted ammeter. Robust louvered steel case. Ready for use complete with leads and battery clips. 12 months guarantee.
Price 69/11. P. & P. 4/6.

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Suitable for guitars, record decks and microphone. Cabinet size approx. 13 x 18 x 7in. The cabinet is well made and attractively finished. Volume, bass and treble controls incorporated. Price **£9.19.6.** P. & P. 10/-. Only a few left.

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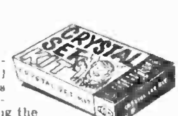

A wonderful educational kit for all children. Provides hours of amusement while following the easy step by step instructions.
It is powered entirely by wireless waves, eliminating the expense of batteries. No soldering required. Receives all main stations.
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SONA STREAMLINE MICROPHONE

Omni-directional response 60-10,000 c/s. Output level 52 dB. Built in on/off switch. Provision for conversion to hand-held, cord suspended or stand mike. Attractive satin chrome finish.

Microphone **37/6** P. & P. 1/9.
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Floor Stands Available.

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Housed in compact metal case. 200/250 v. A.C. mains. Output 250 v. 60 mA fully smoothed. 6.3 at 2 amps. Can be used for powering almost any pre-amp, or radio tuner. **Price 39/6.** P. & P. 2/6.

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Compactly built to be carried by one man. This has a range of app. 10 miles and being crystal controlled tuning is avoided and operation is as accurate as a telephone. Frequency 3.6-9.1 Mc/s. Complete stations comprising receiver/transmitter, rod aerial, One pair of headphones and microphones in canvas carrying bag. Crystal power pack available for authorised use only. 35/- per set. Price per station.

£4.10.0 P. & P. 10/- each.

Two stations for **£9.10.0** Post free.

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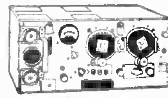
Price 7/6. P. & P. 9d.

SONA

Mains Powered No. 19 Short Wave Receiver



This mains powered short wave receiver has a built in mains power pack and requires only headphones for immediate operation.

£5.19.6 P. & P. 10/-.

Suitable headphone 15/-. P. & P. 2/6. During an evenings' testing on this excellent receiver, we obtained clear reception from scores of stations, many of them thousands of miles distant, including ship stations, Government transmission, maritime broadcasts and also the short wave radio Luxembourg broadcasts.

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Mat 100	7/9
Mat 101	8/6
Mat 120	7/9
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Above MAT's postage paid.
Ferrite Slab Aerials suitable for transistor sets 3/-. P. & P. 6d.

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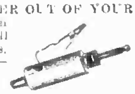
Enables you to determine value of resistor at a glance. A must for the constructor. Price 1/6. P. & P. 3d.

HI-FI GT50 RADIO JACK



MAKE A RADIO RECEIVER OUT OF YOUR AMPLIFIER. Full medium wave coverage. Ideal for all tape recorders, amplifiers, etc. No batteries required—just plug in. 29/-.

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Tested superhet circuits for short wave and communication receivers using MAT's. Price 6/-.
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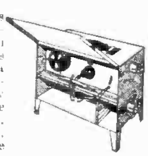
Special offer to P.W. readers, all four books for £1.1.0. Post free.

TEST SET TYPE 46



Will radiate a continuous note. Range 1,250 Mc's—23,000 Kc/s (12—24 Metres) 5 switched bands, contains VR21 valve and has a precision slow motion tuning unit enclosed in grey metal case, rod aerial base on side. Good condition. Power requirement 2 v., 90—120 v. Battery space provided. Due to large purchase reduced to only **2 gns.** P. & P. 6/6

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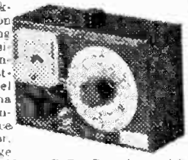

Designed for checking the radiation from a transmitting antenna. The sensitivity can be controlled by adjustment of the panel control, the antenna length, or by increasing distance from the radiator. Frequency range 1 to 250 Mc/s. 200mA D.C. Complete with instruction book. Post free. **67/6**

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Valuable unit comprising mains transformer, neon stabiliser etc., 50 c/s mains input 110 v. or 80 v. Stabilised output 130 v. D.C. and 6.3 v. A.C. Should make ideal battery eliminator. Price 29/6. P. & P. 5/-.

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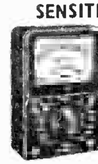
With standard spindle. 2/8 each. P. & P. 6d. 2 for 4/6. Post free.

LEAD ACID ACCUMULATORS (Unspillable)

2 volts at 16 A.H. Brand new. Size 4 x 7 x 2in. 4/11 each. 3 for 12/6. P. & P. 3/- per cell.

SENSITIVE MULTIMETER



20,000 ohm per volt. 1% resistance used throughout. Single control system for all ranges. Compact and lightweight. Highly accurate.

£5.10.0 P. & P. 3/-.

MAINS TRANSFORMER

TYPE 1. 230/250 v. 50 c/s primaries filament type. Secondary 6.3 v. at 2 amps. 6/11. P. & P. 2/-.
TYPE 2. 230/250 v. 50 c.s primaries. Secondary tapped as follows: 3 v., 4 v., 5 v., 6 v., 8 v., 9 v., 10 v., 12 v., 15 v., 18 v., 20 v., 24 v., 30 v. all at 4 amps. 39/6. P. & P. 3/6.
TYPE 3. 230/250 v. 50 c/s primaries. Secondary tapped as follows: 5 v., 11 v., 17 v., at 4 amps. 35/-. P. & P. 3/6.
TYPE 4. 450-0-450, 250 mA, 6.3 v. at 4 amps, 5 v. at 3 amps, fully shrouded upright mounting. 55/-. P. & P. 5/-.

VALVE SALE

All valves 2/6 each. P. & P. 9d. 2 for 4/6. P. & P. 6d. 6K7G, EF50, 6H6, DF92, 6K8G, EB34, 1L4.

NEW WALK ROUND STORE OPEN IN LAMBERT'S ARCADE, LOWER BRIGGATE, LEEDS 1, NEXT TO HALFORDS CYCLE SHOP. OPEN ALL DAY SATURDAY. 48 HOUR DESPATCH SERVICE.
ALL MAIL ORDERS TO OUR BRIGGATE HOUSE ADDRESS.
Postage rates apply to U.K. only

TERMS:
CASH WITH ORDER.
5/- EXTRA ON C.O.D. ORDERS
No C.O.D. under 30/-.

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TRADE SUPPLIED
ORDERS FROM ABROAD WELCOMED
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SONA ELECTRONIC CO. LTD. (Dept. PW11), BRIGGATE HSE, 13 ALBION PL, LEEDS

LASKY'S RADIO

Offer the Finest Value and HOME CONSTRUCTORS

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

THE SKYROVER & SKYROVER De Luxe

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

A simple additional circuit provides coverage of the 1100/1950 M. band (including 1500 M. Light programme). This is in addition to all existing Medium and Short wavebands. All necessary components with construction data **Only 10/- extra** Post Free
This conversion is suitable for both models that have already been constructed.

GENERAL SPECIFICATION:
7 transistor plus 2 diode superhet, 6 waveband portable receiver. Operating from four 1.5 v. torch batteries. The SKYROVER and SKYROVER DE LUXE cover the full Medium Waveband and Short Waveband 31-94 M. and also 4 separate switched band-spread ranges. 13M. 16M, 19M and 25M. with Band Spread Tuning for accurate Station Selection. The coil pack and tuning heart is completely factory assembled, wired and tested. The remaining assembly can be completed in under three hours from our easy to follow stage by stage instructions.
SPECIFICATION:
Superhet 470 Kc/s. All Mullard Transistors and Diode. Uses 4-U2 batteries. 5in. Ceramic Magnet P.M. Speaker Easy to read Dial Scale. Band Spread Tuning. 500 MW Output. Telescopic Aerial & Ferrite Rod Aerial.
WAVEBAND COVERAGE: 180-576M; 31-94M and Band Spread on 13, 16, 19 and 25 metre Bands.

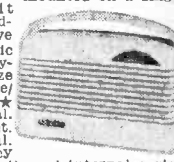
The SKYROVER

Controls: Waveband Selector, Volume Control with on/off Switch, Tuning Control. In plastic cabinet, size 10 x 6½ x 3½ in. with metal trim and carrying handle.
Can now be built for **£8.19.6** P. & P. 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 11½ x 6½ x 3in. 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: 25/- 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 "REALISTIC" Seven



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

An 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. 3/9. Data and instructions separately 2/6. Refunded if you purchase the parcel.

REALISTIC Seven DE LUXE

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 7½in. x 6in. Fitted auto. stop and start. New and perfect.
45 r.p.m. Model 49/6 P.& P. 2/6
2 speed model for 33 and 45 r.p.m. (as illustrated). **69/6** P. & P. 2/6

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: 0-50μA, 0-2.5-50-250 mA. Resistance: 0-2,000Ω, 0-200kΩ, 0-20MΩ. Basic movement: 40μA f.s.d. moving coil. With universal shunt full scale deflection current is 50μA. Size/finish: Black plastic case, 3¾ x 5¾ x 1½in. 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. sockets 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/-.

DEAC RECHARGEABLE NICKEL CADMIUM CELLS

Rating 1.22 v. 3.5 AH at 10 hour rate. 1001 uses for model makers, miniature equipment, portable radios, transistor radios, TV's, tape recs., trans receivers, photo flash etc. Hermetically sealed. Size 3¼ x 1¾ x 1½in. **Listed at 35/- each.**
LASKY'S PRICE 15/-
Post Free. Bank of 9 **79/6.**

TWO NEW SUPER MINIATURE POCKET RADIOS

THE SINCLAIR MICRO-6

Self-contained pocket radio Size only 1⅘ x 1³⁄₁₀ x ½in.
A marvel of modern miniaturisation—truly amazing performance. Without a doubt the most advanced transistor circuit ever offered to home constructors—yet may be built in an evening. Complete with earphone and detailed construction data. **Can be built for only 59/6**
Mercury cell 1/11 extra (2 required). All parts sold separately.

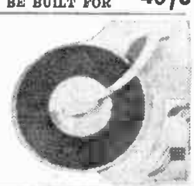
THE SINCLAIR SLIMLINE

The new 2-transistor pocket radio size only 2¾in. x 1¾ x 1½in.
Micro alloy transistorised and printed circuit. All components available separately
Easy to assemble. CAN BE BUILT FOR **49/6**

TRANSISTORISED TELEPHONE AMPLIFIER

Powerfully amplifies the incoming call. The pick-up is suction fixed to phone. Battery-operated at negligible cost. Fitted with on/off switch and vol. control. Size: 4½ x 3 x 1½in. Complete with PP3 battery. **LASKY'S PRICE 69/6.**
P. & P. 2/6.

E.M.I. 4-SPEED RECORD PLAYER



New, unused and individually boxed fitted with lightweight pick-up with ACOS G.P. 73/2 stereo cartridge. Cabinet space required 13½ x 12¼ x 4½in. 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 if desired a G.P. 67 LP/78 Mono cartridge will be supplied in lieu of the G.P.73 at no difference in cost.

LASKY'S PRICE 79/6 P. & P. 3/6 extra.

GUITAR PICK-UPS

CGM5 Crystal-high imp. Size only 1½ x ⅜ x ⅛in. Clips to finger board—no screws. Complete with cable.
LASKY'S PRICE 15/11. P. & P. 1/-.

CGM35. Fully adjustable pick-up position carrier. Simply fixed. Separate tone and volume control. Heavy chrome finish. Pick-up size 3¼ x 1½in., control size 2½ x 1½in. Complete with long lead and jack plug. **LASKY'S PRICE. 59/6** P. & P. 1/6

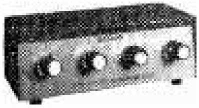
LASKY'S FOR D.I.Y. CONSTRUCTION BARGAINS

Service in Great Britain to both & HI-FI ENTHUSIASTS

LASKY'S RADIO

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

TRANSISTORISED MICRO-PHONE MIXER

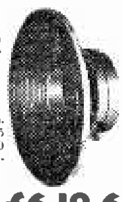


The Harrow will mix 4 high impedance channels: mikes, tape rec's, tuners, grams, etc. 9 v. battery operated. Neatly styled, size only 6 x 2½ x 2¼in. Standard jack sockets. Complete with PP3 batt. full circuit diagram and operating instructions.

Model TM4 Mono 59/6 P. & P. 2/6

Model SM5 Stereo 72/6 P. & P. 2/6

SPEAKERS SPECIAL OFFER



12in. FANE HEAVY DUTY DUAL CONE HI-FI SPEAKER

Type 122/17A—listed at 12 gns. Power handling 25 watts—15 ohms imp. Flux density 17,000 gauss. Special Anisotropic magnet. Limited stock.

LASKY'S PRICE £6.19.6 P. & P. 5/-

TYPE 8CX1 8in. HI-FI SPEAKER—(IMPORTED) Power handling 10 watts—15 ohms impedance.
LASKY'S PRICE 6 Gns. P. & P. 5/-

THE HARROW CV1 VARIABLE CROSSOVER

Gives variable volume control of Woofer and Tweeter. Strong metal construction. Size 4 x 2¾ x 1¼in. Screw tag connections.
LASKY'S PRICE 22/6 P. & P. 1/6

NOW IN STOCK THE NEW STUDIO RANGE OF CELESTION HI-FI SPEAKERS

"HARROW" POWER PACK

Battery eliminator—converts your battery portable to A.C. mains. Replaces 6 v., 4½ v. or 9 v. batteries. State voltage required when ordering. Size only 3 x 2 x 2½in.
LASKY'S PRICE 29/6 P. & P. 1/6

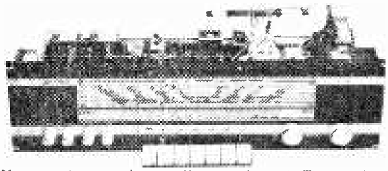
LAFAYETTE TAPE

Famous American Brand—Fully Guaranteed

5in. Double play, 1,200ft., Mylar base....	15	0
5in. Long play, 900ft., Acetate base......	10	0
5in. Standard play, 600ft., P.V.C. base....	8	6
5¾in. Long play, 1,200ft., Mylar base......	15	0
5¾in. Double play, 1,800ft., Mylar base....	22	6
5¾in. Long play, 1,200ft., Acetate base....	12	6
5¾in. Standard play 850ft., P.V.C. base..	11	6
7in. Standard play, 1,200ft., Mylar base..	12	6
7in. Long play, 1,800ft., Mylar base......	19	6
7in. Double play, 2,400ft., Mylar base....	25	0
7in. Long play, 1,800ft., Acetate base....	15	0
3in. Message tape, 150ft..................	3	6
3in. Message tape, 225ft..................	4	11
3in. Message tape, 300ft..................	7	6
3in. Triple play, 450ft. Mylar base	12	6
4in. Triple play, 900ft., Mylar base......	22	6
5in. Triple play, 1,800ft., Mylar base......	42	6
5¾in. Triple play, 2,400ft. Mylar base....	55	0
7in. Triple play, 3,600ft., Mylar base......	75	0

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

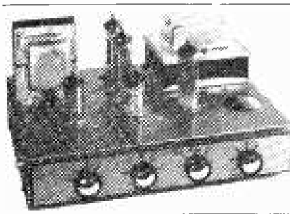
THE NEW "KUBA" CONTINENTAL AM/FM STEREO RADIOGRAM CHASSIS



Long, medium and short waveband coverage plus VHF/FM. Piano key wavechange. Separate flywheel tuning on AM and FM. Bass, treble and balance controls. Magic-eye tuning indicator. Ferrite rod aerial. The very latest printed circuitry. Provision for multiplex adaptor. 5 valves—line up: ECC85, ECH801, ECC83, ELL80, EAF801. Full vision tuning scale size 21 x 6in. Overall dimensions: 21 x 6¾ x 8in. Made to the very highest standards.

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

THE BH-14 HI-FI MONO 14 WATT AMPLIFIER KIT

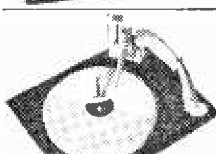


High quality 14 watt power amplifier with bass and treble controls and separate volume controls on each input. Inputs: 1—5 m/v: 2—40 m/v. Output impedance 3 or 15 ohms. 5 valves—Line-up: 2 x EL84, 1 x EF86, ECC83 and EZ81. Frequency response 15 c/s—20 Kc/s. Ideal for the discerning hi-fi enthusiast or for guitar amplifier. Gold hammer finish with distinctive Perspex front panel. Complete kit of parts with detailed construction data.

LASKY'S PRICE 9 GNS. P. & P. 7/6. Instruction book avail. sep. 1/6.

AVAILABLE READY BUILT AND TESTED. LASKY'S PRICE 11 GNS. P. & P. 7/6.

AUTOCHANGER SCOOP!!!



LASKY'S CAN NOW OFFER B.S.R. AUTOCHANGERS AT LOWEST EVER PRICES

All brand new and fully guaranteed—complete with cartridge and stylus.

UA14 4 speed, mains	£3.19.6
UA16 4 speed, mains	£4.19.6
UA14 4 speed, 9 v. battery operated.....................	£5.19.6
UA20 4 speed, mains	£5.19.6

Add 5/- carriage and packing on each.

IT'S FABULOUS!! THE TRANSISTOGRAM

A portable battery operated fully transistorised Record Player for the music of your choice - any time and place! Made by famous British manufacturer, fully guaranteed. Size only 6¼ x 12 x 10½in., weight 10 lbs. Operates on 6 U2 torch batteries. 4 speeds—16⅔, 33⅓, 45 and 78 r.p.m. Goldring Sygnet record player unit with lightweight pick-up fitted with CM-60 turnover ceramic cartridge. Output 500 mw to 5in. ceramic magnet loudspeaker, fitted into lid for maximum sound distribution. Cabinet constructed of wood, covered in two tone (pale blue-grey) leathercloth. Fitted carrying handle and strong lid catches. High quality amplifier with tone and volume controls gives excellent reproduction at all speeds. Plays 7, 10 and 12in. records. Today's value 12 Gns.

LASKY'S PRICE £6.19.6 Carriage & Insurance 7/6. New, boxed and guaranteed—ex. batts.

CRYSTAL PICK-UP CARTRIDGES *LOWEST EVER PRICES!*

All complete with Stylii L.P. and Standard (and Stereo where shown) fully guaranteed. Standard Fitting will fit most P.U. Arms and Heads. Postage 1/- each extra.

STEREO

Acostereo 73/1, 2 sapphires..............	25	0
Acostereo 73/2, Diamond LP/Stereo and sapphire std........................	29	6
Ronette Stereo O.V. Turnover, 2 sapphires	25	0
Ronette Stereo type 105 and 106, 2 sapphires	25	0
Ronette Stereo type 105 and 106 Diamond LP/Stereo and sapphire Std...........	35	0

MONO

Garrard Magnetic T.O.M.2..................	15	0
Acos GP.59	14	0
Acos GP.65/3..............................	15	0
Acos GP.65/1..............................	17	0
Acos GP.67/1..............................	14	0

AND EVEN LOWER PRICES!

Mono C.T.1	4	11
Collaro Type C, stereo, 2 sapphires........	15	0
Collel S.C.1. Diamond LP Stereo	17	6
Sonotone 8T, stereo, 2 sapphires	19	11
Sonotone 2TA, mono, 2 sapphires	15	0

Postage 1/- each extra.

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BOTH OPEN ALL DAY SAT. Early Closing Thurs. Mail Orders to Dept. P.W., Edgware Rd.
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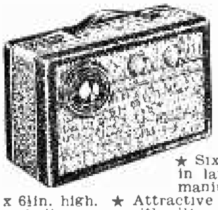
LASKY'S FOR SPEEDY MAIL ORDER SERVICE

STERN-CLYNE

Electronics Centres throughout Great Britain

THE "AIR KING"

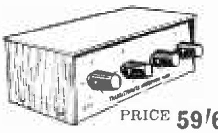


Our highly successful six-transistor luxury portable with the "SLIM LINE" look. To build yourself, with printed circuit chassis for reliability and simplicity in construction. May be used as Car Radio with full MEDIUM wave and LONG wave coverage.
Look at these features:
★ 500 milliwatt output to high flux 7 x 3½in. high fidelity loudspeaker ★ Six selected MULLARD TRANSISTORS in latest supersensitive circuit plus germanium diode. ★ Compact size only 9½ x 3¾ x 6½in. high. ★ Attractive three-tone cabinet, black, dark grey and silver grey with gilt control knobs and all gilt fittings. ★ Coax. socket for car aerial. ★ Brand new guaranteed components. ★ Push-pull output. ★ Automatic volume control. ★ Long-life battery. ★ Super-sensitive internal Ferrite rod aerial. Special inclusive price for all required components. ONLY **£7.19.6** (Plus P. & P. 4/-).
Alignment service available. Full assembly details and individually priced parts lists, all of which are available separately price 1/6 post free.

NOW AVAILABLE!! MAINS UNIT

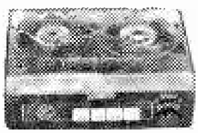
To replace PP11 4½ x 4½ volt battery as used in our "AIR-KING" Receiver described above. Size 2¾in. x 2¼in. x 2in. (fits into battery compartment). A.C. mains 200/250 v. operation. Complete with mains lead. Also suitable for any other receiver using same type battery. **PRICE** 29/6. P. & P. 2/-.

TRANSISTORISED SOUND MIXER



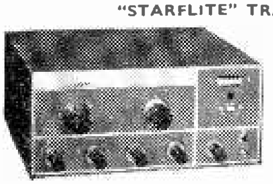
Mixing 4 channels from high impedance source, giving professional results. Inputs for high impedance Microphone, Tuner, Gram and/or Tape Recorder. Compact and beautifully styled, size 6" x 2¼" x 2¼". Standard Jack socket inputs.
PRICE **59/6** P.&P. 2/6 including PP3 battery circuit, diagram and instructions.
Stereo version available. 72/6. P. & P. 2/6.

POCKETCORDER TRANSISTORISED RECORDER



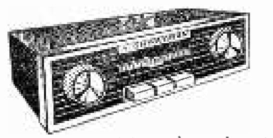
Why be bothered with a notepad? Take Pocketcorder with you on those business trips. the mighty Midget is ideal. Simple to operate. a unique 4-way push-button Switch for record/playback, etc., and remote control switch built into microphone ensures complete ease of handling. Fully adjustable speed through the life of Batteries and the volume and tone from the 2½" internal speaker is outstanding. All accessories included such as Leather Case, Accessory Case, Crystal Earpiece, Tape, Batteries and Microphone. no other extras required. Up to 34 mins. recording time. operates on 1-9 volt PP3 and 2-1½ volt U12 Pen Batteries. Size 5½ x 4 x 2in. Weight 24ozs. PRICE **12 Gns.** P. & P. 4/-.
Spare 2½" empty spools, 1/-; Spare 2½" 200ft. L.P. Tape, 5/-.

"STARFLITE" TRANSMITTER



Designed to meet the needs of most amateurs the Starflite has single-knob bandswitching, 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 13½in. wide x 12in. deep (inc. knobs) x 6½in. high (inc. rubber feet). Weight 28lb. Power requirements. 200/240 v. 50/60 c.p.s. 225 watts.
MAY BE BUILT FOR 35 Gns. Carriage & Insurance 15/-

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 Mullard transistors plus valves types EBF83 and ECH83. ★ No Buzz, high output and sensitivity. ★ Printed circuit (latest type), 7 x 4in. high flux p.m. speaker and baffle. ★ Medium and Long Waves. ★ Push button for fingertip control. ★ Extremely low battery consumption (less than ½-amp). ★ Easy to fit any make car (Positive earth only). ★ 12-volt operation. ★ Compact size, measures only 7 x 7 x 2in. 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, 2"/43", 29/6, both plus P. & P. 2/6 if purchased separately.

P.W. AUTOCRAT CAR RADIO

ALL REQUIRED COMPONENTS AS SHOWN ON BLUEPRINT AVAILABLE FROM STOCK AT ALL BRANCHES

Component price list available on request.

SPECIAL OFFER!

GARRARD MAGAZINE TAPE DECK

Suitable for use on 200/250 v. A.C mains.
2-Track **£5.19.6** 4-Track **£6.19.6** P. & P. 5/- each.
Magazine complete with 600ft. D.P. Tape, 32/- extra.

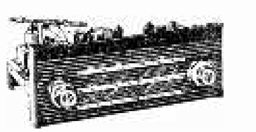
RECORD PLAYERS

GARRARD Model SRP10. Single Record Player fitted with high output crystal pick-up. £5.9.1.
THE NEW GARRARD "AUTOSLIM" 4-speed Autochanger with crystal pick-up. £6.10.0.
GARRARD "AUTOSLIM DE LUXE" 4-speed Autochanger, incorporates transcription Pick-up Arm. £11.3.0.
B.S.R. Model UA14, a 4-speed Mixer Autochanger with crystal pick-up. £5.19.6.
The new GARRARD Model 4HF high Quality Single Record Player fitted with the latest T.P.A. 12 pick-up arm and G.C.S. crystal Cartridge. £16.17.6.
PHILIPS Model AG1016. A 4-speed Player which can be operated both manually and automatically. Suitable for Mono or Stereo operation. £12.12.0. Carriage and insurance on each above 5/- extra.

ACOS MONAURAL STETHOSCOPE HEADSETS

Suitable for Tape Recorders. or monitoring tape recorders. 100 ohm impedance magnetic. Complete with lead. (Originally 21/-). OUR PRICE **12/6** P. & P. 1/6.

CHASSIS BARGAIN



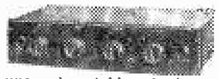
A 6 valve Superhet Radiogram Chassis of outstanding quality covering MW 200/550 Metres. LW 1200-2000 Metres. VHF 87-100 Mc/s.
Incorporating internal Ferrite Rod Aerial and the famous Gorler Tuning Heart for VHF Pick-up input suitable for most modern Record Players. Power output 4 watts, valve line up EZ80, EABC80, EF89, ECH71, EL84, ECC85. Volume On/Off and Tone Control, attractive black Tuning Dial size 15 x 6in. with gold lettering and contrasting cream and gold knobs. A.C. 200/250 v. Size 15 x 7½ x 6½in.
PRICE 16 Gns. P. & P. 5/-. Or £3.9.0 deposit (plus P. & P.) and 9 monthly payments of 32/8.

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** 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 11¼ x 4¾ x 4¼.
KIT OF PARTS **£10.0.0** (Carr. & Ins. 5/-). ASSEMBLED & TESTED **£13.13.0**
Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.

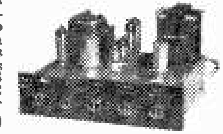
MULLARD "5-10" MAIN AMPLIFIER

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 2/- 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). With PARTRIDGE OUTPUT TRANS. £1.6.0 ex.
Instruction book and detailed price list (free with kit) avaiable separately at 2/- Post Free.

THE MULLARD 3-3RC

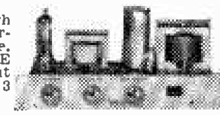
A HIGH QUALITY AMPLIFIER DEVELOPED FROM THE VERY POPULAR 3-WATT MULLARD "3-3" DESIGN.
KIT OF PARTS **£8.8.0**
ASSEMBLED AND TESTED **£11.10.0** (Carr. & Ins. 6/6).
Complete to the MULLARD specification including PARMEKO OUTPUT TRANSFORMER. Switched inputs for 78 and L.P. records plus a Radio position. 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"

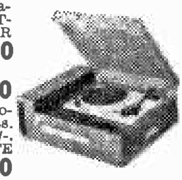
Suitable for most ½ track, Mono Tape Decks. Incorporates Ferrox-cube Push-Pull Oscillator. Treble Inductor and 3-sp. Equalisation. Includes separate Power Unit.
KIT OF PARTS **£14.0.0** (Carr. & Ins. 7/6). ASSEMBLED **£19.10.0**
Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.

SEE PRECEDING PAGE FOR OTHER STERN-CLYNE PRODUCTS

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.

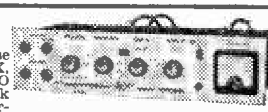


Perfectly suited for Portable Installations for which purposes we offer PORTABLE CASE (£3.10.0), the AMPLIFIER (Kit £4.10.0) and 8" x 5" SPEAKER (£1.0.0). All for **£9.0.0**
Alternatively with ASSEMBLED AMPLIFIER (Carr. & Ins. 5/-). **£10.0.0**
The Case quoted above will accommodate some 4-speed Single 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 1⅞in., 3¾in. and 7½in. speeds. Complete with microphones and 1,200ft. tape.
KIT OF PARTS **£33.0.0**
ASSEMBLED AND TESTED **£43.0.0**
(Carr. & Ins. 15/- extra).

STEREO TAPE PRE-AMPLIFIER



MODEL STP-1. For use with current TRUVOX, BRENELL or COLLARO "STUDIO" ½ and ¼ track Stereo Decks. Incorporates Ferrox-cube 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 ½ track Mono Tape Decks. Incorporates Ferrox-cube 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, Brenell Mk.5 Series II, also the Wearite. Specimen prices as below.

	Kit	Assembled
STP-1 Pre-amp with Collaro Studio Tape Deck......	£36. 0.0	£42. 0.0
Assembled with track switch fitted, £44.2.0		
STP-1 with Brenell Mk. 5 Series II with Track Switch fitted	£68. 4.0	
STP-1 with Brenell Mk. 5 Series II, ¼ 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 Brenell Mk. 5 Series II Deck	£46.11.0	£53. 1.0
Assembled with deck wired and matched, £55.8.0		
HF/TR3 with Collaro Studio Tape Deck...........	£24. 8.0	£29.10.0
Assembled with deck wired and matched, £31.12.0		
HF/TR3 with Brenell Mk. 5 Series II Deck..........	£46. 4.0	£51.11.0
Assembled with deck wired and matched, £53.13.0.		

Carr. & Ins. 15/- on above units. Send S.A.E. for comprehensive price list.

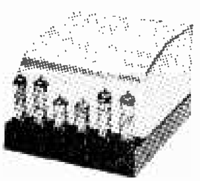
SEND FOR CURRENT PRICE LIST OF ALL LEADING RECORDING TAPES AND ACCESSORIES

STERN-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 VHF/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. 100 mV output mains supply 105/240 A.C. Valve line-up: ECC35, ECH81, EBF89, 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 100 mV from 90 K ohm source inputs—Microphone 5 mV. Tape 5.3 mV. R.I.A.A. 4.3 mV flat 250 mV. Tuner 100 mV. Valve line-up: 2—EF86. 4—ECC83. **Power Amplifier.**—12 watts per channel, sensitivity 1 volt r.m.s. for 14 watts output, frequency response ±0.5dB 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. & I. 7/6
READY BUILT **£13.13.0**

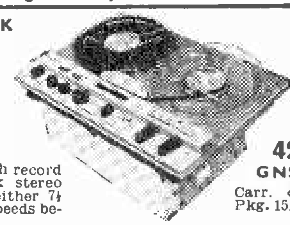
★ DOUBLE FEATURE PRE-AMPLIFIER

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 ferrox-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. & I. 5/-
PRICES: If both above units are purchased together:
KIT OF PARTS **£23.13.0** READY BUILT **£32.0.0** C. & I. 10/-

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

STEREO TAPE-DECK WITH BUILT-IN PRE-AMPLIFIER



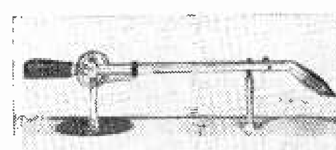
42 GNS Carr. & Pkg. 15/-

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 ¼ track stereo or ¼ track mono at either 7½ i.p.s. or 3¾ i.p.s. both speeds being fully equalised.

Features: Track System: ¼ track 2 channels stereo or monaural record and playback. Independent single channel recording on either channel while playback on other channel. Head Type: ¼ 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 7½in. tape speed Separation: 45dB or more between stereo channels. Frequency Response: 40 to 15,000 cycles per sec. at 7½ i.p.s., 40 to 9,000 cycles per sec. at 3¾ i.p.s. Single Motor: 4 pole heavy duty induction type. Power Supply: 240 v. A.C. 50 cycles. Size 6¼ x 10¼ x 15 in. Tape Size: Up to 7in. Line up: 4—2SB173 Transistors, 2-12AT7, 1—1AU7, 1—12BH7 Valves.

OUTSTANDING PRICE REDUCTIONS

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 10¾in. from tip of Cartridge. Height 2¾in.
Stereo/Mono Cartridge.
Frequency Response: +2.5dB from 30 c.p.s. to 15 Kc/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 **9½ Gns.** Plus 3/6 P. & P.

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

OA2	4/6	6BW6	6/9	6X5	4/6	20P5	12/3	ACHLDD	8/-	EABC8	5/6	EL37	12/3	KTZ41	5/6	QS150/15	9/6	U50	4/6	AF125	10/6
OB2	6/-	6BW7	5/-	6Y6G	6/-	25A6G	7/6	AC/PEN		EAC91	3/3	EL41	7/3	L63	3/-	R12	5/6	U52	4/6	AF126	10/-
OZ4GT	4/3	6BX6	3/9	6Z4	5/-	25L6	4/9	(5)	17/6	EAF42	7/6	EL42	7/6	LN152	6/-	R16	29/-	U76	4/6	AF127	9/6
1A3	2/6	6C4	2/3	7A7	12/6	25U4GT	16/2	AC/PEN		EB34	1/-	EL81	8/3	LN309	7/9	R17	17/6	U78	3/9	BYZ13	11/6
1A5	5/-	6C5	4/-	7B6	12/6	25Y5	7/9	(7)	17/-	EB41	4/9	EL83	6/9	LN319	8/6	R18	9/6	U84	10/6	GD3	5/6
1A7GT	7/9	6C6	3/-	7B7	7/-	25Y5G	7/9	AC/SG	22/6	EB91	2/3	EL84	4/6	LZ319	5/6	R19	6/6	U101	19/6	GD6	5/6
1C1	4/-	6C8	3/-	7C5	7/3	25Z4G	6/6	AC/SG/VM		EBC3	20/6	EL85	7/6	LZ329	5/6	R52	9/-	U107	17/6	GD14	10/-
1C2	6/9	6C9	10/9	7C6	6/9	25Z5	7/3		12/-	EBC33	8/6	EL86	7/3	LP2	9/6	RG1/240A		U191	9/6	GET102	8/6
1C3	6/3	6C10	7/6	7D3	15/-	25Z6GT	8/-	ACTH1	15/-	EBC41	6/6	EL91	2/6	ME41	13/-		54/-	U251	9/-	GET103	7/-
1C5	5/-	6C12	6/-	7D5	15/-	27SU	23/3	AC/TP	18/-	EBC81	5/9	EL95	5/6	ME91	12/6	RK34	7/6	U281	8/9	GET104	10/-
1C6	10/6	6C17	12/6	7D6	14/6	28D7	6/9	AC/VP1	12/-	EBC90	3/9	EL360	27/-	MH4	3/6	S130	22/6	U282	12/3	GET106	17/6
1D5	6/6	6CD6G	18/-	7D8	15/-	30C1	5/6	AC/VP2	20/5	EBC91	5/6	EL820	16/4	MHD4	7/6	SP4B	19/6	U301	11/3	GET111	12/-
1D6	9/6	6CH6	5/-	7H7	5/9	30C15	9/-	ATP4	2/3	EBF80	5/6	EL822	18/6	MHLD6	12/6	SP13C	12/6	U329	9/-	GET113	6/9
1F1	5/9	6CW4	24/-	7R7	12/6	30C18	10/6	AZ1	5/9	EBF83	7/3	ELL80	20/5	ML6	5/9	SP41	2/-	U339	9/6	GET114	6/6
1F2	2/3	6D1	1/6	7S7	14/6	30F5	5/9	AZ31	6/6	EBF89	6/3	EM4	17/9	MS4B	20/5	SP42	12/6	U403	9/9	GET872	10/-
1F3	2/3	6D3	9/6	7Y4	5/-	30FL1	9/3	AZ41	6/6	EBL21	10/6	EM34	11/6	MSP4	12/-	SP61	2/-	U404	6/-	GET873	9/3
1FD1	5/9	6D6	3/-	8D2	2/6	30L1	5/6	B36	4/9	EC52	4/3	EM35	12/-	MU12/14	4/6	SU25	27/2	U801	16/3	GET874	9/6
1FD9	3/6	6E5	9/6	9BW6	9/6	30L15	9/3	B319	5/6	EC53	12/6	EM71	13/6	MX40	8/9	SU61	5/6	U4020	6/6	GEX35	3/-
1G6	6/-	6F1	9/6	9D2	3/-	30P4	12/3	BL63	10/6	EC54	6/-	EM80	6/3	N37	23/3	T41	9/-	VMP4G	11/9	GEX36	10/-
1H5GT	7/9	6F5	5/3	9D7	7/6	30P12	7/6	C1	12/6	EC70	4/9	EM81	7/-	N78	26/-	TDD2	12/6	VMS4B	12/-	GEX45	6/6
1L4	2/3	6F6G	3/9	10C1	8/9	30P16	6/-	C1C	12/6	EC90	2/3	EM84	6/9	N108	26/2	TDD4	7/6	VP2	3/6	GEX64	11/6
1LA6	16/10	6F6GT	7/6	10C2	12/3	30P19	12/3	CCH35	12/6	EC91	3/-	EM85	8/9	N339	15/-	TH4B	15/-	VP2B	9/6	GEX66	15/-
1LD5	4/-	6F8	5/-	10D1	7/-	30PL1	8/6	CK506	6/6	EC92	6/6	EM87	7/6	P41	3/6	TH21C	10/6	VP4	14/6	MAT100	7/9
1LN5	4/6	6F11	17/9	10D2	11/8	30PL13	9/6	CL4	19/6	ECC31	7/3	EN31	10/-	P61	2/6	TH30C	14/6	VP4A	14/6	MAT101	3/6
1N5GT	8/6	6F12	3/-	10F1	10/-	30PL14	12/6	CL33	11/6	ECC32	4/-	EN91	5/6	PABC80	6/9	TH233	6/9	VP4B	20/5	MAT120	7/9
1P1	5/9	6F13	4/9	10F9	9/9	35A5	14/6	CV6	2/6	ECC34	21/7	EY51	5/6	PC86	10/3	TP22	5/-	VP13C	7/-	MAT121	8/6
1P10	4/6	6F14	23/3	10F18	9/9	35L6GT	6/9	CV63	10/6	ECC35	5/-	EY81	7/3	PC88	14/7	TP25	5/-	VP23	2/6	OA5	6/-
1P11	5/3	6F15	6/9	10LD3	6/3	35W4	4/9	CV85	14/6	ECC40	7/-	EY83	9/3	PC95	11/8	TP2620	17/6	VP41	5/-	OA10	6/6
1R5	4/-	6F16	6/9	10LD11	9/6	35Z3	14/6	CV271	12/6	ECC81	3/6	EY84	9/6	PC97	7/3	TY86F	11/8	VP133	9/9	OA70	3/-
1S4	5/-	6F17	12/6	10P13	8/3	35Z4GT	4/6	CY1	16/4	ECC82	4/6	EY86	5/6	PCC84	5/6	UABC80	5/-	VR75	21/-	OA73	3/-
1S5	3/6	6F18	13/5	10P14	11/6	35Z5GT	5/9	CY1C	6/6	ECC83	4/6	EY88	8/9	PCC85	6/9	UAF42	7/-	VR105	5/6	OA79	3/-
1T2	29/-	6F19	4/6	11D3	17/6	39	2/6	CY31	5/9	ECC84	5/6	EY91	3/-	PCC88	10/6	UB41	10/6	VR150	4/9	OA81	3/-
1T4	2/3	6F23	6/3	11D5	17/6	40SUA	6/6	D1	1/3	ECC85	5/9	EZ35	4/6	PCC89	7/9	UBC41	6/3	VT61A	7/-	OA85	3/-
1U4	5/6	6F24	9/6	11E1	15/-	41STH	15/-	D15	13/6	ECC88	8/9	EZ40	5/3	PCC189	10/6	UBC81	6/3	VT501	3/-	OA86	4/-
1U5	5/3	6F26	5/-	11E3	17/-	42	5/-	D42	10/6	ECC189	11/6	EZ41	6/-	PCF80	5/6	UBF80	5/9	VU111	5/-	OA90	3/-
2A7	12/6	6F32	3/-	12A6	2/3	43	10/-	D63	5/-	ECC804	16/4	EZ80	3/9	PCF82	6/3	UBF89	6/9	VU120	10/-	OA91	3/-
2C26	2/9	6F33	3/6	12A8	16/6	45Z6	15/-	D77	2/3	ECC807	15/-	EZ81	4/-	PCF84	8/6	UBL21	10/9	VU120A	10/-	OA95	3/6
2D13C	7/-	6G6	2/6	12AC6	8/6	50A5	21/10	DAC32	7/9	ECF80	6/-	EZ90	3/9	PCF86	7/9	UC92	6/3	VU133	7/-	OA210	9/6
2D21	5/6	6H6	1/6	12AD6	9/6	50B5	6/6	DAF91	3/6	ECF82	6/3	FC4	8/9	PCF805	10/6	UCC84	8/9	W21	5/-	OA211	13/6
2P	23/3	6J5G	3/-	12AE6	8/-	50C5	6/6	DAF96	5/9	ECF86	11/6	FC13	14/6	PCL82	6/3	UCC85	5/6	W42	20/5	OC16W	35/-
2X2	3/-	6J5GT	4/3	12AH7	5/-	50CD6G	40/9	DCC90	6/9	ECF804	24/-	FC13C	17/-	PCL83	7/9	UCF80	8/9	W61M	24/6	OC22	23/-
3A4	3/9	6J6	3/-	12AH8	10/9	50L6GT	6/3	DD4	12/6	ECH3	23/6	FW4/500	6/6	PCL84	7/-	UCH21	8/3	W63	10/6	OC23	57/-
3A5	6/9	6J7G	4/6	12AT6	4/6	52KU	14/6	DD41	10/6	ECH21	9/-	FW4/800	8/6	PCL85	7/6	UCH42	7/-	W76	3/6	OC25	12/-
3B7	5/-	6J7GT	7/-	12AT7	3/6	53KU	14/6	DDT4	8/-	ECH33	22/8	GT1C	9/9	PCL86	8/9	UCH81	6/6	W77	2/6	OC26	25/-
3D6	3/9	6J8	12/6	12AU6	5/9	72	6/6	DET25	7/6	ECH35	6/3	GU50	55/-	PCL88	12/6	UCL82	7/9	W81M	5/9	OC28	24/6
3Q4	5/3	6K6GT	5/6	12AU7	4/6	77	5/-	DF33	8/6	ECH42	7/6	GZ30	7/-	PEN4DD		UCL83	8/6	W101	26/2	OC29	25/6
3Q5GT	7/-	6K7G	1/3	12AV6	6/6	78	4/9	DF66	15/-	ECH81	5/9	GZ32	7/6		25/-	UF41	6/9	W107	10/6	OC35	18/-
3S4	4/6	6K7GT	4/-	12AX7	4/6	80	5/3	DF72	30/-	ECH83	6/6	GZ33	17/6	PEN40DD		UF42	4/9	W729	17/6	OC36	21/6
3V4	5/3	6K8G	3/3	12AY7	9/9	83	22/6	DF91	2/3	ECH84	9/6	GZ34	10/-		34/-	UF80	6/3	X14	7/9	OC41	8/-
4D1	3/9	6K8GT	7/9	12BA6	5/9	83V	8/-	DF96	5/9	ECL80	6/-	GZ37	14/6	PEN45	7/-	UF85	6/9	X18	6/9	OC42	5/-
5R4GY	8/6	6K25	24/-	12BE6	4/9	85A2	6/6	DF97	10/-	ECL82	6/3	H30	5/-	PEN45DD		UF86	9/-	X24	16/6	OC43	12/6
5T4	7/-	6L1	10/-	12BH7	6/-	90AG	67/6	DH30	15/6	ECL83	9/6	H63	6/9		12/-	UF89	6/-	X41	15/-	OC44	8/3
5U4G	4/6	6L6G	6/6	12E1	16/9	90AV	67/6	DH63	4/-	ECL86	8/9	HABC80	9/3	PEN46	4/3	UL41	6/9	X61	6/3	OC44PM	11/-
5V4G	7/6	6L6M	9/-	12H6GT	1/6	90CG	42/-	DH76	3/6	ECLL800		HL2	7/6	PEN383	10/3	UL44	23/3	X63	5/9	OC45	8/-
5Y3GT	4/3	6L7GT	4/6	12J5GT	2/6	90CV	42/-	DH77	3/9		26/2	HL13C	4/-	PEN453DD		UL46	8/6	X64	4/6	OC45PM	10/-
5Y4	9/6	6L17	12/6	12J7GT	7/3	90C1	16/-	DH81	23/3	EF6	20/6	HL23	11/6		10/-	UL84	6/-	X65	5/6	OC65	22/6
5Z3	7/-	6L18	10/-	12K5	10/-	150B2	16/6	DH101	25/-	EF9	20/6	HL23DD	5/-	PENA4	7/-	UM4	15/2	X66	7/3	OC66	25/-
5Z4	7/-	6L19	9/9	12K7GT	3/6	150C2	4/6	DH107	16/11	EF22	6/6	HL41	3/9	PENB4		UM34	16/10	X76M	9/-	OC70	6/6
6/30L2	8/3	6LD3	6/6	12K8GT	9/-	161	13/-	DK32	7/9	EF36	3/3	HL41DD	8/6		23/11	UM80	8/3	X78	20/6	OC71	3/6
6A8G	5/9	6LD13	7/-	12Q7GT	3/6	185BT	34/11	DK40	15/6	EF37A	6/-	HL42DD	8/6	PEN/DD		UR1C	6/6	X79	27/-	OC72	8/-
6AB7	4/-	6LD20	5/6	12SA7	6/9	2158G	6/6	DK91	4/-	EF39	3/9	HL133DD		4020	17/6	UU5	7/-	X81M	29/1	OC73	16/-
6AC7	3/-	6N7GT	5/-	12SC7	4/-	220B	10/6	DK92	6/9	EF40	8/9		9/6	PL33	9/-	UU6	9/-	X101	23/6	OC74	8/-
6AG5	2/6	6P1	9/3	12SG7	3/-	301	20/-	DK96	6/3	EF41	6/9	HN309	25/-	PL36	8/-	UU7	7/6	X109	20/-	OC75	8/-
6AG7	5/9	6P25	6/9	12SH7	3/-	302	10/6	DL33	7/-	EF42	4/9	HVR2	8/3	PL38	16/-	UU8	11/6	X118	9/3	OC76	8/6
6AJ5	8/6	6P26	9/-	12SJ7	5/-	303	15/-	DL35	5/-	EF50	2/6	HVR2A	8/9	PL81	6/9	UU9	5/3	X119	6/6	OC77	12/-
6AK5	4/9	6P28	11/6	12SK7	3/-	304	15/-	DL63	5/3	EF54	3/-	IW3	5/6	PL82	5/3	UU12	4/-	X142	7/-	OC78	8/-
6AK6	12/6	6Q7G	4/-	12SQ7	8/-	305	13/-	DL68	15/-	EF73	5/-	IW4/350	5/6	PL83	5/3	UY1N	10/3	Y63	5/-	OC81	4/-
6AK8	5/6	6Q7GT	7/9	12SR7	5/-	306	13/-	DL72	15/-	EF80	3/9	IW4/500	6/-	PL84	5/-	UY21	7/3	Y65	5/-	OC81D	4/-
6AL5	2/3	6R7G	5/3	12U5G	7/-	866A	12/6	DL75	30/-	EF83	9/9	KBC32	20/5	PL500	15/9	UY41	4/6	Z63	4/6	OC81M	8/-
6AM5	2/6	6R7GT	11/-	12Y4	2/-	1622	12/6	DL92	4/6	EF85	4/6	KF35	12/6	PM84	9/3	UY85	5/-	Z66	7/3	OC82	10/-
6AM6	3/-	6SA7	5/9	13D1	5/-	4033	15/-	DL94	5/3	EF86	6/-	KL35	11/6	PT15	10/-	U10	9/-	Z77	3/-	OC83	6/-
6AQ5	5/9	6SC7	4/9	13D3	5/6	4687	71/-	DL95	6/3	EF89	4/-	KLL32	21/7	PX4	9/-	U12/14	7/6	Z729	6/-	OC84	8/-
6AR6	20/-	6SG7	4/9	14B6	26/9	5763	7/6	DL96	5/9	EF91	3/-	KT2	5/-	PX25	8/6	U16	15/-	Z749	6/3	OC139	12/-
6AT6	3/9	6SH7	3/-	14H7	9/6	7193	1/6	DL810	10/6	EF92	2/6	KT8	15/-	PY31	6/-	U17	5/-	Z759	36/-	OC140	19/-
6AU6	5/3	6SJ7	4/6	15D2	6/-	7475	2/9	DM70	5/-	EF97	11/8	KT32	4/9	PY32	8/6	U18/20	6/6	*Transistors*		OC170	8/6
6AV6	5/6	6SK7	4/6	18	12/6	A1834	20/-	DM71	9/9	EF98	10/-	KT33C	4/-	PY38	8/9	U19	48/6	*and diodes*		OC171	9/-
6B8G	2/6	6SL7	5/3	19	10/6	ACO42	23/3	DW4/350	8/6	EF183	7/-	KT36	29/1	PY80	5/-	U22	5/9	AA129	4/6	OC200	10/6
6BA6	4/6	6SN7	4/-	19AQ5	7/3	ACO44	9/-	DW4/500	8/6	EF184	7/-	KT41	7/6	PY81	4/9	U24	12/6	AC107	14/6	OC201	29/-
6BE6	4/9	6SQ7	5/-	19BG6G	20/5	AC2HL	10/6	DY86	6/9	EH90	7/-	KT44	5/-	PY82	4/9	U25	8/6	AC127	9/6	OC203	14/-
6BG6G	13/6	6SR7	12/6	19H1	6/-	AC2pen	11/6	DY87	8/-	EK2	25/11	KT61	6/9	PY83	5/9	U26	7/6	AD140	25/-	OCP71	17/6
6BH6	5/3	6SS7	2/-	20D1	10/-	AC2PEN/		E80F	24/-	EK32	5/9	KT63	3/9	PY88	7/9	U31	6/9	AF102	27/6	ORP12	12/6
6BJ6	5/6	6U4GT	8/6	20D2	21/-	DD	12/6	E83F	24/-	EL2	19/6	KT66	12/3	PY800	6/-	U33	13/6	AF114	11/-	SX641	10/-
6BQ5	4/6	6U5G	5/-	20F2	11/6	AC4PEN		E88CC	10/-	EL32	3/6	KT74	12/6	PY801	6/3	U35	16/6	AF115	10/6	TS2	12/6
6BQ7A	7/6	6U7G	7/-	20L1	12/6		27/2	E180F	19/6	EL33	6/9	KT88	28/-	QP21	5/-	U37	29/-	AF116	10/-	TS3	15/-
6BR7	8/3	6V6G	3/9	20P1	12/6	AC5PEN/		E1148	1/9	EL34	8/6	KTW61	4/9	QP22B	12/6	U43	5/6	AF117	5/6	V10/15A	12/-
6BR8	8/-	6V6GT	5/6	20P3	12/-	DD	23/3	EA50	1/6	EL35	10/-	KTW62	5/6	QP25	5/-	U45	15/6	AF118	20/-	XA102	19/6
6BS7	25/-	6X4	3/9	20P4	13/6	AC6PEN	4/9	EA76	6/9	EL36	8/9	KTW63	5/6	QS75/20	10/6	U47	3/6	AF124	11/-	XA103	15/-

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

METAL RECTIFIERS. DRM1B 13/-. DRM2B and DRM3B 15/6. LW7 21/-. LW15 26/-. RMO 7/11. RM1 5/3. RM2 6/3. RM3 7/9. RM4 12/9. RM5 17/6. 14A86 17/6. 14A97 19/6. 14A100 23/-. 14A124 26/6. 14A163 35/6. 14B130 31/-. 14B261 11/6. FC101 16/9. 16RC.1.1.16.1 8/-. FC31 21/-. 16RD.2.2.8.1 11/-. 16RE.2.1.8.1 8/6. 18RA.1.1.8.1 4/-. 18RA.1.2.8.1 11/-. FC116 6/-. FC124 12/6. SB3 10/6. C2D 9/-. K3/40 9/-. C3D 11/-. C3B 14/8. R3/2D 4/3. Q3/4 3/7. K3/50 10/4
ELECTROLYTICS. Can types: 32 x 32/450v. 5/9. 50 x 50/350v. 7/-. 64 x 120/350v. 8/3. 60 x 250/275v. 9/6. 100 x 400/275v. 12/6. 100/275v. 3/-. 200/275v. 4/-. 100 x 200/275v. 9/6. Tubular types: 8/450v. 1/9. 16/450v. 2/9. 32/450v. 3/9. 8 x 8/450v. 3/-. 16 x 16 450v. 4/-. 32 x 32/350v. 4/-. 8 x 16 450v. 3/9. 32/350v 3/-.
MULLARD Midget silicon rectifiers. Types BY100. Output 250 volts ½ amp No larger than a shirt button 7/- each. Series limiting resistance 1/6.

EXPRESS POSTAL SERVICE! ALL ORDERS DESPATCHED SAME DAY AS RECEIVED

Terms of business:—Cash with order or C.O.D. only. Post/Packing 6d. per item. Orders over £3 post free. C.O.D. 3/6 extra. All orders cleared day of receipt. Any parcel insured against damage in transit for 6d. extra. We are open for personal shoppers 8.30—5.30 p.m. Sats. 8.30—1 p.m. Complete list of modern and obsolete valves, resistors, condensers, transformers, potentiometers, microphones, etc. with terms of business, 6d. Please enquire for any item not listed with S.A.E.

CLEAR PLASTIC PANEL METERS

First grade quality, Moving Coil panel meters, available ex-stock S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows. Type MR. 38P 2 1/2in. square fronts.

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

Type MR. 52P. 2 1/2" sq. front.

50µA	57/6	1mA	32/6
100µA	47/6	10mA	32/6
500µA	37/6	100mA	32/6
50-0-50µA	57/6	1A. DC	32/6
100-0-100µA	47/6	300V. DC	32/6
300V. AC	32/6	'S' Mr. 1mA	39/6

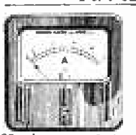
Type MR.65P. 3 1/4x3 1/4in. fronts.

50µA	59/6	1mA	35/-
100µA	49/6	10mA	35/-
500µA	39/6	100mA	35/-
50-0-50µA	59/6	1A. DC	35/-
100-0-100µA	49/6	300V. DC	35/-
VU Meter	59/6	300V. AC	35/-

Type MR. 85P. 4"x4" sq. fronts

50µA	69/6	1mA	45/-
100µA	59/6	10mA	45/-
200µA	55/-	50mA	45/-
500µA	49/6	100mA	45/-
50-0-50µA	69/6	1amp DC	45/-
100-0-100µA	59/6	5 amp DC	45/-
500-0-500µA	49/6	300V. AC	45/-
1-0-1mA	45/-	300V. DC	45/-

Post extra



BAKELITE PANEL METERS

First grade quality. 3 1/2in. square fronts.

25µA	65/-	100mA	29/6
50µA	42/6	1A. DC	29/6
100µA	39/6	5A. DC	29/6
500µA	35/-	*1A. AC	29/6
50-0-50µA	42/6	*5A. AC	29/6
100-0-100µA	39/6	*10A. AC	29/6
50mV	39/6	30A. AC	29/6
100mV	39/6	*50A. AC	29/6
1mA	29/6	300V. DC	29/6
5mA	29/6	*300V. AC	29/6
10mA	29/6	*300V. AC	35/-
50mA	29/6	VU Mtr	49/6

*Moving iron. All others moving coil.

ILLUMINATED 'S' METERS

Cal. in 'S' units. 1mA Basic. 1 21/32in. sq. front **29/6** P. & P. 1/-. 2 5/16in. sq. front **39/6** P. & P. 1/-.

MORE METER BARGAINS

100µA 6in. Flush sq.	92/6
100µA 2 1/2in. Flush rd.	42/6
500µA 2in. Flush rd.	22/6
1mA 2 1/2in. Flush rd.	22/6
30-0-30mA 2 1/2in. Flush rd.	9/6
350mA R.F. 2in. Plug in	8/6
300V. AC 2 1/2in. Flush rd.	25/-
500V. AC 2 1/2in. Flush rd.	25/-
1mA Meter Rectifiers	8/6

Please add postage

SEMI AUTOMATIC BUG KEY

Super speed key, 7 speed adjustments. 10 WPM to as high as desired weight scale for reproducible settings. Precision tooled anti-rust nickel plated brass and stainless steel operating parts. Size 6 1/4 x 3 x 2 1/2in. Brand new. **£4.10.0.** P. & P. 2/6.

LAFAYETTE "PRECON" AMATEUR PRESELECTOR CONVERTER

★Crystal Controlled ★For 80-40-20-15-10 Metre Bands ★As a convertor—converts your receiver to dual conversion ★Improves selectivity ★Widens bandspread ★High signal to noise ratio ★Improved image rejection ★Self powered ★Modern styling

SPECIFICATIONS. 80, 40 Metres preselector only. 20, 15 and 10 metres preselector and convertor. GAIN: Preselector, 36dB at 80 metres; convertor, 22dB at 20 metres. OUTPUT FREQUENCY: 3.5–3.85 M/c on 20M. Band, 3.5–3.95 M/c on 15M band, 3.5–5.2 M/c on 10M band. VALVES: 2-6BA6. 1-6BL8. CONTROLS: Aerial trimmer, function, bandswitch, gain. Two stages of RF. AMP. Sensitivity and stability excellent. 3 crystals are included for 20, 15 and 10M Bands. SIZE: 10" x 6" x 8". Operation 220/240v A.C. **19 gns.** Carr. 7/6 S.A.E. for full details.

CODAR AMATEUR EQUIPMENT

PR.30 R.F. PRESELECTOR 1.5–30Mc/s	£4.17.6
PR.30X. Self powered model. 200/250V A.C...	£7. 2.0
RQ.10 'Q' MULTIPLIER	£6.15.0
RQ.10X. Self powered model. 200/250V A.C...	£8.8 0.
A.T.5. NEW 12 WATT 160/80 metre TRANSMITTER	£16.10.0
Matching P.S.U. for A.T.5 200/250V. A.C...	£8. 0.0

S.A.E. for full details.

MODEL DA-1 TRANSISTORISED FULLY AUTOMATIC ELECTRONIC KEYER

230V or A.C. or Battery operated. Incorporates built-in monitor oscillator, speaker and keying lever. Fully adjustable speeds giving either auto., semi-auto. or hold. 7 transistors. 4 diodes. **£16.10.0.** P. & P. 4/6.

LAFAYETTE PRECISION TEST EQUIPMENT

Modern range of precision test equipment for the service man. Supplied brand new and guaranteed with manual. For operation on 220/240 volts A.C.

TE-20 Signal Generator. 120Kc/s-260Mc/s on 6 Bands. Directly calibrated. Variable R.F. Attenuator. Variable audio output. **£12.** Carr. 5/-.

TE-46 Capacity Resistance Analyser. Ranges 2pF-2,000mFd; 2 ohms-200 Meg. Also checks impedance, turns ratio, insulation. **£15.** Carr. 5/- S.A.E. for full details.

30,000 O.P.V. TEST METER MODEL 500

Reads voltages up to 1,000 D.C. at 30,000 ohms per volt and A.C. at 15,000 o.p.v.; D.C. current to 12 amps. Resistance to 60 Megs; Decibels from —20 to +56. Incorporates internal buzzer for audible warning of direct shorts and blocking condenser for A.F. output measurements. Size 3 5/16 x 6 9/16 x 2 1/8in. Price **£8.17.6.**

ERSKINE TYPE 13 DOUBLE-BEAM OSCILLOSCOPE

Time base 2c/s-750Kc/s. Calibrators at 100Kc/s and 1Mc/s. Separate Y1 and Y2 amplifiers up to 5.5Mc/s. Operation 110/230 volt A.C. Supplied in perfect working order. **£27.10.0.** Carr. 20/-.

TRIPLETT SIGNAL GENERATOR 1632

10 RANGES: 100Kc/s—120Mc/s on fundamentals. Six valves, stabilised H.T. FULLY ATTENUATED OUTPUT. 100 µamp carrier level meter. 1Mc/s xtal check. Operation 115V. A.C. Supplied in perfect working order **£12.** Carr. 10/-. (230/115V. Transformer 12/6 extra).

OSCILLOSCOPE OS-57 USM-38

Brand new high quality American oscilloscopes incorporating 3in. tube, printed circuit and miniature valves. Time base 1, 10, 100 1K and 10KµS/in. Calibration markers 1, 10 and 100µS. Calibrated Y input volts, X expansion, sweep stability. Operation 115V. A.C. Supplied brand new, fully tested with test leads, probe and circuit diagram. **£29.10.0** each. Carr. 10/- (230/115V. Transformer 18/6 extra).

MORSE CODE PRACTICE SETS

Morse key, buzzer, 1.5V battery mounted on panel. Brand new, boxed, **12/6.** P. & P. 1/6.

TS. 76 20,000 O.P.V. PUSH BUTTON MULTI-TESTER

Large clear plastic scale. Simple operation, DC and AC volts up to 1,000V. Resistance up to 10 megohm. Current up to 250 mA. Decibels —20 to +36db. Size 6 x 4 3/16 x 2 1/4in. Complete with leads, batteries and instructions. **£5.19.6.** P. & P. 2/-.

MINE DETECTOR No. 4A

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

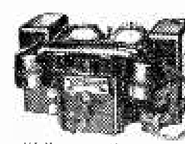
MINIFLEX 1/2 TRACK TAPE HEADS

Set of three, record, playback, erase. Only **29/6** set. P. & P., 9d.

12 VOLT A.C. TIME SWITCH

Vernier 0-14 hrs. 250 v. 5A. switch. **17/6.** post 2/-. Suitable 230/12V. transformer **5/9.**

FIELD TELEPHONES



Type "L". Two line connection, generator bell ringing. Complete telephone intercom. Supplied in excellent condition, fully tested and complete with batteries. Only **69/6** per pair. Carr. 5/-. Type "F". As above but moulded bakelite case (as illustrated). Supplied complete with wooden transit case for field use. **£4.19.6** per pair. Carr. 5/-.

TELEPHONES TYPE H

Sound powered, generator bell ringing 2 line connection. Fully tested. **£4.19.6** pair. Carr. 5/-.

MODEL PV-58 VACUUM TUBE VOLTMETERS

Latest design with special circuit for stable and ccurate measurements. Resistors used are all within 1% tolerance. Specially designed 4in. 200µA meter. 11 meg inputs Ranges:

—D.C.	V.	0-1.5-5-15-50-150-500-1500V.
+D.C.	V.	0-1.5-5-15-50-150-500-1500V.
A.C.	V.	0-1.5-5-15-50-150-500-1500V. RMS. 0-1.4-4-14-40-140-400-1400-4000 P.

Resistance: 2 ohm to 1,000 megohm.
Decibels: —10dB to +65dB.
Operation 220/240 volt A.C. Size 7 x 4 3/4 x 4in. Supplied brand new and guaranteed complete with probe and instructions. **£13.19.6.** P.P. 3/6.

CHASSIS PUNCH SET

Set of 5 popular size hole cutters 1/2", 5/8", 3/4", 1", 1 1/8". Supplied complete with punches, dies, T drive handle, tapered reamer, fitted leather case and instructions **49/6.** P. & P. 2/-.

PLUGS AND SOCKETS

Painton 15-pin in-line printed circuit connectors. **7/6** pair. Large quantities available. Ditto 32-pin. **12/6** pair. **Uniters.** 4-pin, **2/6** pr; 8-pin **3/6** pr; 12-pin, **4/-** pr; 18-pin, **4/6** pr. **Painton Miniature Jones.** 4-pin, **3/6** pr; 6-pin, **4/-** pr; 8-pin **4/6** pr; 18-pin, **7/6** pr; 24-pin. **10/6** pr; 33 pin, **12/6** pr. Post extra.

L.T. METAL RECTIFIERS

FULL wave bridge connected.

12/18V 1A	3/9	23/36V 1A	7/3
12/18V 2A	6/3	24/36V 2A	13/6
12/18V 4A	8/6	24/36V 15A	45/-
12/18V 6A	12/3		
12/18V 10A	22/6		

Post extra.

L.T. TRANSFORMERS

For chargers, models etc. All primaries tapped 200/250V. (1) 3.5, 9 or 17V., 1 amp. **9/9**; (2) ditto 2A., **14/3**; (3) ditto 4A., **16/6**; (4) ditto 6A, **20/-**; (5) 3, 4, 5, 6, 8, 10, 12, 15, 18, 20, 24 or 30V., 2 amp., **18/6**; (6) ditto 4A., **30/-**; (7) ditto 5A., **37/6**; (8) 50V. 1/2 amp. **13/6**; (9) 50V. 1 amp., **15/6.** Post extra.

AUTO TRANSFORMERS

Step up or step down. Tapped 0/115/200/230/250V. 20W., **9/-**; 60W. **12/6**; 75µ. **15/6**; 150W. **18/6**; 200W. **27/6**; 300W. **42/6**; 500W. **67/6**; 1,000W. **90/-**; 1,500W. **£6.19.6**; 3,000W.* **£7.10.0**; 7,500W. **£15.** (* only tapped 0/110/230V.) Post extra.

PETTIMAX 9 VOLT BATTERY ELIMINATOR

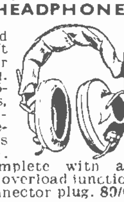
220/240V. A.C. Same size as PP3, **15/6.** P.P. 1/3.

SUBSTITUTION BOXES

Resistance—24 ranges ..	27/6
Capacitance—9 ranges ..	19/6

Post 1/6 extra.

LAFAYETTE HI-FI STEREO HEADPHONES



Air Cushioned headband, soft foam rubber ear pads, freq. response 25-15,000 cycles, high sensitivity, impedance 8 ohms per phone. Supplied complete with all cables, wires, overload junction box and 3-connector plug. **89/6.** P. & P. 2/6.

G. W. SMITH & CO. (RADIO) LTD.

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

SEE OPPOSITE PAGE

TM-59 'er 'S' METER

Signal strength meter using VTVM principles. Calibrated in S units. Sensitivity and zero adjustments. For any superhet receiver with AVC. Requires 150/200V. and 6 or 12V. Complete with valve and full instructions. 82/6. P.P. 2/6.

MAINS ISOLATION TRANS.
230V. to 230V. 50W. 16/6. P.P. 3/-; 100W. 29/6. P.P. 3/6; 1,000W. £5. Carr. 10/-.

MINIATURE LEAD ACID ACCUMULATORS
Brand new. 2V. 1.5A. 4 x 1 x 1¼in., 5/6. P.P. 1/3. 12V. O/75A. 4 x 3 x 1¼in. 15/6. P.P. 1/6.

MARCONI TFI44G/4 STANDARD SIGNAL GENERATORS
First release of this late mark. 85Kc/s to 2Mc/s +1%. Output variable from 1µV to 1 volt. Internal sine wave modulation 400c/s up to 75% depth. Operation 200/250 volt A.C. Offered in really excellent condition, like new, fully tested and guaranteed. £25. Carr. 30/-.

HEAVY DUTY POWER SUPPLIES
Input 200/250 volt A.C. Three H.T. outputs 2 x 400V. 175mA and 350V. 225mA. All fully smoothed. 2 x 6.3V. 5 amp, 6.3V. 4 amp. 12V. 0.5 amp. Supplied in perfect condition. £5.10.0. Carr. 20/-.

PRECISION PORTABLE VOLTMETERS
Polished wood case. 8in. scale with knife edge pointer. A.C. and D.C. volts; 0-160 volts, 59/6; 0-160-320 volts, £5.19.6. P.P. 3/6.

TWIN MOTOR BARGAIN
200/250V. A.C. Twin concentric spindles. Either motor reversible. 14000 r.p.m. Brand new. 12/6. P.P. 2/6.

VARIAC TRANSFORMER
24 amp. Pri. 230V. Sec. 185/250V. £12.10.0. Carr. 10/-.

MAINS MOTORS 220/240V
90 watts, 5,000 r.p.m. 4½ x 3in. ¼in. spindle. 22/6. P.P. 2/-.

GEARED SLIDER RHEOSTAT
1.2 ohms 12 amp. 15/6. P.P. 3/6.

R.C.A. HEADSETS
Low imp. Fitted with std. jack plug. 15/6. P.P. 1/6.

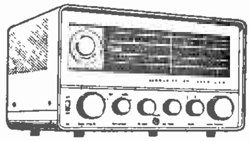
DESK TELEPHONES
Std. type with handset and bell. No dial. Unused, 25/-. P.P. 3/6.

ROTARY TRANSFORMERS
12V. D.C. input. Output 310/360V. D.C. 30mA. New boxed, 10/-. P.P. 2/-.

COLLARO MAGNAVOX. STUDIO TAPE TRANSCRIPTOR
Brand new, 3 speeds, 1⅞", 3¾", 7½" i.p.s. 3 motors, digital counter. Complete with instructions. 2 Track, £10.10.0; 4 Track, £13.10.0. Carr. Paid.

HEADSET & BOOM MICROPHONE
American type, low impedance, padded. 49/6. P.P. 2/6.

BEST BUY!
Send 1/- P.O. for full catalogue and lists.
Open 9 a.m. to 6 p.m. Every day. Monday to Saturday. Trade supplied.



NEW LAFAYETTE COMMUNICATIONS RECEIVER

MODEL HA. 63

A SUPERB RECEIVER FOR ONLY **£27.10.0** Carr. 10/-

7 VALVES Plus Selenium Rectifier

4 BANDS Covering 550 kc/s-31 Mc/s.

● Illuminated "S" Meter ● 1.5 Microvolt Sensitivity ● Electrical bandspread ● Aerial trimmer ● Noise limiter ● B.F.O. ● R.F. stage ● Big slide rule dial ● Output or headphones or 4/8Ω. speaker ● Modern steel cabinet size 13in. x 7 4/5in. x 10in. ● Operation 220/240 volt A.C. S.A.E. for Full Details.

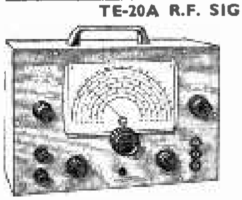
Supplied Brand New and guaranteed with instruction manual.
Matching Speaker in Cabinet 55/-

FULL RANGE of Other LAFAYETTE RECEIVERS in Stock

MODEL HE-40 4 Bands, 550Kc/s to 30Mc/s.	**£19.19.0**	Carr. 10/-
MODEL HE-30 9 Valves 4 Bands, 550Kc/s to 30 Mc/s	**£35. 0.0**	Carr. 10/-
MODEL HE-80 15 Valves 5 Bands, 550Kc/s-30Mc/s and 142-148Mc/s.	**£52.10.0**	Carr. 10/-

Each receiver supplied brand new and fully guaranteed complete with manual. All models for operation on 220/240 Volt A.C. S.A.E. for illustrated leaflet. Generous part exchange allowances.

TE-20A R.F. SIGNAL GENERATOR



A precision signal generator of extremely high accuracy and quality. Six ranges from 120Kc/s to 130Mc/s on fundamentals with calibrated harmonics from 120-390 Mc/s. 400 cps. INT. MOD. OR EXT. MOD. OUTPUTS MOD. RF. UNMOD RF. or 400 c/s audio. RF. output in excess of 100 mV. Large clear 5 inch dial. Handsome grey metal case with handle. Size 7¼ x 10¾ x 4½in. Complete with leads. Operation 220/240 volts A.C. Supplied brand new and guaranteed. £12.19.6. Carr. 5/-.

MAINS RECORD PLAYERS & AUTOCHANGERS HALL GUARANTEED WITH ARM AND CARTRIDGE

GARRARD SRP-10 PLAYER	£4.17.6
GARRARD AUTOSLIM CHANGER	£6. 9.6
GARRARD AT6 CHANGER MONO	£10. 9.6
GARRARD AT6 CHANGER STEREO	£10.19.6
GARRARD 4 H/F MONO	£14.10.6
GARRARD 4 H/F STEREO	£15.15.0
GARRARD TYPE A CHANGER	£17.15.0
GARRARD 301 STROBO. NO ARM	£19.10.0
B.S.R. GU7 SINGLE PLAYER	£4. 7.6
B.S.R. UA16 CHANGER	£6.12.6
B.S.R. UA15 NEW SLIMLINE CHANGER	£6.19.6

POSTAGE EXTRA

MULTI-METERS
Brand New—Fully Guaranteed. Lowest ever prices. Supplied with leads, batteries and instructions.

MODEL TE-12
20,000 o.p.v.
0/.6/6/30/120/600/1,200/3,000/6,000V. DC
0/6/30/120/600/1,200V. AC
0/60µA/6/60/600mA
6/6K/600K/6 Meg/60 MegΩ
5pF—.2mFd
£5.19.6. P.P. 2/6.

MODEL NH-201
30,000 o.p.v.
0/.25/1/10/50/250/500/1,000V. DC
0/10/50/250/500V. AC
0/50µA/10/250mA
0/5K/500K/5 MegΩ
99/6. P.P. 2/6.

MODEL AR-620
20,000 o.p.v.
0/10/50/250/500/1,000V. AC and DC
0/500µA/10/250mA
0/10K/100K/1 MegΩ
250pF—.02mFd
0-500 Henrys
92/6. P.P. 2/6.

MODEL PT-34
1,000 o.p.v.
0/10/50/250/1000V. AC and DC.
0/1/100/500mA DC.
0/100KΩ
39/6. P.P. 1/6.

MODEL NH-400
10,000 o.p.v.
0/.3/3/30/120/300/600/1,200V. DC.
0/12/60/120/300/1,200V. AC
0/120µA/30/300mA DC
0/2K/200K/2 MegΩ
100pF—.2mFd
79/6. P.P. 2/6.

MODEL 250C
2,000 o.p.v.
0/10/50/500/2,500V. DC
0/10/50/500/2,500V. AC
0/2 MegΩ
0/250mA
—20 to +36dB
49/6. P.P. 2/6.

MODEL ITI-2
20,000 o.p.v.
0/5/25/250/500/2,500V. DC
0/10/50/500/1,000V. AC
0/50µA/25/250mA DC
0/60K/6 MegΩ
.01—.3mFd.
82/6. P.P. 2/6.

TWO-WAY RADIOS

New improved "LAFAYETTE" Models.
Type 1. 3 transistor. Range up to 1 mile. £8.17.6 per pair.
Type 2. 9 transistor. Range up to 5 miles, £21 per pair.
Postage extra. S.A.E. for full details.

LAFAYETTE BRAND RECORDING TAPE
First grade quality American tapes. Brand new and guaranteed. Discounts for quantities.

3in.	200ft. L.P. mylar	4/-
3¼in.	600ft. T.P. mylar	10/-
5in.	600ft. std. plastic	8/6
5in.	900ft. L.P. acetate	10/-
5in.	1200ft. D.P. mylar	15/-
5¾in.	1200ft. L.P. acetate	12/6
5¾in.	1800ft. D.P. mylar	22/6
7in.	1200ft. std. mylar	12/6
7in.	1800ft. L.P. acetate	15/-
7in.	1800ft. L.P. mylar	20/-
7in.	2400ft. D.P. mylar	25/-

Postage 2/-. Over £3 post paid.

BRAND NEW R.C.A. AR88D RECEIVERS
Unboxed £65; Boxed with spare valves, copper aerial, headset, and manual, £85. Carr. 30/-.

VARIABLE VOLTAGE TRANSFORMERS
Pri. 230V. Sec. 0-260V. 1 amp. £4.10.0; 2½ amp. £5.17.6; 5 amp. £9; 8 amp. £14.10.0; 10 amp. £16.10.0; 12 amp. £18.15.0; 20 amp. £32.10.0. All fully shrouded.

CHAMOIS PADDED MOVING COIL HEADPHONES
Canadian noise excluding type. Complete with M/C microphone. New, boxed, 25/-. P. & P. 2/6.

Brand New Double Beam CRT's
Cossor 89D. 59/6. P.P. 4/6.
Dumont K1051P1, 59/6. P.P. 4/6.

SILICON RECTIFIERS

400 P.I.V. (SCR)	4.7 amp	7/6
200 P.I.V.	6 amp	5/6
1,000 P.I.V.	650mA	7/6
800 P.I.V.	500mA	5/6
200 P.I.V.	200mA	3/-
400 P.I.V.	00mA	3/6
150 P.I.V.	165mA	1/-
70 P.I.V.	1 amp	3/6
95 P.I.V.	3 amp	5/6

Post extra.

MINIATURE HIGH SPEED COUNTERS
4 Digit available, 6V, 24V, or 50V. ALL 7/6 ea. P. & P. 9d

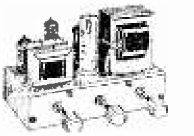
NEW LOW IMPEDANCE HEADSET
Latest Ministry Type. Rubber moulded. Fitted with Std. Jack Plug. Brand New, boxed. 17/6. P. & P. 1/6.

4-CHANNEL TRANSISTORISED MICROPHONE MIXER

Add musical highlights and additional sound effects to your recordings. The MM-4 permits mixing of four signals such as microphone, records, tuner, etc. into single output. Input and output take standard plugs. Fully transistorised and self contained in handsome case. PRICE 55/-. P. & P. 2/6.

G.W. SMITH & CO (RADIO) LIMITED
Phone: GERRARD 8204/9155
Cables: SMITHEX LESQUARE
3-34 LISLE STREET, LONDON, W.C.2

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 7¼in. w x 4in. d x 4¾in. h. Incorporates ECC83, EL84, EZ80 valves, heavy duty double-wound mains transformer and output transformer matched for 3 ohm speaker, separate Bass, Treble and volume controls. Negative feedback line. Output 4½ watts. Front panel can be detached and leads extended for remote mounting of controls.
The HA34 has been specially designed for us and our quantity order enables us to offer them complete with knobs, valves, etc., wired and tested for only **£4.5.0** P. & P. 5/-

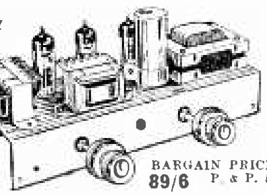
TAPE DECKS

COLLARO STUDIO DECK. £10.10.0 plus 5/6 carr. and ins.
B.S.R. MONARDECK. Single speed. 3¾in. per sec., simple control uses 5¾in. spools, **£6.15.0** plus 5/6 carr. and ins. (Tapes extra on both.)

STEREO AMPLIFIERS

Incorporating 2 ECL82s and 1 EZ80. 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 wavebands transistor superhet. ● Printed circuit panel (size 8½ x 3¾in.). ● 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 £4.5.0 P. & P. 2/6.

35 OHM SPEAKERS

Suitable for use with above. 2in. Goodmans. Ideal replacement for most pocket portables, **8/6**, 3¼in., **12/6**; 5in., **17/6**; 7 x 4in., **21/-**.
P. & P. 1/6 per speaker.

Portable CABINET

Size approx. 9¼ x 6¾ x 3¼in. Suitable for above using 3¼in. speaker. **25/-.** P. & P. 2/-.

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/-. 6 transistor printed circuit board to match, **8/6.** Post 9d. Circuit diagram 1/6 extra.

SPECJAL TRANSISTOR BARGAINS

ALL BRAND NEW

GET 15 (Matched Pair) **15/-**
OC71 **5/-**; OC76 **6/-**; AF117 **7/6**;
Set of Mullard 6 transistors, OC44, 2—OC45, OC81D matched pair, OC81, **25/-**

EDISWAN MAZDA

PXA101 **6/6**; XA103 **6/6.**
R.F.1 Pack: 1—PXA102 Mixer: 2—PXA101 I.F. Amp.; (Equiv. OC44 and OC45)..........**10/6**
R.F. 2 Pack: 2—PXA101 I.F.;—PXA102 Osc., 1—PXA102 Mixer **12/6**
L.F.6 Pack: Consisting of PXB113 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 7in. w. x 2¾in. d. x 5¼in. h. This amplifier (which is used in a **29** gn. record player) employs ECC83 EL84. EZ80 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 6in 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 8½in.

PRICE £3.9.6 Carr. 5/-.

EMBASSY PORTABLE RECORD PLAYER CABINET. Will accommodate amplifier, up to 7 x 4in. speaker and B.S.R. or GARRARD autochanger or single player unit. Attractive rexine covered finish. Overall size 17 x 15 x 8½in. Supplied with uncut motor board. PRICE **69/6.** Carr. 5/-.

4-SPEED PLAYER UNIT BARGAINS

All Brand New in Makers' Original Packing

SINGLE PLAYERS

B.S.R. TU/12............ **£3.10.0** Carr. 3/6
B.S.R. GU7 with unit mounted pick-up arm **£4.18.8.** Carr. 4/-

AUTO CHANGERS

B.S.R. UA14...................... **£5.19.6**
Latest B.S.R. UA16.................. **£6.19.6**
Garrard AT6 Mono................ **£10.10.0**
LATEST GARRARD AUTO-SLIM. With heavy duty 4-pole motor. FEW ONLY **£7.7.0.** (Standard Auto-Slim **£6.10.0**). Carr. 5/- on each.

NEW CARTRIDGE BARGAINS

B.S.R. TC85. High output compatible Stereo **Cartridge.** Brand new. Complete with Stereo/LP/78 sapphire stylii 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 sapphires. Original list price **67/9. OUR PRICE 24/-.** P. & P. 1/-.
COLLARO HI-FI STEREO T/O CARTRIDGE. Type "C". Complete with universal bracket and stylii for Stereo, L.P. and 78. Original list price **59/8. OUR PRICE 25/-.** P. & P. 1/-.

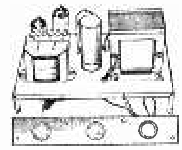
E.M.I. 4-speed Player and P.U.

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

Heavy 8¾in. metal turntable. Low flutter performance 200/250 v. shaded motor with tap at 45v. for amplifier valve filament if required. Turnover LP/78 head.

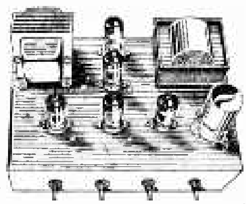
THE NEW HARVERSON KIT FOR THE HOME CONSTRUCTOR

A really excellent all purpose A.C. mains 200/240v.
AMPLIFIER KIT TYPE HSL 'FOUR' 3 VALVE, 4 WATT USING ECC83, EL84. EZ80 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 for use with guitar, microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● All this builds onto a chassis size only 7¼in. wide x 4in. deep. Overall height 4¼in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves, output transformer (3 ohms only), screened lead, wire, nuts, bolts, solder etc (No extras to buy) PRICE **79/6** P. & P. 5/-
(Comprehensive circuit diagram, practical layout and parts list 2/6. (Free with Kit).

10/14 WATT HI-FI AMPLIFIER KIT



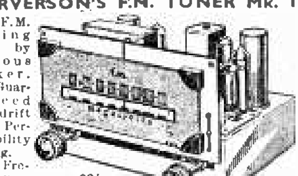
A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull Super reproduction of both music and speech with negligible hum. Separate inputs for mike and gram. allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15Ω speaker and independent volume controls and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet 1/6. (Free with parts).
All parts sold separately. ONLY **£6.19.6** P. & P. 6/6
Also available ready built and tested complete with standard input jack sockets. **£8.15.0.** P. & P. 6/6.
Carrying Case for above **£8/6** P & P. 4/-

HIGH GAIN 4-TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT

Type TA1

● Peak output in excess of 1½ watts. ● All standard British components. ● Built on printed circuit panel size 6 x 3in. ● Generous size Driver and Output Transformers. ● Output transformer tapped for 3 ohm and 15 ohm speakers. ● Transistors (GET 114) or 81 Mullard OC81D and matched pair of OC81 o/p ● 9 volt operation. ● Everything supplied, wire battery clips, solder, etc. ● Comprehensive, easy to follow instructions and circuit diagram 1/6 (Free with Kit). All parts sold separately.
SPECIAL PRICE 45/- P. & P. 2/6
Also ready built and tested, **52/6.** P. & P. 2/6.
A pair of TA1's are ideal for stereo

HARVERSON'S F.M. TUNER Mk. I



● F.M. tuning head by famous maker. ● Guaranteed non-drift ● Permeability tuning. ● Frequency coverage 88/-100 Mc/s. ● OA81/-balanced diode output. ● Two I.F. stages and discriminator. ● Attractive maroon and gold dial (7 x 3in. glass). ● Self powered, using a good quality mains transformer and valve rectifier. ● Valves used ECC85, two EF80's and EZ80 (rectifier). ● Fully drilled chassis. ● Size of completed tuner 8 x 6 x 5¼in. ● All parts sold separately. Set of parts if purchased at one time **£5.19.6.** plus 8/6 P. P. and ins. Circuit diagram and instructions 1/6 post free. **Mark II Version** as above but complete with magic eye, front panel and brackets, **£6.12.6.** P. & P. 8/6.
Mark III Version as Mark I but with output stage (ECL82) and tone control. **£7.7.0.** P. & P. 8/6.
Handsome Metal Cabinets. Choice of Grey, Black or Green. To fit Mark 1, **25/-.** P. & P. 2/6. To fit Mark II, **17/6.** P. & P. 2/6.

SPECIAL PURCHASE! TURRET TUNERS

By famous maker. Brand new and unused. Complete with PCC84 and PCF80 valves, 34-38 Mc/s I.F. Biscuits for Channels 1 to 5 and 8 to 9. Circuit diagram supplied. **ONLY 25/-** each. P. & P. 2/6.

BRAND NEW CYLDON F.M. TUNER HEAD
Permeability tuned. 88-100 Mc/s. Printed circuit. A completely screened unit ready for direct mounting in chassis. 10.7 Mc/s. I.F O/P. Supplied complete with ECC85 valve and full circuit diagram. Aerial input circuit suitable for either 75 ohm unbalanced or 300 ohm balanced. Size only 3in. w. x 2¾in. d. x 1¾in. h. (2¾in. high with valve). Limited number only at **27/6.** P. & P. 1/6.
Also available 10.7 Mc/s I.F trans. and disc. trans **11/6** pair. P. & P. 1/6.

GORLER F.M. TUNER HEAD

88-100 Mc/s, 10.7 Mc/s, I.F **15/-**, plus 1/9 P. & P. (ECC85 valve, **8/6** extra)

SEE LEFT HAND PAGE FOR MORE ITEMS

HARVERSON SURPLUS CO. LTD.

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

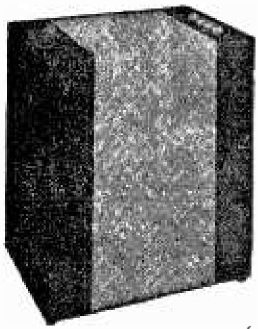
Open all day Saturday *Early closing Wed. 1 p.m.*

A few minutes from South Wimbledon Tube Station (Please write clearly)

PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.
SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

R.C.S. BRADFORD, BRISTOL, BIRMINGHAM, DERBY, DARLINGTON, EDINBURGH, GLASGOW, HULL, LEICESTER, LEEDS, LIVERPOOL, LONDON, MANCHESTER, MIDDLESBROUGH, SHEFFIELD

PAGE 614 FOR ADDRESSES



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.
★ Dual Cone in second speaker reproduces frequencies up to 17,000 c.p.s.
★ Heavily made cabinet of convenient size 24 x 21 x 14in. has an exceptionally attractive covering in two contrasting tones of Vynair.
★ 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.

39½ Gns. Send S.A.E. for leaflet OR DEPOSIT of £4.3.0 and 12 monthly payments of £3.9.11. Carr. 17/6.

R.S.C. G5 GUITAR AMPLIFIER

5-watt high quality output. Incorporating high flux 12in. 10 watt 12,000 line loudspeaker Sensitivity 50 m.v. High impedance jack input. Handsome strongly made cabinet (size 14 x 14 x 7in. approx.) finished in complimentary shades of Rexine/Tygan. 200-250 A.C. mains.

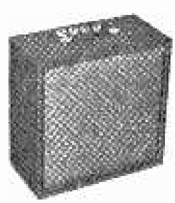
£9.19.6 Or DEPOSIT 22/3 and 9 monthly Payment of 22/3. Carr. 7/6

LINEAR TREMOLO/PREAMP. 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/-

Send S.A.E. for leaflet. Or DEPOSIT 39/11 and twelve monthly payments of 33/4.

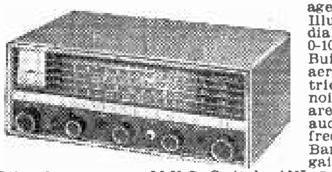
R.S.C. B20 BASS GUITAR AMPLIFIER

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 v. 50 c.p.s. A.C. mains.
Send S.A.E. for leaflet.

29½ Gns. Or Deposit £3.2.0 and 12 monthly payments of 51/8. Carr. 17/6.

COMMUNICATION RECEIVERS

HE-40 De-Luxe 4 Band. 220/240 v. 50/60 c.p.s. A.C. mains operation. Frequencies covered 550 Kc/s to 30 Mc/s continuous. Incorporates 5in. speaker. Slide rule tuning dial, 'S' meter. Internal ferrite aerial for medium wave. Telescopic whip aerial 59in. 10 section for short waves. Fitted sockets for optional outdoor aerial. Headphone, external speaker socket. Other features are electrical bandspread tuning, 0-100 logging scale. Noise limiter, A.V.C., B.F.O., stand by switch. Size approx. 14 x 8¼ x 5½in. Handsome grey crackle finished metal cabinet with chromium fittings. Brand new with full instructions manual. Usual guarantee.
TERMS: Deposit £3.15.0, and nine monthly payments of 52/3.
Cashpriceifcleared in 3 months Only **£24.15.0** Carr. Free.



HE-30 4 Band Continuous coverage 550 Kc/s. to 30 Mc/s. Illuminated slide rule dial. Edgewise 'S' meter 0-100 logging scale. Built in 'Q' multiplier aerial trimmer. electrical bandspread. noise limiter. controls are: Function switch. audio gain, selectivity. frequency (B.F.O.), Band selector, I.F. gain, trimmer, A.V.C./M.V.C. Switch, ANL switch, main tuning, bandspread tuning. Output for H/Phones or standard speaker. Provides 1.5 watts output. Size 15 x 10 x 7¾in. For 220/240v. 50/60 c.p.s. A.C. mains. A highly efficient receiver representing exceptional value at only **40** Gns. Post Free.
TERMS: Deposit £5.4.0, and nine monthly payments of 91/2.
Cash price if settled in 3 months.

TRANSRECEIVERS.

Two-way Transmitter Receivers. 9 transistor S/H circuit. Crystal controlled range up to 5 miles according to conditions. Size of each unit 6¾ x 3 x 1¼in. Complete with batteries. Telescopic aerials and leather cases. Brand new guaranteed **£25.0.0** Per Pair.

COMPLETE POWER PACK KIT, 19/11

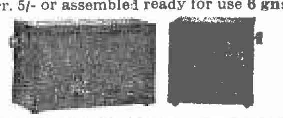
Consisting of Mains Trans., Metal Rectifier, Double electrolytic smoothing choke chassis and circuit. For 200-250 v. A.C. mains. Output 250 v. 60 mA, 6.3 v., 2 a.

R.S.C. POWER PACK, 39/9.

Louvred metal case only 8 x 5¼ x 2¼in. Stove enamelled. For 200-250 v. A.C. mains. Output at 4 pin plug and socket 250 v. 60 mA. fully smoothed at 6.3 v. 2 a. Suitable for power requirements of almost any Pre-amp. or Radio Tuner.

R.S.C. BABY ALARM or INTER-COMM. KIT.

Complete set of parts with diagrams, etc. Housed in two polished walnut finished cabinets of pleasing design. High sensitivity. For 200-250 v. A.C. mains. Fully isolated. Controllable at both units. An intercomm. of this class would normally cost £20-£30. Only **89/6**, carr. 5/- or assembled ready for use **6 gns.**



SELENIUM RECTIFIERS

F.W. BRIDGE			
6/12 v. 1a.	3/11	24 v. 2 amp.	14/9
6/12 v. 2a.	6/11	24 v. 20 amp.	89/9
6/12 v. 3a.	9/9	H.T. TYPES H.W.	
6/12 v. 4a.	12/3	150 v. 40 mA	3/9
6/12 v. 6a.	15/3	250 v. 50 mA	3/11
6/12 v. 10a.	26/9	250 v. 60 mA	4/11
6/12 v. 15a.	35/9	250 v. 80 mA	5/11
		250 v. 250 mA	11/9

CONTACT COOLED. 250 v. 75 mA. F.W. (Bridge). 10/11. 250 v. 50 mA. F.W. (Bridge). 8/11. H.W. 250 v. 60 mA. 5/11.

HI-FI 10-WATT AMPLIFIERS

Brand New Complete Units. **£7.19.6** Carr. 5/6
Manufacturer's discontinued Model. Push-Pull output. Latest high efficiency valves. Dual separately controlled Inputs for "Mike" and gram. Separate Bass and Treble Controls. High Sensitivity. Output for 3 or 15 ohm speaker. Guaranteed tested and in perfect working order.

LARGE REXINE COVERED SPEAKER CABINETS.

Full range for 12", 15" and 18" Speakers. Cash or H.P. Send S.A.E. for leaflet. **from 11 Gns.**

HEAVY DUTY LOUDSPEAKERS IN SUBSTANTIAL REXINE COVERED CABINETS.

Type BG1. Suitable for Bass Guitar. Speaker Unit 15in., High Flux, 15 ohms, 30 watts. Cabinet size approx. 24 x 21 x 13in. Only 19½ gns. Or Deposit 43/- and 12 monthly payments of 34/-. Type BG3/2. Suitable Bass and Lead Guitar. Two 12in. high flux 15 ohm 25 watt speakers, one with aluminium speech coil and dual cone to provide smooth frequency response from 25 to 17,000 c.p.s. Cabinet size approx. 30 x 21 x 14in. Covered in two contrasting tones of grey Vynair and Rexine. Rating 50 watts. Only 29 gns. Or Deposit £3.7.6 and 12 monthly payments of 50/-.

FANE EXTRA HEAVY DUTY LOUDSPEAKER 15in. TYPE 153.

40 watts. Total flux 375,000 lines. Extremely high sensitivity. 15 ohm voice coil. Only 18 gns. or Deposit 37/6 and 12 monthly payments of 31/6.

FANE EXTRA HEAVY L/SPEAKER 183.

18in., 15 ohms, 60 watts. 3in. diam. Speech Coil. Total Flux 375,000 lines. High sensitivity. ONLY 24 gns. or Deposit 51/- and 12 monthly payments of 42/9. Send S.A.E. for leaflet on 153 and 183.

TRANSISTOR SALE.

Mullard OC71 3/9, OC45 4/11, OC44, 4/11, OC72 4/9, OC81 4/11, OC171 8/9, Ediswan XA101 3/9, XB102 3/9, XA112 3/9, XB113 3/9, XB104 3/9, XC101A 3/9. Postage 6d. for up to 3 Transistors.

EX. GOVT. SMOOTHING CHOKES. 200 mA, 3-5 H, 50 ohms. Parmeko, 8/9; 150 mA, 10 H, 50 ohms, 9/9; 120 mA, 12 H, 100 ohms, 8/9; 50 mA, 50 H, 1,000 ohms 6/9; 100 mA, 10 H, 100 ohms 6/9; 60 mA, 5-10 H, 250 ohms 2/11.

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

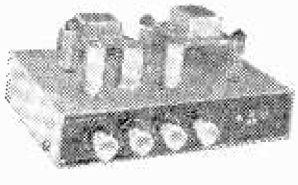
AUDIOTRINE HI-FI TAPE RECORDER KIT 25½ GNS. Carr. 17/6.

REALISM AT INCREDIBLY LOW COST, CAN BE ASSEMBLED IN AN HOUR
Incorporating the latest Collaro Studio Tape Transcriptor. 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 14¼ x 15 x 8¼in. high and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.A.E. for leaflets.
TERMS. Deposit £2.13.9 and 12 monthly payments of 44/-. Cash price if settled in 3 months.

HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

ONLY 8 PAIRS OF SOLDERED JOINTS PLUS MAINS

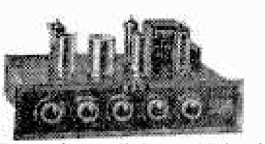
PUSH-PULL ULTRA LINEAR OUTPUT 'BUILT-IN' TONE CONTROL PRE-AMP STAGES



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 60 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 FEEDER UNIT.** Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohms speaker. 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 louvred metal cover with 2 carrying handles can be supplied for 18/9. **TERMS ON ASSEMBLED UNITS. DEPOSIT 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 1⅞in., 3¾in., 7½in. and Playback. EM84 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriptor 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



A complete set of parts for the construction of a stereophonic 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 **8 Gns.**
Full constructional details and price list 2/6. Carr. 10/-.
Kit can be supplied assembled and ready to use for 59/6 extra.

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, 16/9. Acos Stereo-Monaural, 29/9. Ronette Stereo-Monaural 39/9. B.S.R. Stereo 39.9.
BRADMATIC RECORDING HEADS. High Impedance Record/Playback 22/-. Low Impedance Erase, 12/6.
MARRIOTT RECORDING HEADS. High Impedance, Record/Playback, Low Impedance, Erase, 25/- pair
PICK-UP ARMS. Complete and with latest Acos/hi-fi Turnover Cartridge 29/11
CRYSTAL MICROPHONES. Hand 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. Lapel type 29/9.
COLLARO JUNIOR. 4-speed Single Player Unit and Crystal Pick-up with hi-fi Turnover head. Only £3.19.6.
B.S.R. UA14 4-sp'd AUTO-CHANGERS with hi-fi turnover head, £6.19.6. 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 DE-LUXE 4-SPEED AUTOCHANGERS. Turnover GC8 head, for 200-250 v. A.C. mains, £11.9.0.
GL3A 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.V. mains. Size 11¼ x 2½ x 2¼in. Controls: Vol. and Tone with Switch. Only 59/6.

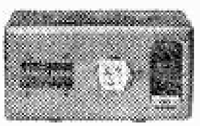
SENSATIONAL STEREO OFFER

A complete set of parts to construct a good quality Stereo amplifier with an undistorted output total 6 watts. **4 Gns.** 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.

HEAVY DUTY CHARGER KIT 6/12 v. 6 amps., variable output. Consisting of Mains Transformer 0-200-230-250 v.; F.W. (Bridge) Selenium Rectifier; Ammeter, Variable Charge Rate Selector Panels, Plugs, Fuses, Fuseholder and circuit, 59/9. Carr. 4/6.

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

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



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

ASSEMBLED 6/12 v. 2 amps. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case finished attractive hammer blue. Fused, ready for use with mains and output leads. **39/9** Carr. 3/9.
6/12v. 1 amp. 27/9 Less meter.

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

6v. or 12v. 1 amp..........	22/9
As above with Ammeter..	28/9
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 each.

CHARGER KIT, 12 v. 14 AMP or 24 v. 7 AMP Consisting of mains trans. 200-230-250 v. F.W. (Bridge) Selenium Rectifier. Ammeter, Fuses, Variable Resistor, Heavy Steel Stove enamelled case and Circuit. Only £9.19.6. Carr. 15/-. Please state if 12 v. or 24 v. kit required.

CHARGER KIT, 12v. 10 Amp. with variable charge rate adjustment and ammeter. £4.19.6. Carr. 10/-.

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

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

TOP SHROUDED DROP THROUGH

250-0-250v. 70mA. 6.3v. 2a. 0-5-6.3v. 2a	17/9
350-0-350v. 80mA. 6.3v. 2a. 0-5-6.3v. 2a	19/9
250-0-250v. 100mA. 6.3v. 2a. 6.3v. 1a ..	21/9
250-0-250v. 100mA. 6.3v. 3.5a. C.T. ..	19/9
250-0-250v. 100mA. 6.3v. 4a. 0-5-6.3v. 3a	27/9
300-0-300v. 130mA. 6.3v. 4a. 6.3v. 1a. for Mullard 510 Amplifier ..	33/9
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 Midget type 2½ x 3 x 3in. ..	17/11
250-0-250v. 100mA. 6.3v. 4a. 0-5-6.3v. 3a	28/9
300-0-300v. 100mA. 6.3v. 4a. 5v. 3a ..	28/9
300-0-300v. 130mA. 6.3v. 4a. C.T. 6.3v. 1a. for Mullard Amplifier	35/9
350-0-350v. 100mA. 6.3v. 4a. 0-5-6.3v. 3a	28/9
350-0-350v. 150mA. 6.3v. 4a. 0-5-6.3v. 3a	37/9

FULLY SHROUDED (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. C.T., 5v. 3a	59/9
450-0-450v. 250mA. 6.3v. 4a. C.T. 5v. 3a	69/9

OUTPUT TRANSFORMERS

Midget Battery Pentode 66:1 for 3S4, etc.	4/6
Small Pentode, 5,000Ω to 3Ω	4/6
Small Pentode, 7/8,000Ω to 3Ω	4/6
Standard Pentode 5,000Ω to 3Ω ..	5/9
Standard Pentode 7,000Ω to 3Ω ..	5/9
10,000Ω to 3Ω	5/9
Push-Pull 8 watts, EL84, or 6V6 to 3Ω or matched to 15Ω	9/9
Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5-8 to 15Ω	19/9
Following types for 3 and 15Ω speakers	
Push-Pull 10-12 watts 6V6 or EL84 ..	18/9
Push-Pull 15-18 watts, 6L6, KT66 ..	22/9
Push-Pull Mullard 510 Ultra Linear ..	29/9
Push-Pull 20 watts, sectionally wound 6L6, KT66, EL34, etc.	49/9

MIDGET MAINS Primaries 200-250 v..

50 c/s. 250v. 60mA, 6.3v. 2a.	11/9
250-0-250v. 60mA. 6.3v. 2a.	12/11

Both above size 2¾ x 2¼ x 2¼in.

FILAMENT TRANSFORMERS All with 200-250v. 50 c/s primaries 6.3v. 1.5a, 5/9; 6.3v. 2a, 7/6; 12v. 1a, 7/11; 6.3v. 3a, 8/11; 6.3v. 6a, 17/6; 12v. 1.5a, twice, 17/6.

SMOOTHING CHOKES

150mA. 7-10 H. 250 ohms	11/9
100mA. 10 H. 200 ohms	8/9
80mA. 10 H. 350 ohms	5/9
60mA. 10 H. 400 ohms	4/11

CHARGER TRANSFORMERS All with 200-230-250v. 50 c/s Primaries; 0-9-15v. 1½a, 12/9; 0-9-15v. 2a, 14/9; 0-9-15v. 3a, 16/9; 0-9-15v. 5a, 19/9; 0-9-15v. 6a, 23/9; 0-9-15v. 8a. 28/9.
AUTO (Step up/Step down) TRANS. 0-110/120-230/250v. 50-80 watts. 13/9; 250 watts. 39/9; 150 watts. 27/9.
MICROPHONE TRANSFORMERS 120:1 high grade, clamped. 8/9.

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

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

Facilities include:

★ **Three-position tone compensation switch.**

★ **Stereo/Mono switch so that peak monaural output of 28 watts can be obtained.**

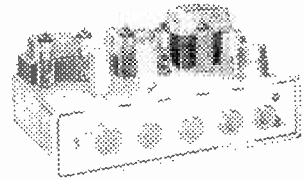
★ **Separate Bass 'lift' and 'cut' and treble 'lift' and 'cut' controls.**

★ **Neon panel indicator.**

SUITABLE for 'MIKE', GRAM, RADIO OR TAPE.

INTENDED FOR THE HOME or STUDIO BUT EQUALLY SUITABLE FOR LARGE HALLS OR CLUBS.

For operation on standard 200-250v. A.C. mains.



Complete set of parts with point to point wiring diagrams and instructions. **12GNS.** Carr. 10/- or Factory assembled, tested and supplied with our usual 12 months' guarantee for **16 gns.** Or DEPOSIT **37/9** and nine monthly payments of **37/9.** Protective wooden cabinet covered in pleasing shade of leathercloth and fitted carrying handles and plastic feet **59/9** extra or DEPOSIT **6/9** and nine monthly payments of **6/9.**

Based on a current Mullard design and employing valves ECC83, ECC83, ECL86, ECL86, ECL86, ECL86, EZ81. Output transformers are high quality sectionally wound to required specification. Output matchings for 3 and 15 ohm speakers on each channel. FREQUENCY RESPONSE ± 2dB. 30–20,000 c.p.s. Hum level 65dB down. SENSITIVITY: 15 millivolts maximum. Send S.A.E. for illustrated leaflet.

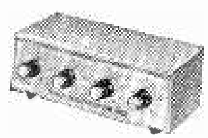
R.S.C. COLUMN SPEAKERS

Cabinets polished walnut finish. Ideal units for vocalists and public address systems.

Type C58 20 watts for 15 ohms and 100v. line. Fitted five 8in. high flux P.M. Speakers and matching transformers. Size approx. 42 x 10 x 5in. **15GNS.** Carr. 10/- Or Deposit **34/9** and nine monthly payments of **34/9.**

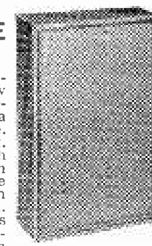
Type C57 as above model but 10 watts rating and incorporating five elliptical speakers with an overall size of approx. 26 x 9 x 4in. **11gns.** Carr. 7/6 or DEPOSIT **25/9** and nine monthly payments of **25/9.**

TRANSISTORISED MICROPHONE MIXER



Enables mixing of up to 4 instruments, i.e. mic, tape, gram, tunes, etc., into single output. Compact and completely self-contained uses standard 9v. battery. Inputs and outputs take standard plugs. PRICE **59/6**

THE AUDIOTRINE 3D/1



A complete three diaphragm high fidelity loudspeaker unit designed to occupy a minimum of space. Depth is only approx. 8in. Height 24in. Width 15in. This has been made possible by the latest developments in loudspeaker design. The 12in. cast chassis Bass unit has a resonant frequency which is extraordinarily low. It has a second diaphragm which extends the frequency range to 17,000 c.p.s. A further speaker operates only on the middle frequencies and ensures a smooth response from 40–17,000 c.p.s. Rating 20 watts. Imp. 15 ohms. Cabinet finish is either polished walnut veneer, or leathercloth to match stereo/20 cabinet. Highly recommended for any Stereo or Mono amplifier. Surely the best value ever at **11GNS.** Or Deposit 25/9 and nine monthly payments of 25/9

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PAGE 614 FOR ADDRESSES

HOME RADIO CATALOGUE

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With the arrival of the 10th Edition of the famous Home Radio Catalogue we announce a fresh policy. The new price of 5/- will just cover the cost of the paper and printing, but on the first page of the catalogue you will find 5 coupons, each worth 1/- if used as directed. Briefly the system will operate thus: for each complete £1 of your order you enclose one of the coupons and deduct 1/- from the money you send. **There is no time limit** so if you purchase £5 worth of components from us—*even though spread over several years*—your catalogue will have cost you nothing!

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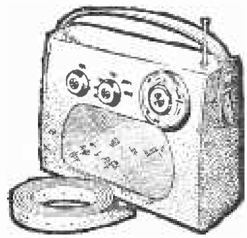


ROAMER SEVEN Mk III

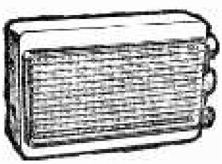
5 WAVEBAND PORTABLE OR CAR RADIO

Amazing performance and specfication ★ ***Now with PHILCO MICRO-ALLOY R.F. TRANSISTORS***

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

Covers Medium and Long Waves, Trawler Band and two Short Waves to approx. 15 metres. Push-pull output for room filling volume from rich toned heavy duty 5in. speaker. Air spaced ganged tuning condenser. Ferrite rod aerial for M & L waves and telescopic aerial for S Waves. Real leather look case with gilt trim and shoulder and hand straps. Size 9 x 7 x 4in. approx. The perfect portable and the ideal car radio. (Uses PP7 battery available anywhere).

Total cost of parts now only **£5.19.6** P. & P. 5/6
Parts Price List and easy build plans 3/-



TRANSONA FIVE

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

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

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

Total cost of all parts now only **42/6** P. & P. 3/6 *Parts Price List and easy build plans 2/-*

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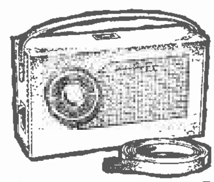
". . . amazed at volume and performance. . . has really come up to my expectations." S. G. Stockton-on-Tees.



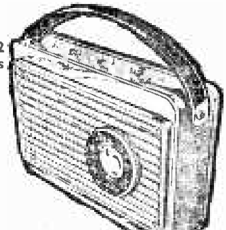
● **8 stages—6 transistors and 2 diodes**

Our latest completely portable transistor radio covering medium and long waves. Incorporates pre-tagged circuit board, 3in. heavy duty speaker, top grade transistors, volume control, tuning condenser, wave change slide switch, sensitive 6in. ferrite rod aerial. Push-pull output. Wonderful reception of B.B.C. Home and Light, 208 and many Continental stations. Handsome leather-look pocket size case, only 6½ x 3½ x 1½in. approx. with gilt speaker grille and supplied with hand and shoulder straps.

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

TRANSONA SIX

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

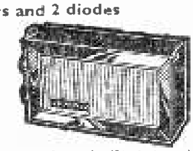


This is a top performance receiver covering full Medium and Long Waves and Trawler Band. High-grade approx. 3in. speaker makes listening a pleasure. Push-pull transformers for ample power. Ferrite rod aerial. Many stations listed in one evening including Luxembourg loud and clear. Attractive case in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

Total cost of all parts now only **59/6** P. & P. 3/6.
Parts Price List and easy build plans 2/-.

POCKET FIVE

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



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

Parts Price List and easy build plans 1/6.
Total cost of all parts now only **42/6** P. & P. 3/-.

SUPER SEVEN

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

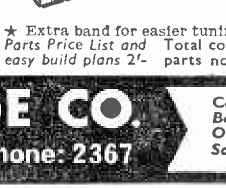
Covers Medium and Long Waves and Trawler Band. The ideal radio for home, car, or can be fitted with carrying strap for outdoor use. Completely portable—has built-in Ferrite rod aerial for wonderful reception. Special circuit incorporating 2 RF Stages, push-pull output. 3in speaker (will drive large speaker).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

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

ROAMER SIX NEW!!

NOW WITH PHILCO MICRO-ALLOY R.F. TRANSISTORS

● **6 WAVEBAND!!**



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

Listen to stations half a world away with this 6 waveband portable. Tuneable on Medium and Long waves, Trawler band and three Short Waves. Sensitive ferrite rod aerial and telescopic aerial for short waves. Top grade transistors, 3-inch speaker, handsome case with gilt fittings. Size 7½ x 5½ x 1½in. Carrying strap 2/- extra.

★ Extra band for easier tuning of LUX. etc.
Parts Price List and easy build plans 2/- Total cost of all parts now only **£3.19.6** P. & P. 3/6

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

RADIO EXCHANGE CO.

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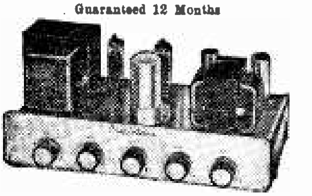
THE TRIPLETONE HI-FI MAJOR

PRICE ONLY £15.18.9 COMPLETE
Guaranteed 12 Months



A 12 watt quality amplifier incorporating negative feedback, with a pre-amp for mic. and provision for mic./gram mixing. Frequency response ± 1 dB 15-20,000 c/s. Distortion only 0.15%, with noise and hum —80 dB. Separate Bass, Middle and Treble lift controls. Valve line-up, 12AX7, 12AX7, EL84, EL84 and EZ81. Push-pull output with matching to 3 or 15 Ω. Fully isolated power supply from 200/250 v. A.C. input, with take-off for tuner etc. Size 12 x 5¾ x 6in. high.

De Luxe Case: 14in. x 9in. x 7¼in., 30/- extra.

New R.C.S. VALVES 90-day Guarantee

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6J6	5/-	954	2/-	EZ40	5/-	EL41	9/-
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465 K/s Slug Tuning Miniature Can, 2 x 1 x 1in.
High Q and good bandwidth. Data Sheets.

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TRIMMERS. Ceramic. 30, 50, 70 pF., 9d.; 100 pF., 150 pF., 1/3; 250 pF., 1/6; 500 pF., 750 pF., 1/9.
TV etc. TRIMMER, 1000 pF., with knob, 2/-.
RESISTORS. Preferred values. 10 ohms to 10 meg. ¼ w., ½ w., 1 w., 4d.; 1½ w., 8d.; 2 w., 1/-.
High Stability. ½ w., 1%, 2/-. Preferred values 10 Ω to 10 meg. Ditto 5% 10 Ω to 22 meg., 9d.
BRIMISTORS CZ1, 3/6; CZ2, 2/6; CZ3, 1/6.

WIRE-WOUND RESISTORS 10 ohms—10,000 ohms
5 watt 1/3
10 watt 2/-
15 watt 2/-

12.5 K to 25 K 10 w. 3/-
Toggle Switches, s.p., 2/-; d.p., 3/6. d.p.d.t., 4/-. Min. Slide d.p.d.t., 3/6.

Volume Controls Linear or Log Tracks Long spindles. Midget 5 K ohms to 2 Meg. L.S., 3/- D.P., 4/6
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1m. log + 1m. A/log, 7/6

80 ohm CABLE COAX Semi-air spaced ¼in. 40 yds. 17/6 60 yds. 25/- **6d.yd.**
Ideal 625 lines. Low loss 5dB 100ft. 500 Mc/s **1/6yd.**

MAINS TRANSFORMER 200/250 v. A.C.
Postage 2/- each transformer
STANDARD, 250-0-250 80mA. 6.3 v. 3.5 a. tapped 4 v. 4 a. Rectifier 6.3 v. 1 a., 5 v. 2 a. or 4 v. 2 a., 22/6, ditto, 350-0-350 29/6
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MULLARD "510" Mains Transformer .. 33/6
MAINS POWER PACKS. Ready built with Transformers, Rectifiers, Condensers, providing H.T. and L.T. outputs.
200 v. 20 mA. D.C. 6.3 v. 1 a. A.C. .. 25/6
220 v. 50 mA. D.C. 6.3 v. 2 a. A.C. .. 35/6
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INTERVALVE TRANSFORMERS. 3:1 or 5:1, 9/-.
O.P. TRANSFORMERS. Heavy Duty, 5/6. Multi-ratio, 7/6. Multiratio heavy duty push-pull, 10 w. 15/6. Battery, 4/6. Sub. min. DL96, 3V4, etc., 5/9. 10 w. O.P. matching trans, 3, 7, 15 Ω, 12/6.
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C.R.T. BOOSTER TRANSFORMERS for heater cathode short circuit or tubes with failing emission. Full instructions supplied, mains input. Type A optional 25% and 50% boost 2v. or 4v. or 6.3v. or 10.8v. or 12.6v. State Voltage required. PRICE 10/6.

TINNED COPPER WIRE 16 to 22 swg., ½lb.. 3/6
ENAMEL COPPER WIRE 16-22, 2/9; 24-30, 3/6; 32-40, 4/6; D.C.C. 28, 34, 36 swg., 2oz., 3/6.
FULL WAVE BRIDGE SELENIUM RECTIFIER: 2, 6 or 12 v., 1½ amp., 8/9; 2 a., 11/3; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amps., 15/6; 2 amps., 17/6; 4 amps., 22/6. Circuit included.
4 AMP CAR BATTERY CHARGER with ammeter, Leads, Fuse Case, etc., for 6 v. or 12 v., 59/6.

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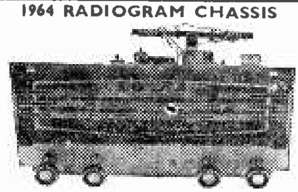
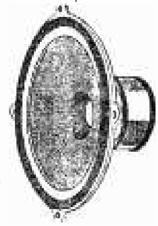
4 TRANSISTOR PUSH-PULL
Size 3 x 1½ x ¾in. **AUDIO AMPLIFIR**
A ready built miniature push-pull amplifier with Driver and output transformers, 4 transistors. Ideal for use with record players, intercoms., BABY ALARMS, etc. Complete with full instructions and circuit.
Price **47/6** 9v. Batt. 2/3. 2½in. Speaker 15/-

1964 RADIOGRAM CHASSIS



THREE WAVEBANDS FIVE VALVES
S.W. 16 m —50 m. LATEST MULLARD, etc.
M.W. 200 m —550 m. ECH81, EF89, EBC81,
L.W. 800 m.—2,000 m. EL84, EZ80
12-month Guarantee
A.C. 200/250 v. Short-Medium Long/Gram. Ferrite Aerial A.C.V, 3 ohm output, 5 watts. **Tape Sockets.** Glass dial, horizontal wording size 13in. x 7in. Aligned and callibrated, isolated Chassis size 13½in. x 7in. high x 5½in. deep.
£9.15.6 Carr. & Ins. 4/6.

BAKERS 'Selhurst' LOUDSPEAKERS



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BAKER'S
8in. JUNIOR SPECIAL. 8w. 17,000 lines. 5 gns. Foam Suspension 40-20,000 c.p.s.

BAKERS
12in. STALWART HEAVY DUTY 15w. 5 gns. 3 or 15 ohm voice coils. Unlimited Applications. Response 45 to 13,000 cps. Magnet 12,000 lines. Quality unbeatable.

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BAKERS
12in. BASS HEAVY DUTY 25w. 12 gns. New 1964 high power model. Aluminium coil former with magnetic damping 25-15,000 cps. Ideal for all electric guitars.

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15in. AUDITORIUM MODEL 35w. 18 gns. Improved magnet alcomax with heavy plated assembly. weight 16lbs., 17,000 lines. 20-12,000 cps. Solid heat proofed Paxolin Coil Former. Ideal for all Electric Guitars.

LOUDSPEAKERS P.M. 3 OHM. 2½, 3, 4, 5in. 7 x 4in., 15/6; 6½in. Rola, 16/6; 8in. Plessey, 17/6; 9 x 6in., 8 x 5in., 21/-; 10 x 6in., 22/6; 10in. Rola 30/-; 12in. R.A., 30/-; EMI, Double Cone Ceramic magnet 10 w. 13 x 8in., 45/-. Horn Tweeter, 29/6.
STENTORIAN HF1012. 10in. 3 to 15 ohms 10 w., 92/-; 8in. HF812, 76/-; Crossover CX3000, 33/-.
EXTENSION SPEAKER CABINET. 5in., 15/6; 6½in., 18/6; 8in., 19/6; 10in., 29/6; 12in., 60/-.
TWIN GANG TUNING CONDENSERS. 365 pF., 1in. x 1¼in. x 1¾in., 10/-; 500 pF Standard with trimmers, 9/-; midget, 7/6; with trimmers, 9/-. 500 pF slow motion tuning standard, 9/-. Transistor gang 208+176 pF with trimmers, 10/6. **SMALL** 3 gang 500 pF, 17/-. **SINGLE** 365 pF, 7/6. **SINGLE** 10 pF, 25 pF, 50 pF, 75 pF, 100 pF, 150 pF, 5/6. Solid dielectric 100, 300, 500 pF, 3/6.
CONDENSERS. 0.001 mfd, 7 kV, T.C.C., 5/6; 20 kV, 9/6; 0.1 mfd, 7 kV, 9/6; Tubular 500 v. 0.001 to 0.05 mfd, 9d.; 0.1, 1/-; 0.25, 1/6; 0.5/350v., 1/9; 0.1/350v., 9d.; 0.01/2,000v., 0.1/1,000v., 1/9; 0.1mfd, 2,000 volts, 3/6.
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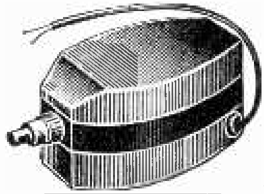

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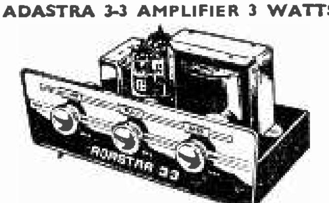

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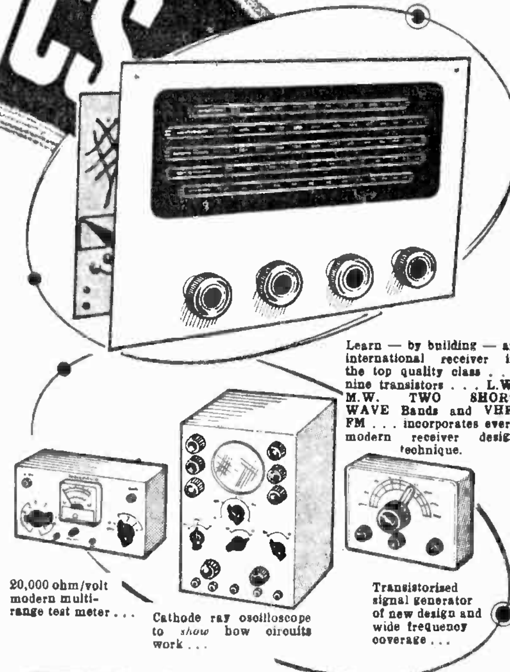

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British National Radio School

Practical Wireless

Vol. XL No. 693 NOVEMBER, 1964

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Contents

Times have Changed!

THE problem of pirates has been with us since radio began. In this context we are not talking of floating pop-music stations but of illegal amateurs operating in (or out of) the amateur bands.

In pre-war days, a prospective radio amateur had first to obtain from the GPO an "Artificial Aerial" licence which permitted him to build and experiment with equipment to be used only under dummy load conditions.

Log books and records of experiments, together with an inspection of the actual equipment, formed the basis for assessing the ability of the applicant to put his station on the air and receive his full licence.

Occasionally an impatient AA licence holder would succumb to temptation and put some r.f. out. Even so, a pirate of this nature had at least built his own equipment, had a working knowledge of amateur radio practice and was in most cases a qualified amateur operator anticipating the issue of his full "ticket".

Today's pirates are largely in a different category. Most seem to operate war surplus units or imported American and Japanese walkie-talkies. Most have little or no knowledge of ham radio procedure, have only a rudimentary knowledge of how the equipment works, and often do not even operate in the authorised bands.

Perhaps the root cause of this new situation is that nowadays *anyone* can buy, without question, transmitting equipment from a radio dealer. Advocates of "freedom" see nothing wrong in this; they urge that *anyone* who wants to go on the air should be allowed to do so. They think it an impertinence that an enthusiast should have to pass a simple technical test when all he wants to do is to operate a transmitter for his own amusement.

Such theories are shortsighted and irresponsible. All right, we'll abolish the radio examination—and with it examinations for doctors, opticians, dentists, lawyers! We'd like to see a "free air" fan having his molars drilled by an unqualified dentist.

The allusion, of course, is undoubtedly shaky—but it serves to illustrate a principle. For there is much more to it than just switching on a transmitter and exchanging small talk with a pal. Amateur frequency allocations are extremely small and vastly overcrowded and these conditions demand efficient equipment and intelligent operating.

Amateur radio cannot be regarded purely as a personal hobby, for thousands of other people are involved. Other amateurs, of course. The general public (how would a modern pirate deal with TVI problems?). And those anarchists who feel they do not even have to consider authorised amateur bands can involve any of the other services legally using the restricted airways. Uncontrolled freedom can only lead to chaos and confusion.

There are many angles to examine, but perhaps the most important is that often put forward as the platform of the "free-air" devotees. *Times have changed!* Indeed they have—and next month we will see just how.

In the meantime, we hope prospective pirates will turn to page 627 this issue . . .

Our next issue dated December will be published on November 6th.

ROUND THE WORLD of WIRELESS

NEWS AT HOME AND ABROAD

The 1964 R.S.G.B. Exhibition

THIS year's International Radio Communications Exhibition will again be held at the Seymour Hall, Seymour Place, London. W.1, from 28th to 31st of October, and once again radio enthusiasts from all parts of the country will visit this, the annual show of the Radio Society of Great Britain.

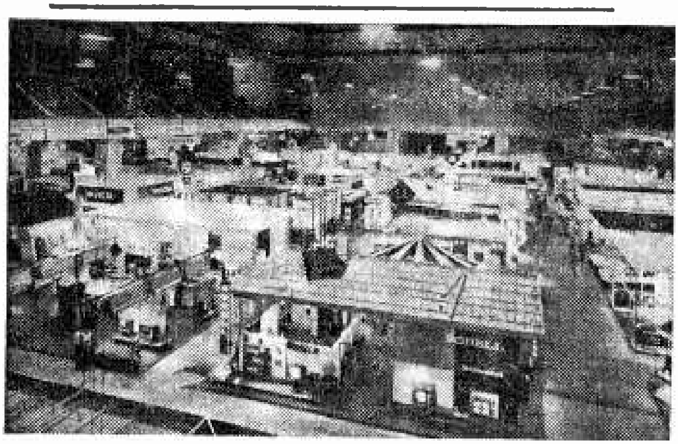
Manufacturers — British, American and Japanese—will be displaying the very latest in receivers and transmitters for the amateur, including a transistorised all-band communications receiver. Kit and aerial manufacturers, technical publishers, etc., will all be exhibiting as will the Royal Navy, Royal Air Force, Army and General Post Office with their newest communications equipment.

The 1964 Silver Plaques for the most outstanding home built piece of equipment and manufacturers' new equipment, head the list of awards which will be presented during the show.

The R.S.G.B. will this year operate a new home-constructed transmitter on 435Mc/s, 144Mc/s and 3·5Mc/s. A demonstration of r.t.t.y. will also by on the air on 3·5Mc/s, 80m and 145Mc/s, 2m.

The official opening will be performed at noon on 28th October, by E. D. Whitehead. M.B.E., Director of Electrical Inspection at the Ministry of Aviation, and the Exhibition will be open daily from 10 a.m. to 9 p.m., admission 3s.

The 1964 Radio Show



Here is a view of this year's Radio Show at Earls Court, London. Attendance this year was down on the last Show, held in 1962. A Report on the show appears on page 636.

MICROWAVE TELEPHONE NETWORK FOR PORTUGAL

A HIGH capacity microwave relay network for Portugal that can handle as many as 960 telephone conversations simultaneously, is to be supplied to the government of Portugal by the Raytheon Company of America.

The 140 mile network will consist of seven stations and will span northern Portugal with terminals for the main line at Porto and Nogueira. At Nogueira, the system will interconnect with a scatter communications system linking Portugal to France and the European Telecommunication network. Three other cities —Penafiel, Vila Real and Braganca—will be linked into the network via feeder spurs.

The main line will consist of Raytheon's RM-1C microwave relays, as will the Vila Real spur, because of its heavy traffic pattern. The two other spurs will feature 600 channel microwave relays built by Raytheon's Italian affiliate, Selenia S.p.A.

To provide maintenance centres with a complete picture of the system's operating condition, the network will incorporate automatic fault-reporting systems.

NEW INSTRUMENT CHECKS EQUIPMENT FOR SPACE

AN instrument which will perform fault-revealing checks on the electronic equipment of future space vehicles launched by the National Aeronautical and Space Administration of the U.S.A., is being developed by the Raytheon Company of Massachusetts.

The equipment consists of a fast scanning infra-red microscope that can forecast possible failure of electronic space devices without long, complex tests.

The microscope, which has been termed a Performance Analyzer, will sense minute amounts of infra-red radiation and from this will indicate the reliability and probable life expectancy of an integrated circuit or semiconductor device. Potential electrical failure can be pin-pointed by this equipment, not only in conventional parts but in the micro-circuits and thin-film assemblies which are featuring more and more in space vehicle electronics. So tiny are some of these integrated circuits, that they frequently contain faults which cannot be detected by conventional testing methods.

In operation the analyser relies on the fact that virtually all built-in causes of failure result in abnormal thermal behaviour when electrically activated. The infra-red detector measures the heat dissipated when a component or circuit is operating. Comparing this with a standard, an engineer can determine performance and discover the presence of hidden defects that could cause later failures.

Eire Telephone Expansion

TO expand the trunk telephone network in Eire, orders worth £145,000 have been placed with AEI Telecommunications Transmission Department for terminal equipment capable of handling 300 separate conversations, for transmission over small diameter coaxial cables.

Four new links are to be established: from Dublin to An Uaimh and Ceanannus Mor (24 high quality speech circuits), Limerick to Tipperary (96 circuits), Cork to Youghal and Cork to Bandon (both with 60 circuits).

In using conventional small diameter coaxial cable, AEI will be taking advantage of the low cost compared with conventional telephone cable networks of similar capacity, and better speech quality, since the incorporation of transistorised repeaters has overcome the problem of housing which the considerably larger counterpart valve equipment presented before.

With transistors however, the size of amplifiers that AEI will use, along with their power consumption, has been considerably reduced and large numbers of repeaters will take their power from current fed along the cable.

Radar Developments on Show at Farnborough

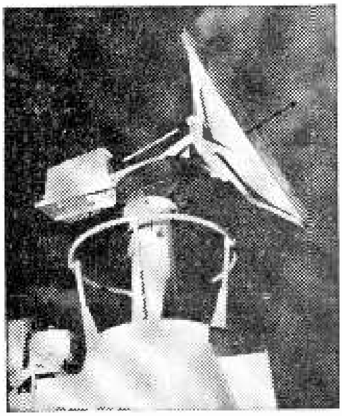
TWO new Marconi developments in radar were shown publicly at the recent Farnborough air show. One was a new high power, long range meteorological radar system which can track and pin-point storms and rain producing clouds within an area of 125,000 miles, with extreme accuracy and reliability.

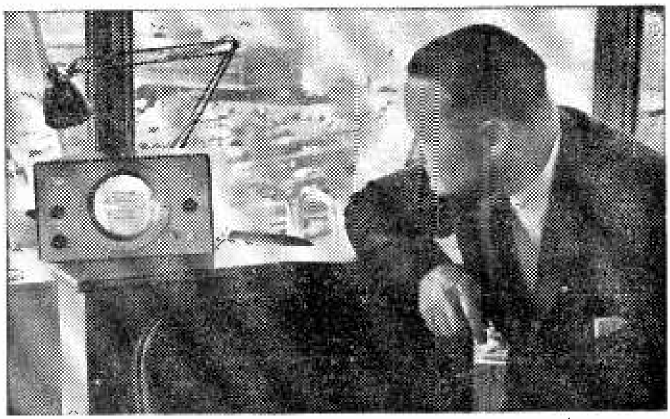
Named RAINBOW, the system has been designed to provide an inexpensive equipment suitable for use at airports, where it can provide first hand meteorological information to the air traffic control centre.

RAINBOW's 70kW p.e.p. high power transmitter and receiver are both housed in a 12ft. high conical shaped aluminium tower on top of which is mounted a 6ft. diameter parabolic dish aerial

The other Marconi innovation seen on their Farnborough stand, was the production model of a new radar display which can be viewed in bright daylight.

A considerable step forward is claimed for this new development, which is based on the use of a direct view storage tube. The tube, which produces a very bright radar picture using a high efficiency short persistence phosphor, contains a storage element to introduce persistence to the picture.





On the left is the transmitter and receiver and dish aerial of Marconi's new RAINBOW meteorological radar system. The equipment in the photograph shown on the right is Marconi's daylight radar display in use at London Airport.

PRESENTED FREE
WITH
"PRACTICAL WIRELESS"
NOVEMBER 1964

Practical Wireless

"AUTOCRAT" CAR RADIO

PRICE 5/-

PUBLISHED BY GEO. NEWNES LTD., TOWER HOUSE, SOUTHAMPTON STREET, LONDON W.C.2.

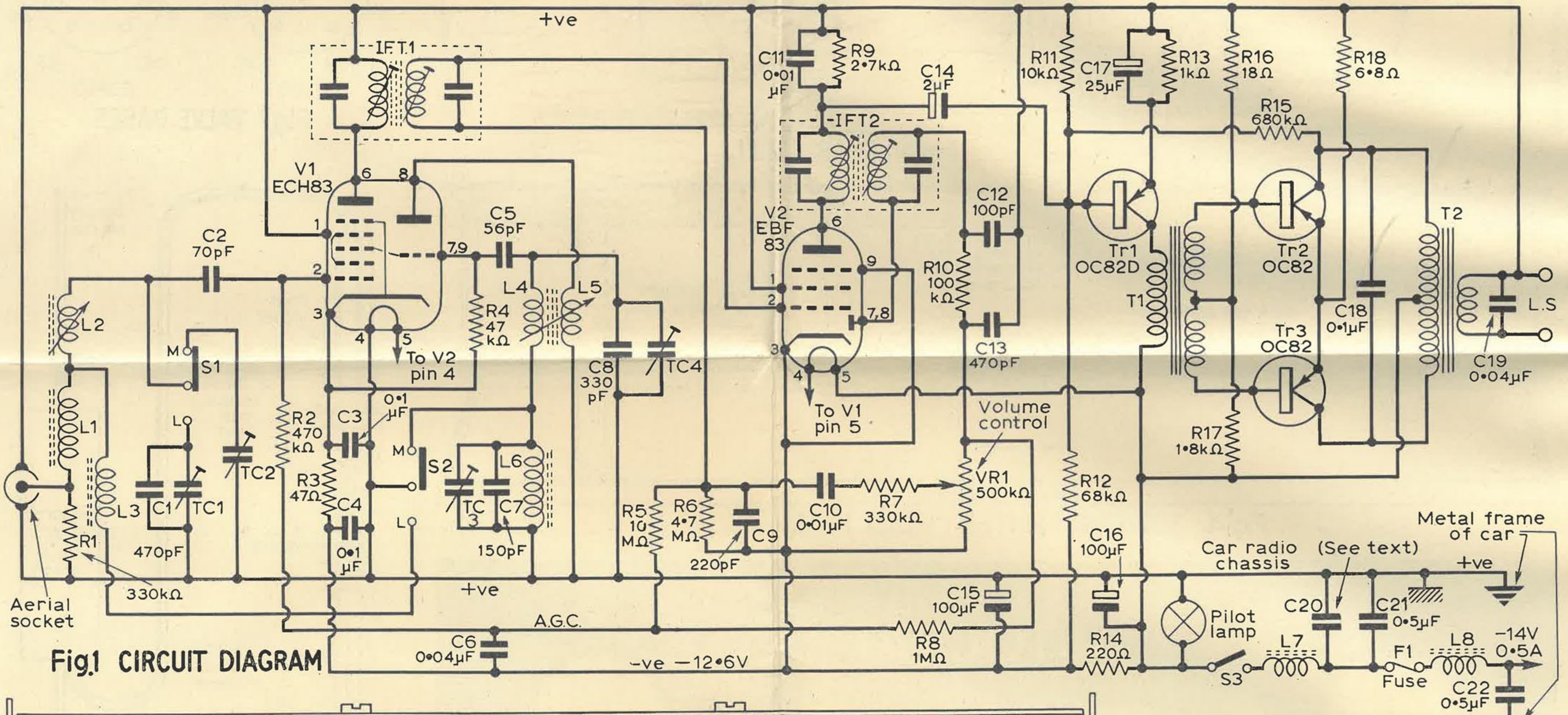


Fig.1 CIRCUIT DIAGRAM

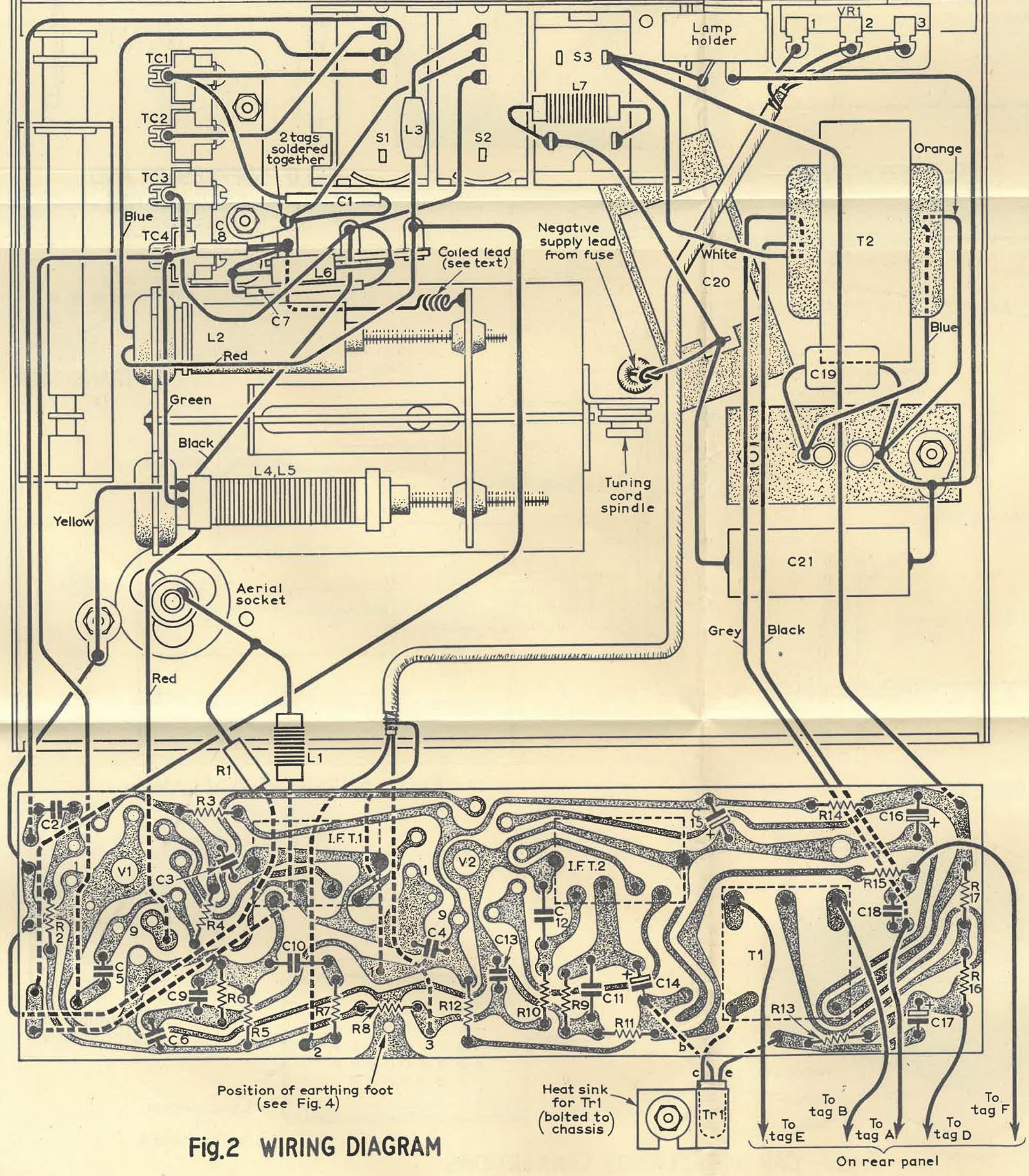


Fig.2 WIRING DIAGRAM

COMPONENTS LIST

Resistors:
- R1 330kΩ
- R2 470kΩ
- R3 47Ω 10%
- R4 47kΩ 10%
- R5 10MΩ
- R6 4·7MΩ
- R7 330kΩ
- R8 1MΩ
- R9 2·7kΩ 10%
- R10 100kΩ
- R11 10kΩ 10%
- R12 68kΩ 10%
- R13 1kΩ 10%
- R14 220Ω 10%
- R15 680kΩ
- R16 18Ω 5%
- R17 1·8kΩ 5%
- R18 6·8Ω 10% 1W

All ± 20% and ¼W carbon, unless otherwise stated.
- VR 500kΩ log. potentio meter

Inductors:
- IFT1, 2 I.F. transformers
- L1 25μH r.f. choke
- L2, 4, 5 M.W. aerial and oscillator coils, part of permeability tuner unit mounted on chassis. ●
- L3 L.W. aerial loading coil (yellow)
- L6 L.W. oscillator loading coil (green)
- L7 25μHr.f. choke
- L8* 25μHr.f. choke ●
- T1 Push-pull driver transformer
- T2 Push-pull output transformer

Valves and Transistors:
- V1 ECH83
- V2 EBF83
- Tr1 OC82D
- Tr2, 3 OC82 matched pair

Miscellaneous:
S1, S2, S3 Push-button switch unit
LP1 12V 2·2W bulb MES
F1 2A fuse
Bulbholder. Elliptical loudspeaker. Printed circuit board.● Tuning dial.● Two 1⅛in. x 4BA spacers. One two-pin plug and socket. One 3-way tag strip. One grommet. One 6-way tag strip. Speaker baffle. Two control knobs. Two B9A printed circuit valveholders. Two valve screening cans B9A. Two screening can earthing clips. Fuseholder. Three transistor heat sinks.

Capacitors:
- C1 470pF silver mica or Polycap 5%
- C2 70pF ceramic or silver mica
- C3 0·1μF Polycap
- C4 0·1μF Polycap
- C5 56pF ceramic or silver mica
- C6 0·04μF Polycap
- C7 150pF Polycap or silver mica 2·5%
- C8 330pF Polycap or silver mica 2·5%
- C9 220pF ceramic or silver mica
- C10 0·01μF ceramic
- C11 0·01μF ceramic
- C12 100pF ceramic or silver mica
- C13 470pF ceramic or silver mica
- C14 2μF elec. 15V
- C15 100μF elec. 15V
- C16 100μF elec. 15V
- C17 25μF elec. 6V
- C18 0·1μF Polycap
- C19 0·04μF Polycap
- C20● Spark plate, see text
- C21 0·5μF paper
- C22* 0·5μF paper ●

Variable Capacitors:
TC1-4 4-way trimmer bank

Nuts, Bolts, Wire, etc.:
Eight self-tapping screws. Seven 6BA x ¼in. bolts. Seven 6BA full nuts. Four solder tags. Two 4BA x 1½in. bolts. Five 4BA x ¼in. bolts. Seventeen 4BA full nuts. Seven 4BA washers. Four 4BA x ½in. bolts. Twelve inches of twin screened lead. Two yards of twin stranded lead. Single stranded lead and systoflex. Adhesive double-sided tape 2in. x 1in. (C20—see text).

Main Metalwork and drive components, etc.:
Main chassis fitted with dial-drive assembly, aerial socket and permeability tuner unit (L2, L4, L5). ●
Rear panel ●
Metal cover ●
Chrome escutcheon ●

* The filter/suppressor components, C22/L8, are supplied as a complete, assembled unit

● Sterne-Clyne, Ltd.

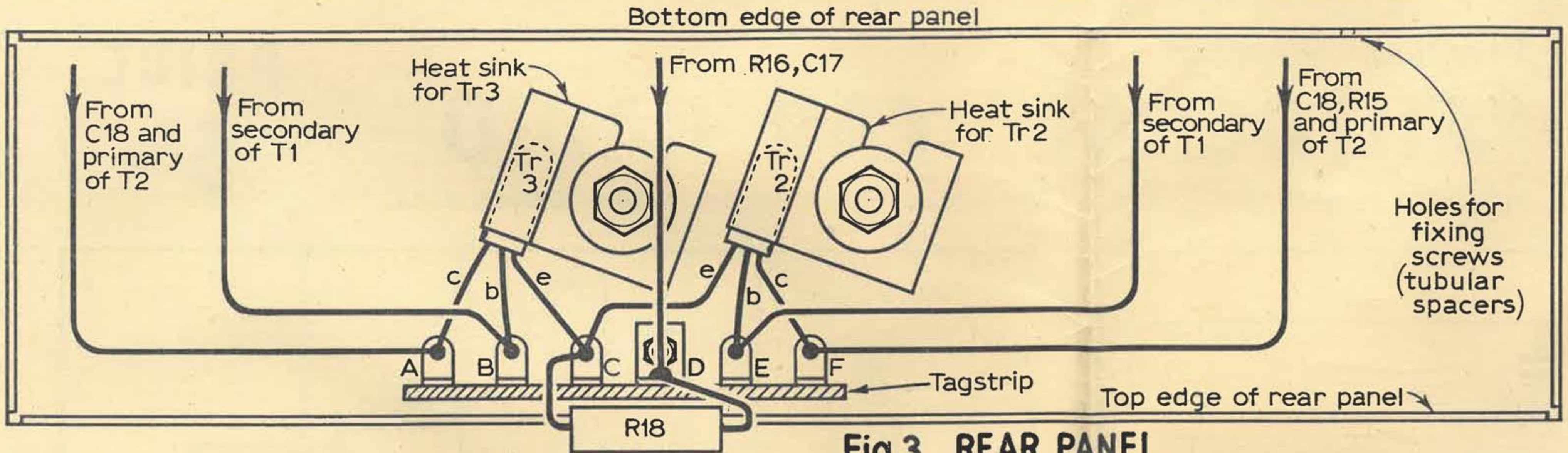


Fig.3 REAR PANEL

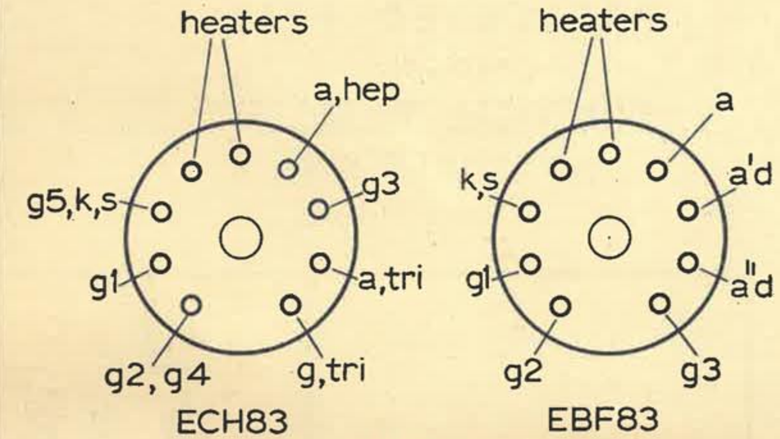


Fig.7 VALVE BASES

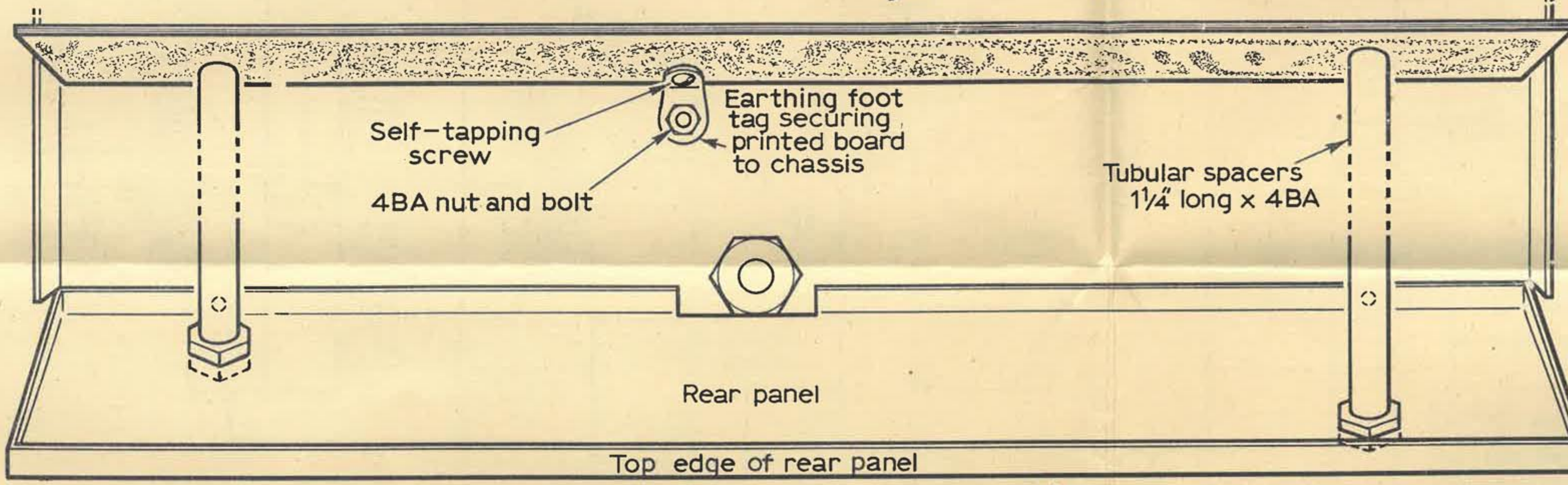
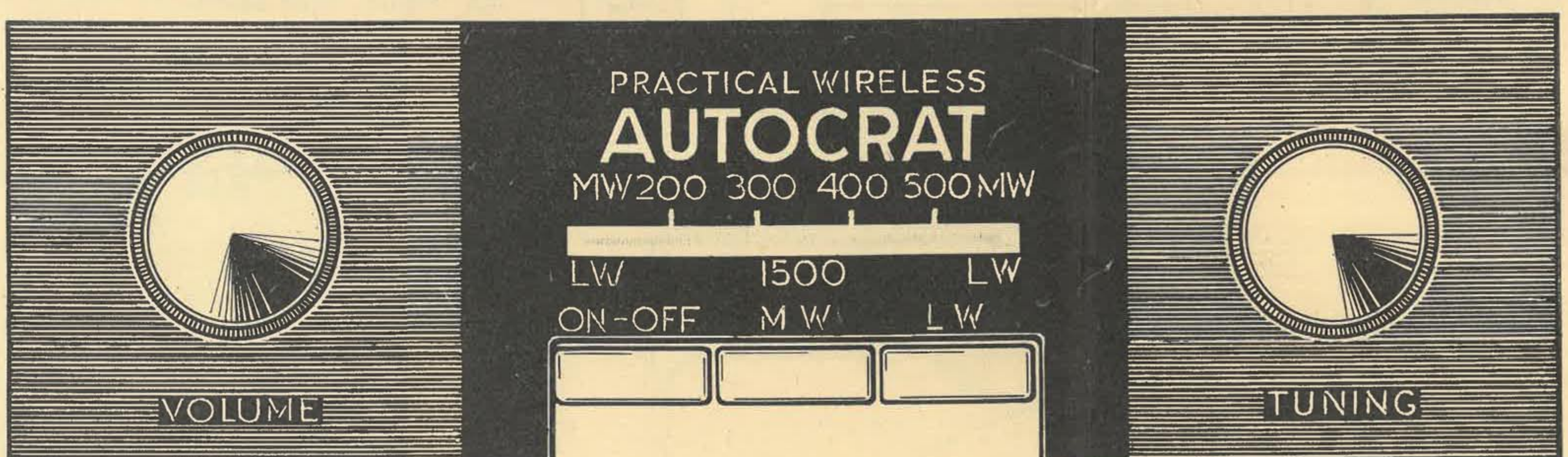


Fig.4 SECURING PRINTED CIRCUIT BOARD



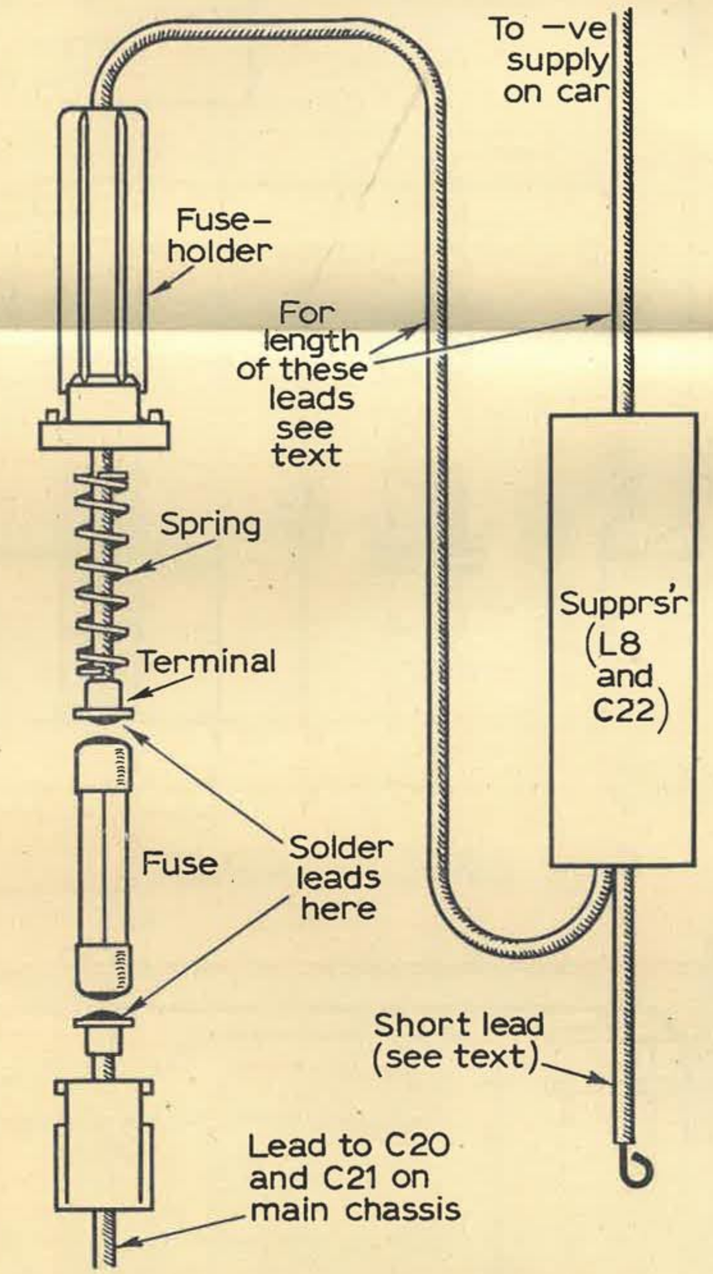


Fig.5 FRONT VIEW

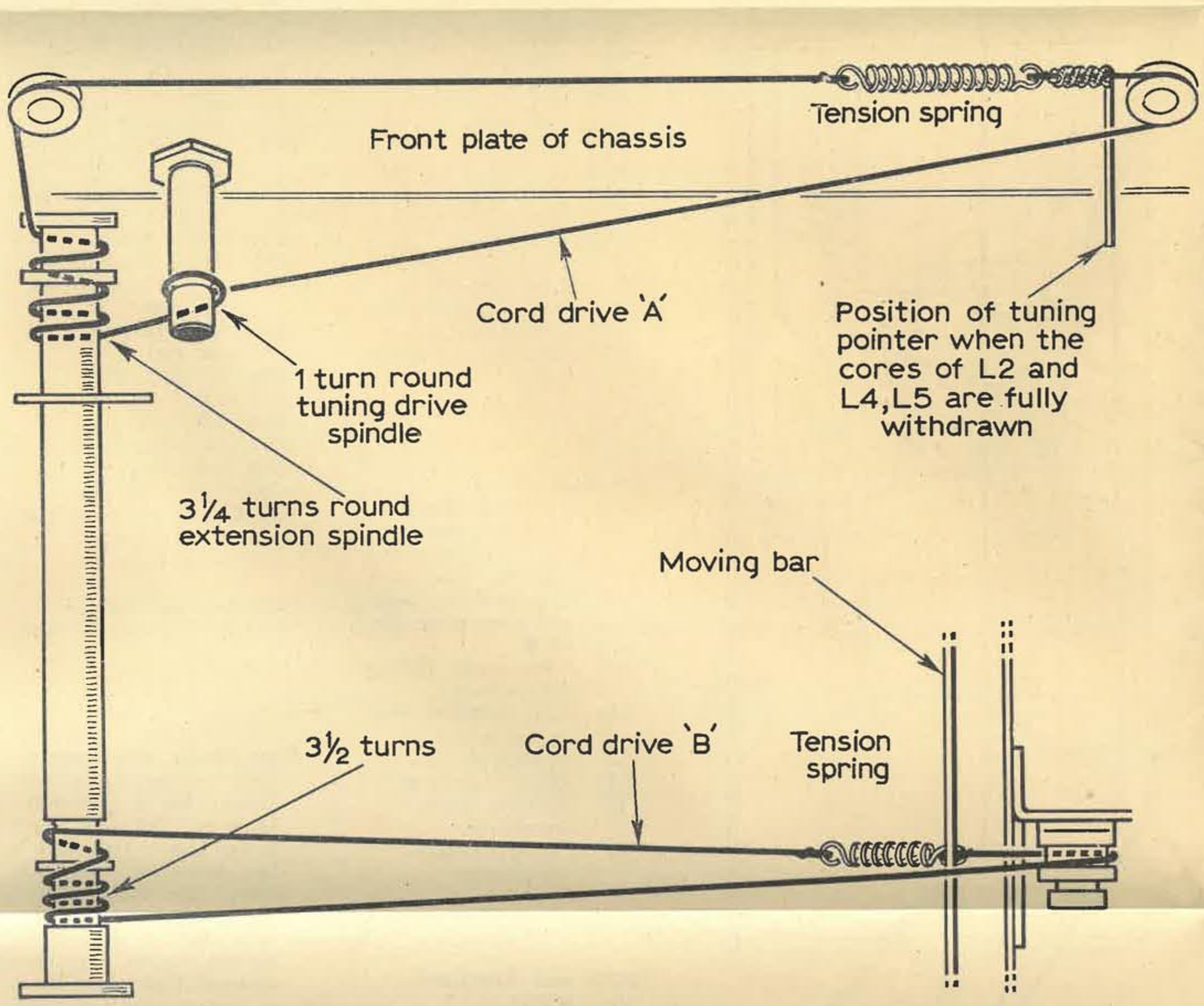
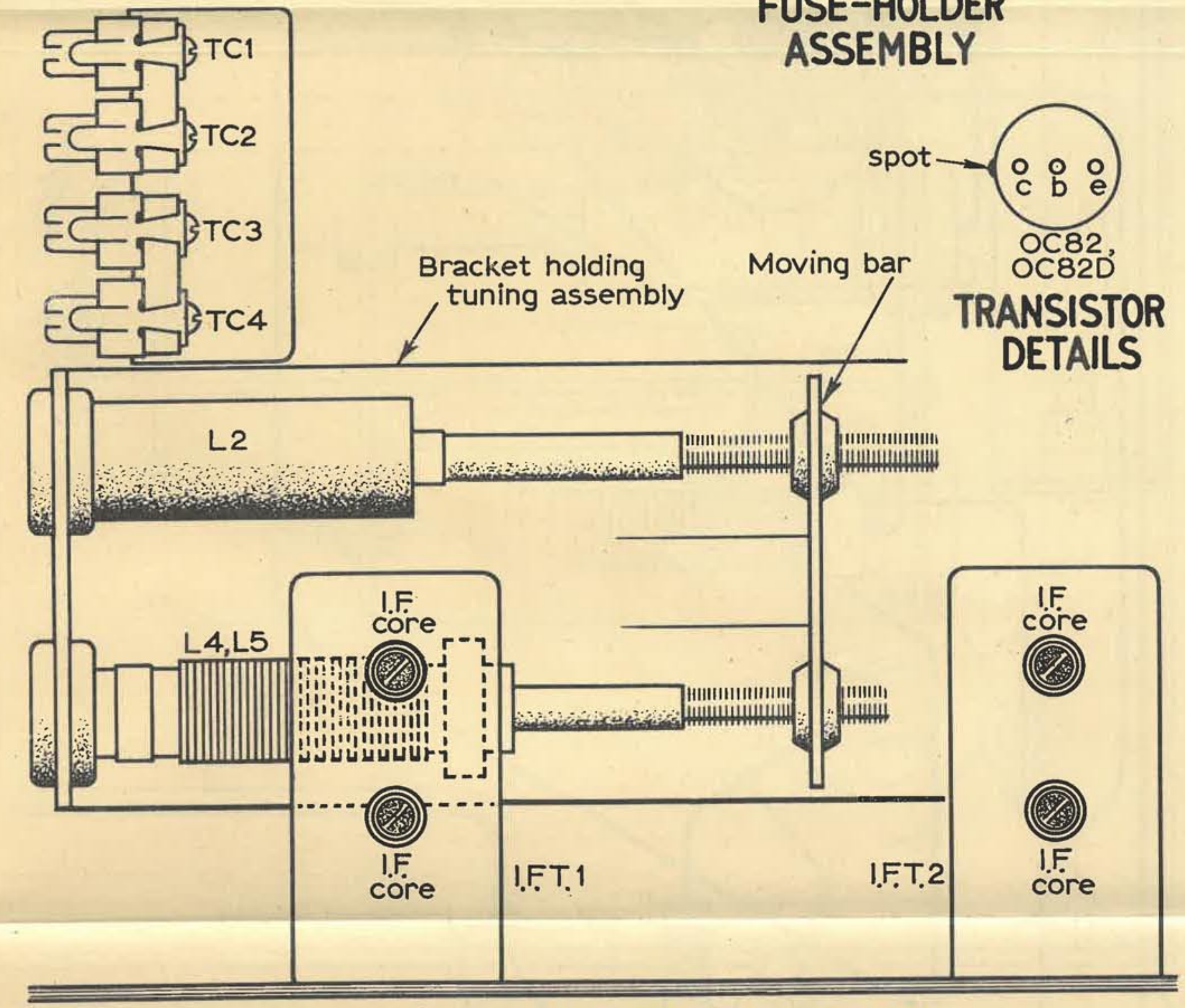


Fig.6 CORD DRIVE DETAILS

Fig.8 SUPPRESSOR AND FUSE-HOLDER ASSEMBLY



TRANSISTOR DETAILS

Fig.9 ALIGNMENT DIAGRAM

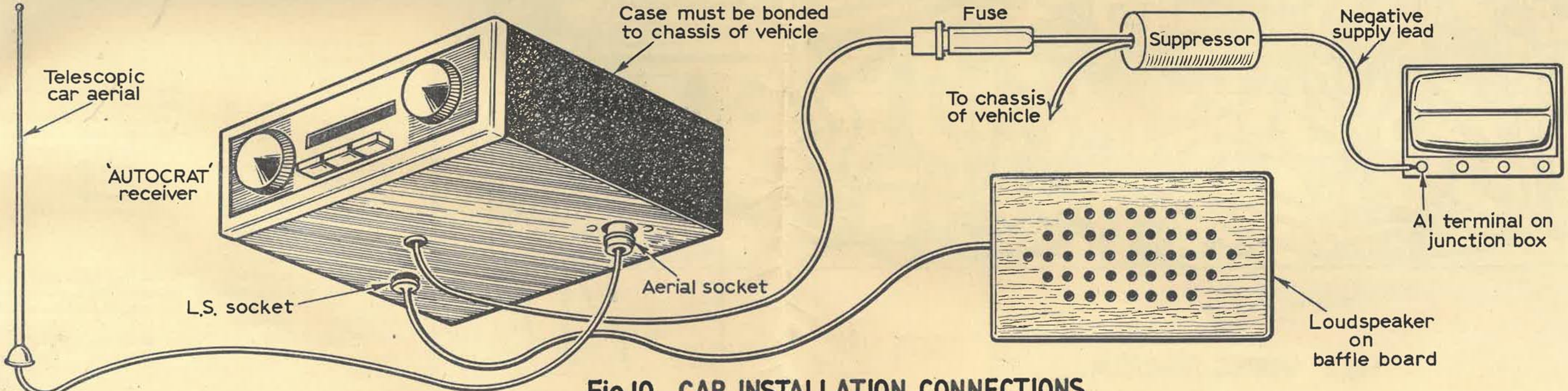
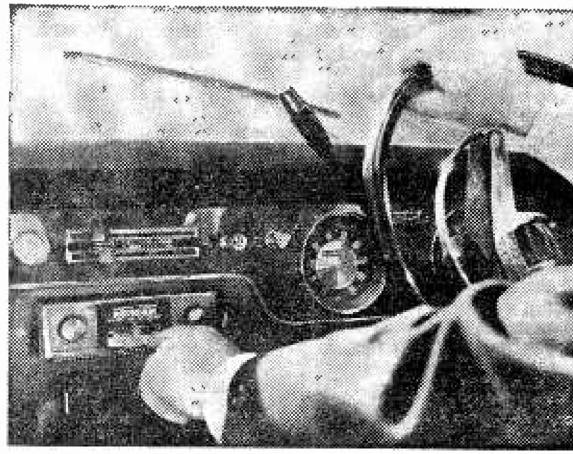


Fig.10 CAR INSTALLATION CONNECTIONS

The subject of this month's free Blueprint is a two-band, hybrid car radio employing printed-circuit construction.



The PRACTICAL WIRELESS AUTOCRAT

THE parts to build this inexpensive car radio, including the drilled chassis and metalwork, are readily available* and if all the components are ordered at one time, they will be supplied to PRACTICAL WIRELESS readers for under £10, this being a considerable saving on the total cost of the individual components.

The "Autocrat" car radio utilises a printed circuit board, thus ensuring simplicity and reliability in construction and making it an ideal project for the home constructor. Two valves plus three transistors are used in the superhet circuit which includes a push pull transistor output stage, giving an audio output of approximately 1·5W. Selectivity and sensitivity are quite good, despite the fact that no r.f. stage is employed.

The receiver covers the whole of the medium waveband from 180—550 metres. The tuning is also adjustable on the long waves, although coverage is restricted to reception of the BBC Light programme transmitted on 1500 metres. This has simplified the design of the receiver and also the final alignment.

As the receiver is designed for a 12V *positive* earth system only, i.e. the + terminal of the battery is connected to the metal frame of the motor vehicle, the metal chassis and case of the radio will be connected automatically to the positive supply when it has been correctly installed in the car. *Any reversal of polarity for however brief a period may permanently damage the transistors.*

The car radio is unsuitable for cars where the negative, i.e. the — terminal of the battery, is connected to the vehicle chassis (e.g. many Continental models).

*Messrs. Sterne-Clyne Ltd., 3-5 Eden Grove, Holloway, London N.7, and branches. An accessory kit comprising brackets, screws, etc., for fitting the car radio is also available.

The dial drive assembly and permeability tuning unit is supplied already assembled and fitted to the chassis, which considerably simplifies the mechanical work involved in the construction of the radio. Located just behind this tuning unit is the aerial socket. This, plus the spark plate (C20) are also supplied already fitted in their correct positions on the main chassis (see Fig. 2 on the Blueprint).

The dimensions of the radio are such that it will fit the majority of standard "cut-outs" in cars. In instances where this does not apply, the car radio may be conveniently installed below the dashboard, or any other convenient position. Metal bushes, tapped for 2BA bolts are provided on the sides of the metal cover to facilitate the fitting of brackets, etc.

When the receiver has been completed and all wiring and connections checked, it will be necessary to carry out alignment of the aerial, oscillator and i.f. tuned circuits with a signal generator before the car radio will function correctly.

Messrs. Stern-Clyne Ltd., offer an alignment service to those constructors who have purchased all parts from them and are unable to obtain the use of suitable alignment equipment. A charge is made for this service, details of which may be obtained on application.

The i.f. transformers in this receiver contain adjustable iron-dust cores. These are *extremely fragile* and on *no account* should they be adjusted with a metal type of electrician's, or so called "grub" screwdriver. The correct type of trimming tool must be used and readers are referred to the article on page 524 of the October 1964 issue of PRACTICAL WIRELESS. The free trimmer and alignment tools supplied in that issue are ideal for the purpose. Alternatively a plastic knitting needle or even a matchstick with the end suitably shaped to fit the slot in the dust cores exactly should be used.

ASSEMBLY

To commence assembly, fit the various components to the printed circuit board, with careful reference to Fig. 2.

All components are fitted on the paxolin side of the printed circuit board and solder applied to the copper side.

To simplify the assembly, it is recommended that some order is followed, and therefore commence by soldering all the resistors in position. If they are of the printed circuit variety, the ends will be already trimmed and formed to the correct length. If not, they will have to be trimmed accordingly. Before the capacitors are fitted, it is advisable to fit the twin screened lead that runs from the printed circuit board. This should be approximately 10in. in length and again with reference to Fig. 2, is soldered to points 1—2—3. The earth braid that goes to point 1 should be fitted with insulating sleeving to avoid contact between the braid and other points of the circuit.

All the capacitors may now be fitted to the printed circuit board, noting particularly the polarity working of the electrolytic capacitors, C14, C13, C16 and C17. The + and − markings on these components must coincide with those shown in Fig. 2.

The two B9A valveholders and i.f.t.1 and i.f.t.2 should now be fitted. The i.f. transformers are identical and may be fitted in either position, and as their pins are offset they can only be fitted in one way. Do not forget to solder the can earthing clips to the printed circuit. Small clips are also supplied for earthing the valveholder screening can, and are fitted between pins 1 and 9 and soldered. They should be fitted in such a manner that they tend to bend away from the valveholder.

The driver transformer T1 and the two 4BA x 1½in. bolts plus spacers are next fitted. A 4BA solder tag is bent to form a foot, and is bolted and then soldered in position where shown in Figs. 2 and 4.

Tr1, a Mullard OC82D transistor, is next fitted with sleeving on its three leads and soldered in position. The leads should not be cut, and particular note should be made of the lead connections, e—b—c.

Mains Chassis Assembly

The following components should be fitted in the order given. The push button selector switch, taking 6BA x ¼in. bolts, is fitted to the cut-out at the front of the chassis, and the volume control VR1 fitted alongside. Next T2, the output transformer is fitted, along with the bank of four trimmers TC1—TC4. An earthing solder tag may also be fitted under one of the nuts holding this component, but if considered possible, this solder tag can be dispensed with, provided the earthing foot of the three-way tag strip can be persuaded to fit instead. Whichever method proves easiest should be utilised. The loudspeaker socket should be mounted using 6BA x ¼in. bolts, plus an earthing tag where shown. Also fix an earthing tag to one side of the aerial socket. A polythene grommet is fitted to the large hole adjacent to C20, through which the negative supply lead will eventually pass. Join the blue and orange leads to the loudspeaker socket, fit C19 in position and earth one side of the socket.

Take L1, the r.f. choke, and solder this, together with R1, to the aerial socket. R.F. chokes L1, L7 and L8 are all identical and are therefore easily identified.

Rear Panel

Fit the 6-way tag strip to the inside of the rear panel as shown in Fig. 3 using 4BA x ¼in. bolts, also Tr2/Tr3 the two OC82 push-pull output transistors—remembering to fit heat sinks. Do not cut the transistor leads, and cut sleeving to fit over each lead, as for Tr1. Solder R18 in position and fit a 6in. length of insulated wiring to tags A—B—D—E and F.

Final Assembly

Join the free ends of the five leads that emerge from the rear panel to the printed circuit board. Refer to Figs 2 and 3 for this.

With reference to Fig. 4, bolt the rear panel assembly to the printed circuit board using the 4BA x 1½in. bolts and spacers previously fitted.

Carefully bolt the lower edge of the rear panel to the rear of the main chassis using two small self-tapping screws, and then finally secure the printed circuit earthing foot in position. The heat sink may now be fitted to Tr1 and then bolted to the main chassis. The remainder of the wiring and mounting of the balance of the components shown in Fig. 2 may now be completed.

The coiled lead shown between the moving metal bar on the tuning unit and the tag strip is simply a short length of stranded lead which has been wound onto the shaft of a small diameter screwdriver to form a coil. This is then simply soldered in position where shown.

When fitting the lampholder and pilot lamp, make sure that the metal surround to the lamp is not shorting to the metal chassis.

L3 coil is supplied fitted with a *yellow* sleeve and L6 with a *green* sleeve.

If the *blue* lead from L2 coil is short, it should be extended as necessary.

Fig. 8 shows the assembly of the suppressor filter unit and fuseholder.

The loudspeaker is fitted to the baffle using suitable 4BA bolts and washers. It is possible that the holes in the loudspeaker frame will not coincide with those in the baffle. Simply punch extra holes if necessary, using a sharp pointed object or even a small screwdriver. A suitable length of twin lead should also be fitted to the two loudspeaker tags, plus a two-pin plug at the other end.

Insert the two valves into their respective sockets V1 ECH83 or equivalent 6DS8, V2 EBF83 or equivalent 6DR8, and fit the metal screening cans to both valves. Finally the dial and the push-on control knobs are fitted. Now re-check all wiring very carefully.

Alignment

This requires the use of a signal generator for optimum results and for those constructors who either own such an instrument, or who have access to one, the following details are given. It will be necessary to obtain a suitable 12V d.c. supply, the battery + is connected to the car radio chassis and the battery− to the −ve supply lead.

Connect the loudspeaker and switch on the radio. The dial lamp should immediately come on. Press the medium wave push button and adjust pointer to 550m on the dial.

Set the signal generator to the i.f. frequency of 470kc/s and feed a modulated signal to aerial socket. Adjust the cores in i.f.t.1 and then i.f.t.2 for maximum audio output. Adjust the volume control to a suitable level, and adjust the output from the signal generator to a minimum.

Set signal generator to 550kc/s and adjust the core of L4/L5 for maximum signal and then L2 core. By using a pair of thin nose pliers, draw the brass threaded rod attached to the dust core either in or out of the coil former. The cores have a slot at the grommet end, and the end of the brass thread has been flattened to facilitate adjustment with suitable trimming tools, but some difficulty may be experienced if this method is used due to limited working space. Re-adjust the signal generator to 1·5Mc/s, and tune the pointer to 200m and adjust TC4 trimmer for maximum signal, followed by TC2. Depress the L.W. button and re-adjust the signal generator to 200kc/s. Set the pointer to 1500m and adjust first TC3 and then TC1 for maximum output. Disconnect the signal generator and connect a suitable aerial (preferably a car aerial) to the aerial socket and check the performance.

The aerial circuit trimmers TC2—medium wave —and TC1—long wave—may be then re-peaked for optimum sensitivity. This final operation may, however, be carried out in the car.

The cover and chrome escutcheon is held in position using small self-tapping screws.

Installation

If the radio will fit the cut-out in the dashboard of your motor vehicle installation will be relatively easy. Alternatively, it may be held under the dashboard by use of suitable home-made strips. As mentioned earlier, the "bushes" fitted to the sides of the radio's metal cover are tapped for 2BA bolts, and this should not be any longer than ⅜in.

Any paint around the bushes and on the car chassis where the brackets are to be bolted, must be scraped away, i.e. the car radio metal case must make good electrical (and mechanical) contact with the metal frame of the motor car. The loudspeaker may also be fitted in any convenient position.

The negative supply lead from the car radio is normally taken to the A1 terminal on the junction box. Reference to the "owner's handbook" should indicate its location. The "short lead" shown coming from the suppression unit in Fig. 8 must be securely connected to the nearest earthing point on the car chassis.

Interference Suppression

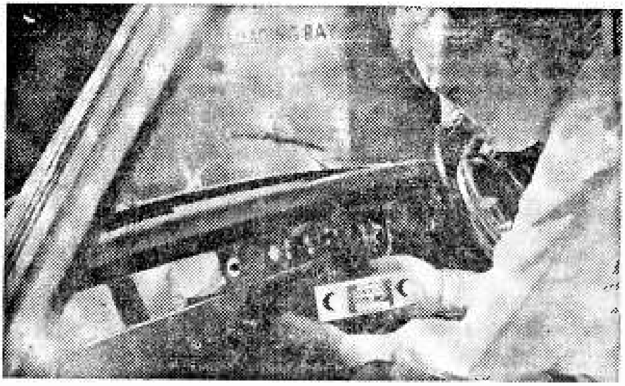
Now, although the "Autocrat" is fitted with a filter unit in the negative (−) supply lead to reduce the effects of electrical interference, it is also of prime importance that the ignition system, dynamo, sparking plugs, windscreen wiper electric motor, flasher indicators etc., are also fitted with suppression devices.

The ignition system, if insufficiently suppressed will cause a continuous clicking or popping sound in the receiver, and the dynamo will cause a whine which will increase in level when the engine is accelerated.

The majority of modern cars are already fitted with adequate suppression devices but brief details are included herewith for those vehicles that still require suppression. The types of devices that are utilised for suppression of electrical interference are capacitors, resistors and chokes of various sizes. Some vehicles may have a resistance type suppressor fitted to the distributor, but if not it should be fitted in the high voltage lead that runs between the spark coil and distributor rotor. This must be fitted as close to the distributor as possible. The nominal resistance of these devices is 5—10kΩ.

Resistance type suppressors should also be fitted to each lead that runs from the distributor head to the spark plugs. Simple cut lead or clip-on type suppressors may be purchased from a radio dealer or garage. Once again, these units must be fitted as close to the sparking plugs as possible.

Suppressor capacitors for the dynamo are normally contained in a metal can, which has a metal bracket for mounting plus a flying lead. The bracket is securely fitted under the nearest convenient earthing nut on the case of the dynamo, and the loose lead is then taken to the dynamo *live output terminal*. The value of capacitor is normally 0·5 or 1μF.



A P.W. "Autocrat" car radio takes its place in the fascia of a modern family saloon.

It may also be necessary to fit a suppressor capacitor to the ignition coil and once again this may be of the same type as fitted to the dynamo. Bolt the fixing bracket to the nearest earthing point and take the loose lead to the *SW* terminal on the ignition coil.

For further information on the fitting of these and other devices, approach a local supplier or garage who will normally give assistance. ■

PREPARING FOR THE R.A.E.

BRIAN ROBINSON.

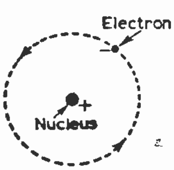
1: BASIC THEORY, RESISTANCE, OHM'S LAW

IT is the wish of the writer to include in a series of only twelve articles, sufficient theory work to enable the reader to sit the City and Guilds of London Institute "Radio Amateurs' Examination" in November 1965. I have tried to explain the more difficult theory in simple language and have included diagrams and sketches wherever they are likely to help the reader. As all the theoretical material cannot be included in detail the reader is urged to study suitable text books also—and a list of suitable books is given at the end of this the first article.

At the end of each article will be a series of questions which have been designed to help the reader; these will be generally of the "calculation" type, and answers will be given at the end of the following article. If the work is undertaken diligently, a "pass" in the examination would not be too great a reward!

1.1 The Electric Current

All materials are composed of *Atoms*. A simple atom, such as that of Hydrogen, consists of a central core or *Nucleus*, which carries a positive charge, and a particle called an *Electron*, which carries a negative charge. The electron spins round the nucleus in much the same way as the earth orbits round the sun. (See Fig. 1.)



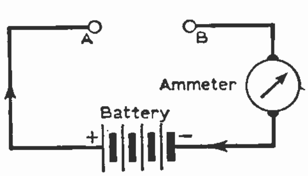


Fig. 1 (left): The Hydrogen atom.

Fig. 2 (right): A simple test set-up for conductors and insulators.

The Hydrogen atom is the simplest of all the atoms and if we were to draw a diagram of say a Copper atom, it would have no less than 29 electrons orbiting round it. If an electron can be made to leave its orbit and join the orbit of the electron next to it, an *Electric Current* will flow. If we make a current flow through a material such as a length of copper wire, we must supply a "force" to make the electrons of the copper atoms move along. This force is generally supplied as a result of a *Chemical Reaction* in a *Cell* or *Battery*. (The "force" can also be supplied by heating and magnetic effects but these will not be dealt with here.) Therefore, for our purposes we can consider that an electric current is in fact a flow of electrons.

1.2 Conductors and Insulators

Materials which will give up electrons easily to form an electric current are said to be *Conductors*. Those materials which will not easily allow an electron flow to take place are called *Insulators*. In Fig. 2 we can connect various substances between A and B to determine which are conductors and which are insulators. If no current shows on the ammeter the material is an insulator, if a current shows on the meter the material is a conductor; the higher the current the better the conductor. Conductors have a *Low Resistance* to the passage of an electric current and insulators have a *High Resistance*.

1.3 Electrical Units

The *Coulomb* is a basic electrical unit, and is represented by "Q". The coulomb indicates the rate at which an electric current flows and therefore it has a time component. The unit used to measure the current flowing (average) in a circuit is the *Ampere* or *Amp.*, which is denoted by "I", and this is given in the expression $I=\frac{Q}{T}$ where Q is in coulombs and T is in seconds.

We can also see that 1 coulomb of electricity passes when a current of 1 amp. flows for 1 second, or from the above expression:

$$Q=I\times T$$

If a current flows through a conductor, it can be increased by increasing the *Potential Difference* across the ends of the conductor, i.e. a greater *Electrical Pressure* has to be used to "push" the current round the circuit. Potential difference or electrical pressure is measured in *Volts*. Therefore to increase the current flowing through a conductor, the voltage across its ends must be increased.

All materials do not allow a current to flow through them with equal ease (see 1.2) and they can be said to possess different amounts of *Resistance* to the flow of an electric current. The unit which is used to measure this resistance is the *Ohm*.

1.4 Ohm's Law

The scientist Ohm discovered a relationship between voltage (E), current (I) and resistance (R). The circuit shown in Fig. 3 can be used to demonstrate (N.B. *not* prove) the results he obtained.

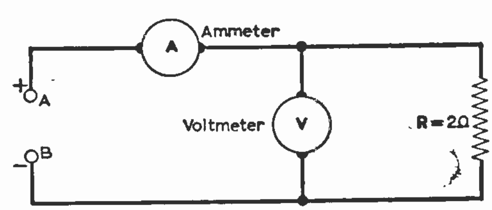


Fig. 3: Arrangement for demonstrating Ohm's Law.

A resistance of say 2 ohms is connected to batteries of various voltages, the battery being connected to AB. An ammeter measures the current flowing through the resistance and a voltmeter measures the voltage appearing across the resistance. Values of I and E are recorded, and also values of $\frac{E}{I}$ are worked out for each set of readings. The results are tabulated as shown in Fig. 4.

E	I	$\frac{E}{I}$
2 V	1 A	2
4 V	2 A	2
6 V	3 A	2
8 V	4 A	2

Fig. 4: Typical values to indicate Ohm's Law.

It can be seen that $\frac{E}{I}$ gives a constant result of 2, but we also know that the value of the resistance R was 2 ohms, so it appears that $R=\frac{E}{I}$ and thus if E and I are known R can be calculated. The equation can also be written as $I=\frac{E}{R}$ or $E=I\times R$.

Thus if any two of voltage, current and resistance are known, the third can be found. Ohm's Law can be stated as follows: "the current flowing in a circuit is directly proportional to the applied Voltage and inversely proportional to the Resistance". When Ohm's Law is applied the voltage must always be in volts (not kilovolts, millivolts, etc.), the current must always be in amperes (not milliamperes, etc.), and the resistance must always be in ohms (not megohms, kilohms, etc.).

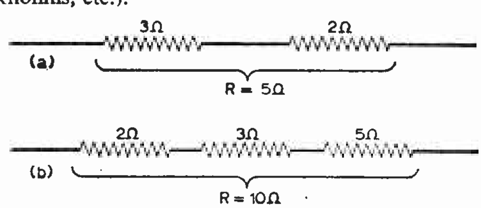


Fig. 5: Examples of resistances in series.

1.5 Resistance in Series

If two resistances are connected in *Series* as shown in Fig. 5a, the total resistance, R is equal to

$$R_1+R_2$$

in this case $R=3+2=5$ ohms.

In Fig. 5b three resistances are connected in series and the total resistance, R, is $2+3+5=10$ ohms. (N.B.—Ohms are generally represented by the Greek letter Omega, Ω.) Therefore for any number of resistances connected in series the total resistance is

$$R=R_1+R_2+R_3+R_4+\ldots.$$

1.6 Resistance in Parallel

If two resistances are connected in parallel, as shown in Fig. 6a, the total resistance, R, can be found by using the expression

$$R=\frac{R_1\times R_2}{R_1+R_2}$$

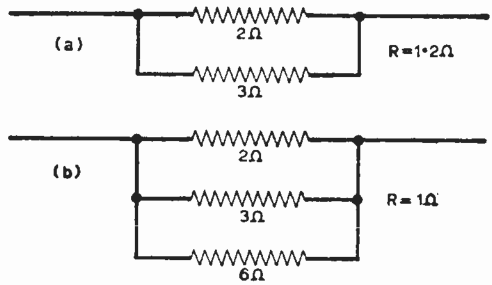


Fig. 6: Examples of resistances in parallel.

Thus in Fig. 6a, $R=\frac{2\times 3}{2+3}=1\cdot 2\,\Omega$.

If three or more resistances are connected in parallel, the formula used to determine R is

$$\frac{1}{R}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\ldots.$$

or

$$R=\frac{1}{\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\ldots.}$$

Thus in Fig. 6b $R=\frac{1}{\frac{1}{2}=\frac{1}{3}=\frac{1}{6}}=1\,\Omega$.

For resistances connected in parallel, the total

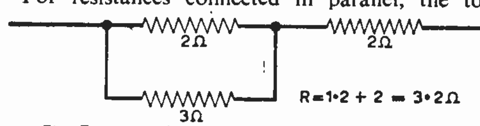


Fig. 7: Examples of resistances in series/parallel connection.

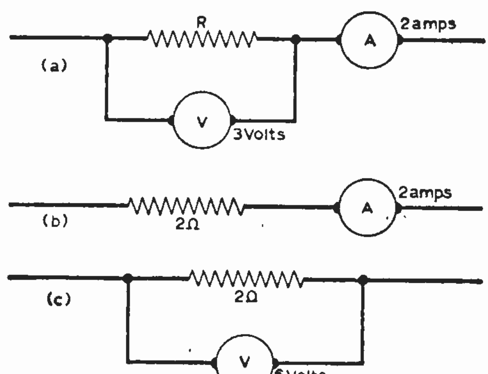


Fig. 8: Arrangements to find the power dissipated by a resistance.

effective resistance, R, is always *less* than that of the lowest value resistance in the circuit.

1.7 Resistances in Series/Parallel Arrangements

The resistance of a series/parallel arrangement such as that shown in Fig. 7 can easily be found by finding the resistance of the parallel connected resistances and

—continued on page 631

a midget ANTENNA for the DX bands

by D. GIBSON G3JDG

THE miniature antenna, like the perfect v.f.o. will always rate high in the dreams of any amateur or shortwave listener. From time to time various ingenious approaches have been made to clip off the precious inches and yet still preserve the effectiveness of the antenna. Discussion with other amateurs tends to indicate the opinion that if element lengths are reduced then something must invariably suffer.

Either the radiation resistance drops to a ridiculously low value or the bandwidth is microscopic. Often such a system is difficult to load or exhibits a very high standing wave ratio.

The handbooks and theoretical text books do not appear very eager to praise the undersize antenna either and usually give diagrams and discussions on systems of the "correct length". They take a piece of wire say half a wavelength long and suspend it by some miraculous means so that it is held in mid-air with no supports at either end. (To introduce any supports might interfere with the polar diagram so they conveniently dispense with them!)

This wire is then situated some half wavelength high completely in the clear and over a wonderfully efficient earth—probably an empty 50 acre field on top of a hill.

All the time the amateur is reading this he is thinking about his back garden some 30 feet long at best, the telephone wires nearby, a metal shed in a neighbours garden etc., and wondering how to make the best of it all.

The writer is one of such creatures and the main interest centres on the 20 metre band 14,000—14,350kc/s. The dipole length for this band is some 34ft. long but in order to "give it a chance" it needs to be 34ft. high as well. This implies at least one 35ft. mast and possibly two, or some form of extension pole attached to the side of the house—see Fig. 1.

Those who frequent the 20 metre amateur band will know that these days a dipole will not always prove a particularly suitable aerial. Not that it is inefficient, nor to imply that there are amateurs who cannot work DX with a dipole on twenty. However if one does use this simple system today then it will have to compete with shiny new 3-element beams (often commercially made and pre-adjusted) 4-element beams and cubical quads etc., not to mention the hundreds of watts p.e.p. of sideband that is often pumped into them.

On the other hand there are many who would be thankful if they could erect even a dipole but who are unable to do so on account of available space or neighbours who object to various objects waving above the skyline. It is for just such a need that this article is intended.

It was reasoned that although the text books and more learned brethren may be quite correct in their scepticism of pruning element lengths it was a very real fact that mobile stations with their short loaded whips were busy working half the world. This, be it noted, with element lengths that were not so much pruned as massacred!!

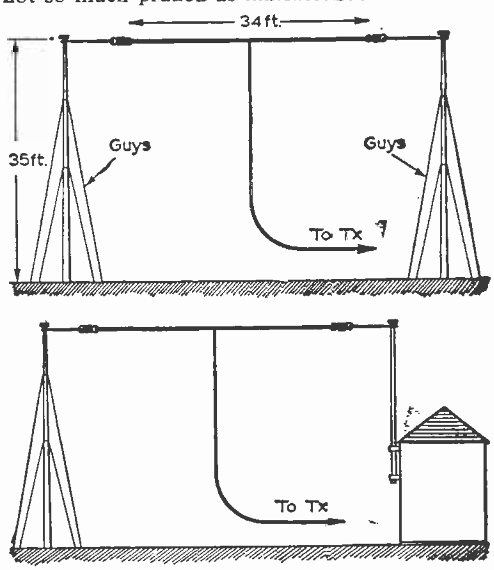


Fig. 1: Two variations on the aerial apparently necessary for efficient reception on 20m.

It was decided to pursue this line of thought and see how far it could be developed.

Basic Design

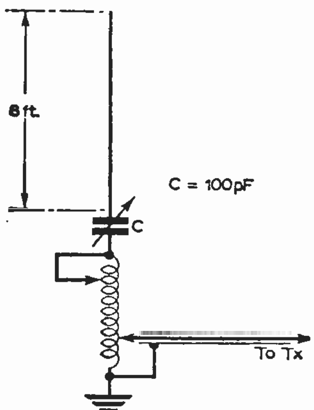
The maximum length was set at 8ft. and since this was to be a vertical would require no space at all other than the diameter of the element itself. (Owners of 2in. square gardens please note). Accordingly an antenna was rigged up as per Fig. 2.

The 8ft. element was made as follows: a 9ft bamboo pole about 1—1½in. diameter was covered with an 8ft. x 6in. length of baking foil. The pole was merely rolled in the foil rather like rolling a cigarette, and this was held in place by small pieces of p.v.c. tape.

The whole assembly was then once again rolled in a long piece of polythene sheeting to protect it from the weather, the polythene being held in position by attaching a spiral of p.v.c. tape.

TABLE 1.

Band Mc/s	Coil Dimensions
7	19 turns Tap 3 turns from earth.
14	8 turns Tap 2 turns from earth
21	6 turns Tap 1¾ turns from earth



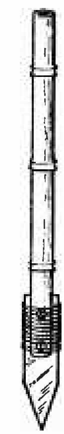


Fig. 2 (left): The theoretical set-up for the basic antenna. Fig. 3 (right): The element may be attached to a shaped piece of wood for simple erection in any convenient plot of ground.

The result is an element which is weather-proof, lighter than the same diameter aluminium tubing, cheaper and will "give" in the wind. It may, if required, be fixed to an 18in. length of 1½in. x 1in. wood and stuck in the ground wherever is convenient (Fig. 3).

Note also, that it will require no unsightly guy wires either. The capacitor in Fig. 2 is 100pF, and the coil consists of some 26 turns of 16s.w.g. tinned copper wire on a 2in. ceramic former spaced the diameter of the wire.

It was found, much to the writer's joy, that by shorting out some of the turns, i.e. varying the inductance and also the tapping point of the co-ax, that the element could be tuned up and loaded with a low s.w.r. on 7, 14, and 21Mc/s. (See Table 1.)

A tentative call on 14,040kc/s brought a 599 report from OE5XXL in Austria and this was with the antenna propped up against the wall of the house. Note that a dipole on this band would be 34ft. long and 34ft. high. By contrast, the present antenna was 8ft. long and about 3in. (three inches) off the ground.

Adding the 2nd Element

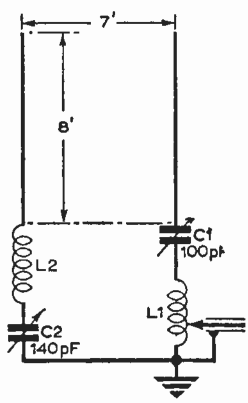
Fired with enthusiasm the next obvious line of experiment appeared to be the addition of another element to make it a sort of 2-element miniature vertical beam and another element exactly the same as the first was manufactured. This was spaced some 7ft. from the driven element and the coil was wound on the lower end of the actual bamboo pole itself. (Not the best of low loss coil formers).

This coil consisted of 12 turns of 16s.w.g. tinned copper wire and the capacitor was a 140pF. The grid dip oscillator indicated that this combination could be resonated from 13—15Mc/s. Thus it could be tuned as a director or reflector.

Setting Up

Method of setting up was first to tune the driven element to 14,050kc/s since c.w. was the prime interest. This was done with the aid of a transistorised g.d.o. Then, the parasitic element was tuned as a director. In the event of no g.d.o. being available, the parasitic can be roughly tuned by ear, and tuning the capacitor C2 Fig. 4 with an insulated screwdriver, signals can be peaked or attenuated some two S-points. After this, all that remains is to adjust the tapping point of the co-ax for minimum s.w.r.

Fig. 4: The arrangement used in the setting-up procedure.



As with all aerials of this type a good earth will make a difference to performance. The earth used for the experiments with the prototype consisted of two 6ft. lengths of ¾in. diameter copper pipe driven 5¼ft. into the ground 6ft. apart and bonded together by a length of 7/029 wire.

This is far from being an ideal earth and better results might be possible with an improved earthing system. Note that there is a heavy gauge wire from the parasitic to the driven element and the whole system is earthed at this one point (Fig. 4).

Results

Results so far seem encouraging, but a longer period of trial is needed before any definite conclusions can be reached. A CQ call brought 599 from UA1KAG in Leningrad and with the beam in the same position a 569 was received from I1SCI in Italy indicating a 3S-point difference. The s.w.r. appeared reasonable from 14.010—14.070kc/s.

In the first few days of operating, some 13 countries have been worked with the worst report of 579 when the beam was peaked and DJ5DR reported 5 and 8 on 'phone. Note this was on 14.200kc/s whereas the system was lined up and adjusted to work on 14.050kc/s. This antenna system will not compete with say a quad, but where space is at a premium it will enable a respectable signal to be radiated.

The above results were obtained with the beam propped up against the side of the house wall not 4in. off the ground, most unfavourable conditions.

Further Suggestions

There is ample room for further experiment, the spacing of the elements for instance. The spacing of 7ft. used proved successful, but may not be optimum, and increasing it to 10ft. proved detrimental to performance.

A further line of thought would be the addition of another element to make a 3-element beam (director, driven element, and reflector). Or perhaps the third element could be arranged as per Fig. 5. The two parasitics arranged to tune as reflector or director with a small relay. In this way, the beam would be rotated electrically.

Capacitor A would be tuned as a director in each case then the relay could be energised and capacitor B adjusted to tune the element as a reflector.

For those who like their information compact, the details of the driven element are shown in Table 1. These figures will vary depending on proximity to earthed objects, efficiency of the earthing system etc., but will provide a useful starting point and guide, after which the system can be adjusted for peak performance under actual local conditions.

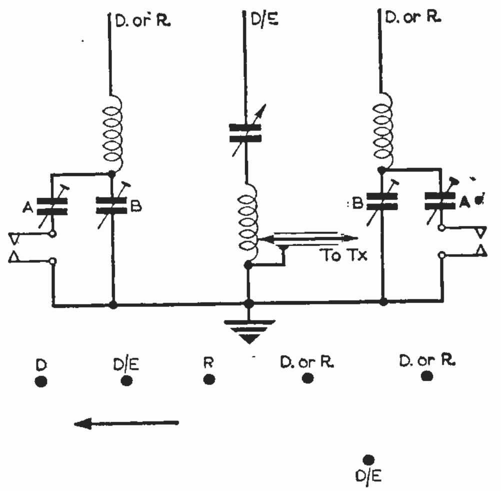


Fig. 5: Providing a third element.

The author would be very interested to hear from readers experimenting with aerials along the lines suggested in this article. ■

Preparing for the R.A.E.

—continued from page 628

then adding to this the value of the series resistance.

Thus, in Fig. 7 the value of the parallel resistances is

$$R=\frac{R_1\times R_2}{R_1+R_2}=\frac{2\times 3}{2+3}=1{\cdot}2\,\Omega.$$

Add to this the value of the series resistance to obtain the total resistance. Therefore total resistance $1{\cdot}2+2=3{\cdot}2\,\Omega$.

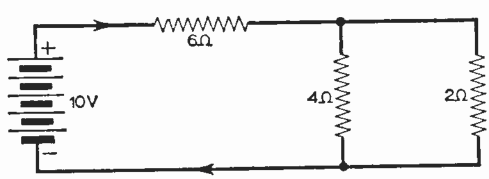


Fig. 9: Circuit for Question 1.

1.8 Power

Power is the rate of doing work and its unit, in electrical work, is the *Watt*, which is denoted by W.

$$W=I\times E$$

or by substitution from Ohm's Law,

$$W=I^2\times R$$

$$\text{or}\quad W=\frac{E^2}{R}$$

Three ways of finding the number of watts dissipated as heat in a resistance are shown in Fig. 9.

In Fig. 8(a) $W=I\times E=2\times 3=6$ watts.

In Fig. 8(b) $W=I^2\times R=4\times 2=8$ watts

In Fig. 8(c) $W=\frac{E^2}{R}=\frac{36}{2}=18$ watts.

Question 1

The answer to the following questions will be given at the end of next month's article.

In the circuit diagram given in Fig. 9, calculate:

1. The total current drawn from the battery.
2. The voltage appearing across the 6 Ω resistance.
3. The power dissipated by the parallel connected resistances of 2 Ω and 4 Ω.
4. The power dissipated in the entire circuit.
5. The current flowing through the 4 Ω resistance.

Recommended Literature

(*a*) "The Amateur Radio Handbook"—Radio Society of Great Britain.
(*b*) "A Guide to Amateur Radio"—Radio Society of Great Britain.
(*c*) "The A.R.R.L. Handbook"—The American Radio Relay League.
(*d*) "Physics and Radio"—M. Nelkon.
(*e*) "Foundations of Wireless"—M. G. Scroggie.

Part 2 Next Month

Twin Triode Two

TWO-VALVE PUSH-PULL AMPLIFIER

BY A. C. RODEN

THIS amplifier was designed to obtain reasonable volume and quality for a small outlay. It uses two twin triodes in a simple circuit, only consumes 25mA h.t. and has adequate gain for a crystal p.u. The first stage is half a 12AX7 in a conventional amplifier circuit and the output is fed to the other half of the valve which is wired as a "concertina" phase splitter. The outputs from this are fed to the two halves of a 12BH7 twin triode arranged in push-pull.

Components

The majority of components are not critical but the phase splitter is rather important. R7 and R5

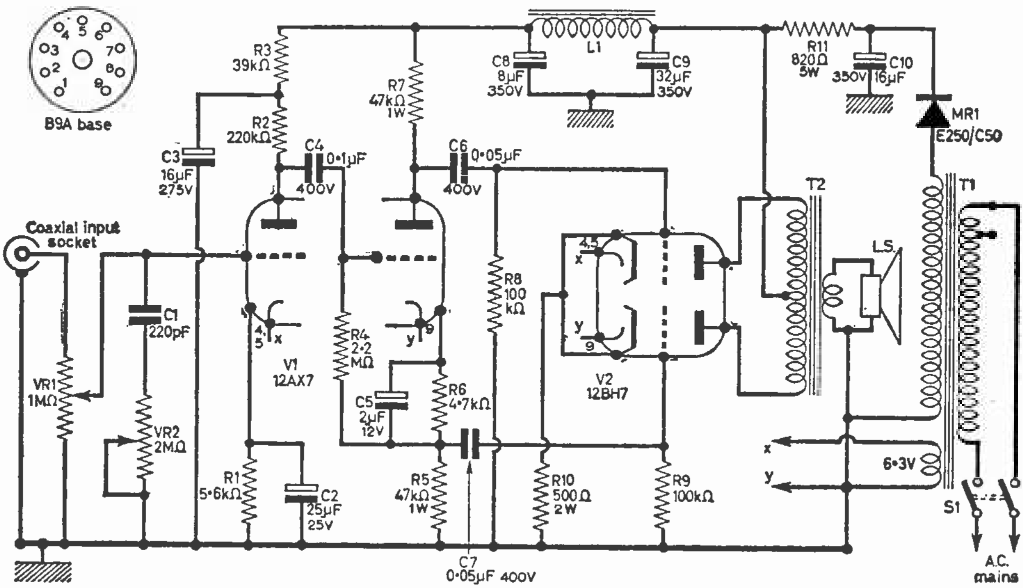


Fig. 1: The simple two-valve circuit.

COMPONENTS LIST

Resistors:

R1	5·6kΩ	R7	47kΩ 5% 1W
R2	220kΩ	R8	100kΩ
R3	39kΩ	R9	100kΩ
R4	2·2MΩ	R10	500Ω 2W
R5	47kΩ 5% 1W	R11	820Ω 5W w.w.
R6	4·7k 5%		

All ±10% ½W carbon unless otherwise stated.
VR1 1MΩ potentiometer with d.p. switch, S1
VR2 2MΩ potentiometer

Valves:
V1 12AX7 V2 12BH7

Transformers:
T1 Mains transformer. Secondaries: 250V 50mA; 6·3V 2A
T2 Output transformer. Primaries: 8000Ω anode-anode centre-tapped. Secondary: 3 or 15Ω

Capacitors:
C1 220pF paper or mica
C2 25μF 25V electrolytic
C3 16μF 275V electrolytic
C4 0·1μF 400V paper
C5 2μF 12V electrolytic
C6 0·05μF 400V paper
C7 0·05μF 400V paper
C8 8μF 350V electrolytic
C9 32μF 350V electrolytic
C10 16μF 350V electrolytic

Miscellaneous:
L1 20H 20mA smoothing choke
MR1 E250/C50 250V 50mA half-wave metal rectifier
S1 Double-pole on/off switch (on VR1)
Aluminium chassis. Two B9A valveholders. Tag strip. Coaxial socket, grommets, nuts, wire, etc.

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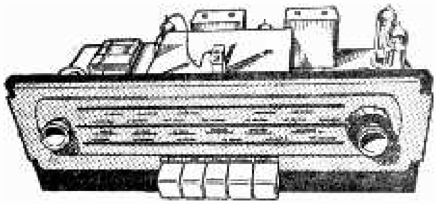

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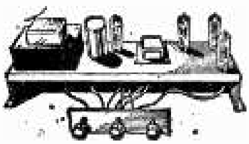
Pick-up, Ext. Speaker, Ae., E., and Dipole Sockets. Five push buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. O.P. Transformer. Tone Control. 1000-1900 M.; 200-550 M.; 88-98 Mc/s. Valves EZ80 rect.; ECH81, EF89, EABC80, EL84, ECC85.
10 x 6in. ELLIPTICAL SPEAKER 25/- to purchasers of this chassis.
TERMS: (Chassis) £3.10.0 down and 5 monthly payments of £2.4.0. Cheap Room Dipole for V.H.F., 12/6. Feeder 6d. per yard.
ALTERNATIVE DESIGN. L.W. 1000-1900 M.; S.W. (9-15 Mc/s); M.W. 190-475 M.; V.H.F. 87-100 Mc/s.; Gram position. Otherwise similar to above chassis. Price £15.15.0 (carr. paid). **TERMS:** £3.10.0 down and 6 monthly payments of £2.4.0. Circuit diagram 2/6



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7in. Stand play, 1,200ft. ..	12/6	**ACETATE BASE**	
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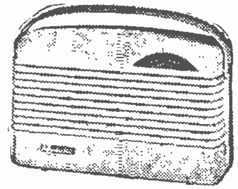

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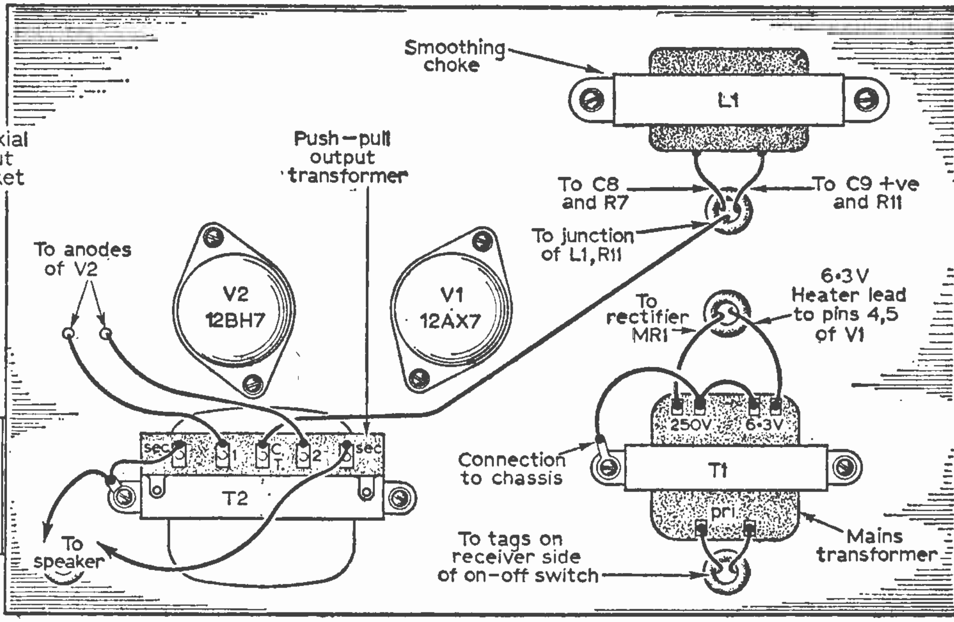

Fig. 2: The above-chassis layout of the amplifier

also R8 and R9 must be as accurately matched as possible or the output will be unbalanced, with distortion.

The cathode bias resistor in the output stage is undecoupled and thus introduces some negative feedback.

—continued on page 647

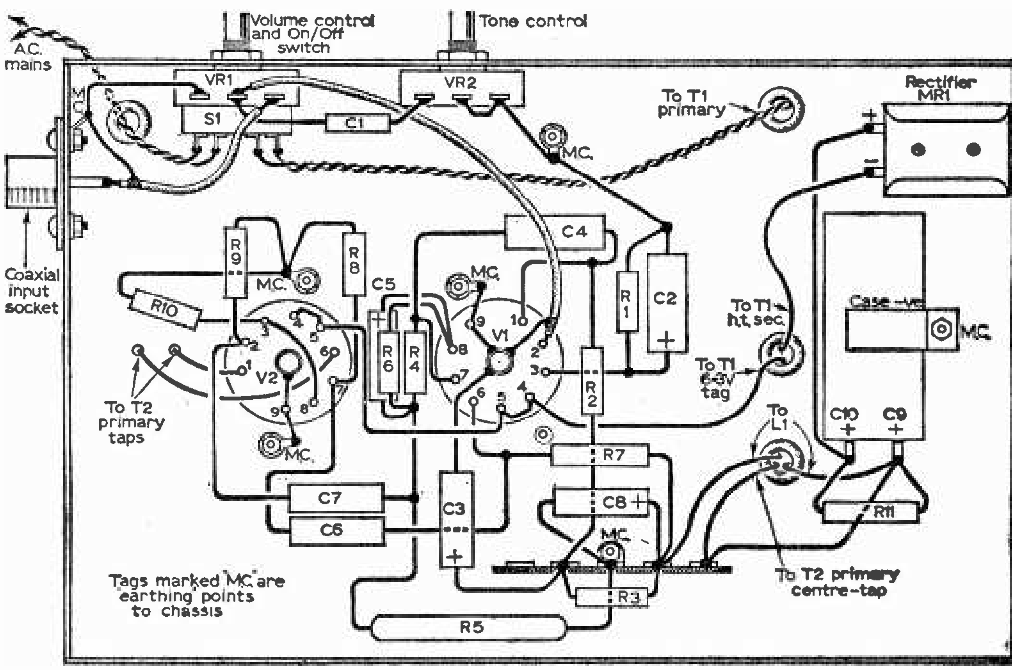

Fig. 3: The underchassis wiring diagram.

TV & RADIO SHOW

Earls Court, August 24-September 5, 1964

Practical Wireless Report

★ A summary of new models seen at Earls Court and the trade exhibitions around London, and notes on design trends and features.

★ The tables list new models only and do not necessarily represent the complete range of the makers concerned.

★ For details of all the new TV sets, refer to the November issue of *Practical Television.*

Transistor Portable Radios

TENDENCY of most manufacturers has been to concentrate on improved quality rather than a reduction in size. Several makers now market portables that are more applicable to a static site —fit to grace any sideboard—yet light and completely self-contained. Facilities available have been greatly extended.

There is no lack of tiny sets but most of these were to be found in the "splinter shows" of imported goods scattered around London. Lightest was a medium wave only matchbox sized receiver with an eight-transistor circuit, weighing only 4oz.

Most comprehensive was probably the Perdio *Marco Polo* with six short wave bands, long, medium and v.h.f. bands—the latter covering the international range—three aerials, two tuning controls, tuning meter, a.g.c., a.f.c., b.f.o., wide-range separate tone controls and a host of specialist facilities.

In general, more concentration was on band coverage with short waves (in readiness for the Olympics, some makers stated), v.h.f., Luxembourg bandspreading and even Radio Caroline marked on the dials of at least two of the models we inspected. New types of transistor have made for tighter tuning and consequently a better look to most dials and pointers.

Tape sockets and car radio aerial cut-out sockets are now accepted inbuilt features with most responsible manufacturers. Several makers featured the portable that doubles as car radio with the addition of a simple bracket and connector.

Micro-miniaturisation has entered the domestic radio field and was a feature of some **Stella** portables. Larger, flatter and more powerful loudspeakers have improved quality all round.

Of the "special" gimmicks one was the **STC** mains-operated charger and rechargeable battery which **K-B** were adding to their *Carioca* and **Regentone** to their *Regenteener* model at no extra charge for the show period. Value is put at 30s. Then there was the **G.E.C.** camera portable at 19gns., advertised as the first camera that receives Luxembourg—which could equally well be the first receiver taking colour pictures!

Camera-like, too, were some of the Japanese imports, while the German models and a few of the American range tended to be more severely functional and at least three of these claimed to be the best in the world.

Of these, the receiver which is probably of most interest to *Practical Wireless* readers is the **Braun** T1000, a 13-waveband portable with all the features and specifications of a communications receiver. Imported by Argelane Ltd. at £195.

Space limitation precludes a coverage of the many imported innovations. For example, **Sharp Sales and Service** had over 20 new models in their personal portable range from Japan. Practically every variation in price and facility could be seen in the foreign shows, one small pocket set even having provision for multiplex stereo! British manufacturers tended to be more conservative.

On our rounds of the splinter shows we several times overheard strong criticism by dealers, public and Press of the imports that could not be backed by adequate service information. One salesman dared to tell us that the model we queried was so cheap that it "was hardly worth repairing"; another stated that all repairs could be handled by the importing agents. *Readers should be warned—check on after-sales service facilities before buying.*

TRANSISTOR PORTABLE RADIOS

Model	*Wavebands*	*Price*	*Notes*
ACE *Promenade*	L.M.	10½ gns.	Carrying case and earplug £1 5s. extra.
ALBA 939 *Olympic*	L.M.S.	18 gns.	High "Q" ferrite aerial plus telescopic. 6 x 4 in. speaker Two-speed tuning for Lux bandspread.
ACME Ajax *Empress* TR330	L.M.S.	£14	Leather case, earpiece. Car ae. socket. Fine tuner.
BUSH TR112	L.M.	21 gns.	Car ae. socket. Tone control. 6 x 4 in. speaker. 7-transistor.
BANG & OLUFSEN Beolit 611	L.M.S.FM	£33 12s.	Ext. ae.: ext. L.S., Gram and T/Rec. sockets. 9 x 5 in. speaker. M/C meter (tuning or battery condition). Ferrite rod and whip aerials.
Biolit *Teena*	L.M.FM	18 gns.	1·4W output. 7 x 5 in. speaker. Sockets as 611.
COSSOR CR1341T	L.M.FM	24½ gns.	Push-button. 4in. speaker. Telescopic ae. 9 transistor.
CR7243T	L.M.S.FM	38 gns.	AFC. Light-flash battery state indicator. 4 in. speaker. 10 transistor.
DENHAM & MORLEY			
Sonocolor *Clipper*	L.M.S.	19½ gns.	Push-button. Tuning/Battery meter. 6 x 4 in. speaker.
Sonocolor *Rhythm*	M.L.FM	24 gns.	9 transistor. Omni-directional aerial. AFC. Tone control. 6 x 4 in. speaker.
Akkord *Autotourist*	M.L.S.FM	39 gns.	9 transistor. Tone control. Mains unit. Car ae. socket.
DANSETTE *Hilton*	L.M.	12½ gns.	5in. L.S. earphone, tape, Ext. L.S. and car ae. sockets.
Stroller	L.M.S.	—	Prototype. Cut-out for car aerial.
Serenade	L. 2xM.	13 gns.	Prototype. Bandspread Lux. 5 in. L.S.
DECCA TP99	L.M.	15 gns.	5 transistor. Car ae., phone and tape sockets. 5in. speaker.
1125 (*Intercontinental*)	L.M.3S.	52 gns.	400mW output. 8 transistors. Bandspread tuning. Telescopic aerial. Phone, Tape, Ext. L/S sockets.
EKCO PT208	L.M.	13½ gns.	Lux. tuning. Personal socket.
PT426/L	L.M.	16 gns.	Lux. tuning. Tape, personal.
PT438	L.M.	9½ gns.	7-transistor. Available Oct.
CR926	L.M.	15 gns.	Car radio, with bracket, speaker baffle, suppressor.
PT424	L M.FM	22 gns.	Ext. ae. Tape sockets.
EVER READY *Sky Queen*	L.M.	15 gns.	7-transistor. 4-in. L/S. 500mW Output. Car ae. socket.
EUROPA 25064	L M.S.FM	37½ gns.	AFC on FM.
25041	L.M.FM	27½ gns.	1·3W output. Car switch.
FERGUSON 3124 "*Auto-twin*"	L.M.	17 gns.	9 transistor. Car/home set. Permeability tuner, P.B. selection.
3122 "*Flight*"	L.M.S.	12 gns.	7 transistors. Lux. band-spread. P.B. controls. Telescopic aerial.
3128 "*Fieldsman*"	L.M.FM	19½ gns.	Recessed controls. Telescopic aerial.
FERRANTI PT1127	L.M.	13½ gns.	Lux. bandspread. Personal skt.
FIDELITY 208	L.M.Lux.	13 gns.	Lux. Bandspread. P.B. switching. 7 transistor. 7 x 4 in. speaker. Car ae., tape, personal sockets.
Fulmar	L.M.	9 gns.	7 transistor. Skts as 208.
Galaxy	L.M.S.	12 gns.	7 transistor. 3 in. L/S. Car ae. socket. Tel. ae.
G.E.C. *Transistomatic* G822	L.M.	19 gns.	Combined camera. Built-in flash. Cartridge film loading. Lux. tuning.
G.818	L.M.	13½ gns.	Lux. bandspread. Car ae., ext. L/S, personal sockets.
GRUNDIG *Transonette* 70	M.S.	16 gns.	6 transistors. 800MW output. 5 in. L/S.
HACKER *Herald* RP30	L.M.	22 gns.	9 transistors. 8 x 5 in. L/S. 1·2W output. Independent tone controls. Car ae. Tape skts.
Herald RP31SW	L.M.S.	26 gns.	11 transistors. Tel. ae.
Sovereign RP18	L.M.S.FM	39 gns.	15 transistors. AFC on FM. 8 x 5 in. speaker. 1·2W o/p. Separate AM and FM tuners.
Mini-Herald RP17A	L.M.	17 gns.	Restyled Herald. 7 transistors. Carrying case £1 5s. extra.
INVICTA 8007	L.M.	14 gns.	Lux. easy tuning. Car ae. skt.
HMV/MARCONIPHONE			
2112	L.M.	12½ gns.	"Junior" model.
2120	L.M.S.	13½ gns.	"Junior" model
2114	L.M.	15 gns.	
2116	L.M.FM	19½ gns.	
2122	L.M.S.	17 gns.	
KOLSTER-BRANDES KR010	L.M.S.	13 gns.	Lux. bandspread. 8 transistor. Tel ae. Tape, ae. skts.
KR012	L.M.S.	16 gns.	Lux. bandspread. 8 transistors. Slow-SW drive. P.B. control.
WP11 *Carioca*	L.M.	10½ gns.	Battery-eliminator and reachargeable battery extra.
LEE PRODUCTS Hitachi TH600	M only.	9 gns.	6-transistor, camera styling. 2½ in. speaker. Speaker grille tuning ring. Earpiece.
Hitachi WH837	L.M.S.	18 gns.	4 in. speaker. Tel. ae. SW. earpiece.
Hitachi W734	M.S.	26 gns.	Clock radio. Alarm. Auto time switch. Tel. ae. SW. Recording lead and earpiece.
Hitachi KH1002R	L.M.FM	25 gns.	10 transistors. Tel ae. Recording lead and earpiece.
LOEWE-OPTA *Freddy*	L.M.FM	34 gns.	9 transistors. "K" version with SW in place of LW.
Auto-Lord	L.M.S.FM	45 gns.	10 transistors. Car bracket. AFC separate tone controls.
Ingelen *Golf*	L.M.FM	19½ gns.	9 transistor.
Marquis	L.M.S.FM	25 gns.	10 transistors.
Klarad *Tourist*	L.M.S.FM	27 gns.	10 transistors. Tone control.
720/730	L.M.3S	25 gns.	8 transistor. SW fine tuning.
MASTERADIO D518 "208"	L.M.	13½ gns.	Lux. Bandspread. 7 transistors. 5 in. speaker.
D516	L.M.FM	18½ gns.	Tape, car ae. phone skts.
PAM 5222	L.M.S.FM	24 gns.	9 transistor. 1W p-p output. 7 x 5 in. speaker. Tone control.
PERDIO *Marco Polo*	L.M.6S.FM	95 gns.	17 transistors. Continuous coverage 1·6Mc/s to 30Mc/s. M/C tuning indicator. Dial light. 6 x 4 in. speaker. Car ae. Sw. Two tone controls. AFC on FM.
PHILIPS 237 *Riviera*	L.M.	11 gns.	Micro-miniaturised. Camera styled.
336 *Majorca*	L.M.	16½ gns.	Slow-motion tuning. Tone control. 1W output.
130T *Starfinder*	L.M.	11 gns.	Micro-miniaturised.
390T Car Portable	L.M.	18½ gns.	Mounting Kit, inc. L/S.
PYE 1357	L.M.	13 gns.	Car ae. socket.
1359 *Poppet*	L.M.	5 gns.	Pocket portable, incl. strap case and earpiece.
RGD RR214 *International*	M.2S.FM	29 gns.	10-section Tel. ae. P.B. dial light. Ext. amp. skt.
REVELATION			
W. Wood & Son T20	L.M.FM	28 gns.	10 transistor. Car ae. Sw.
REGENTONE BT23 *Regenteener*	L.M.	9½ gns.	Battery charger and re-chargeable battery added free for period. Retail value 30s.

—*continued overleaf*

TV AND RADIO SHOW REPORT

TRANSISTOR PORTABLE RADIOS

Model	Wavebands	Price	Notes
SOBELL *World Ranger* Mk. 2	L.M.S.	16½ gns.	Cartridge loading batteries. Top controls. Car ae. Sw.
S316	L.M.FM	18½ gns.	Unbreakable case. Tel. ae.
STELLA ST428T	L.M.	—	Edge-controls. Slow-motion tuning. Tone control.
SANYO 8SP25 *Cadnica*	M.S.	23 gns.	Rechargeable batteries—mains-operated while charging. 8 transistor.
SHARP BXL377	L.M.	10½ gns.	Wrist-strap. Phone output.
FX-L09	L.M.FM	17 gns	10 transistor. AFC
TELEFUNKEN *Bajazzo TS*	L.M.S.FM	55 gns.	Doubles as table model. Three separate tuners. 1W output as portable, 2·3W output as car radio. Wood case, choice of colours.
TOSHIBA 8L 688L	L.M.2S	17 gns.	8 transistors. 400mW output, 3½ in. speaker. Fine tuner.
8TL 463R	M.S.	13½ gns.	400mW output. 3½ in. L/S.
ULTRA 6118	L.M.S.	12½ gns.	Restyled version.

Table Radios

Many of the foregoing models can fairly claim a double life as portable and table radio so improved has styling become, especially in the home-built product. Yet there is still a demand for the conventional table radio and a few makers were showing tasteful wooden-cased receivers in addition to the leather, plastics and composition coverings in popular models.

One of the comparatively few sets in this category was a mains-operated set of luxury specifications displayed by **Philips,** while the imported models again swayed toward lavishness with opulent finish, multi-waveband, multiplex stereo decoders, battery or mains operation, multi-speaker systems *et al.*

Impressive, yet by no means prohibitive in price. The consumer is temporarily in the happy position of being wooed from all sides. Now is the time to go shopping, it seems.

Radiograms

Big talking point of the Radio Show was undoubtedly the move to "solid state" by many manufacturers of radiograms. The **Thorn Group** has made a special feature of this design, introducing the first fully integrated receiver-amplifier with transistorised chassis.

There are five transistors and four diodes in the receiver, those in the v.h.f. tuner being silicon planar types. Output stages, due to this innovation, can now be transformerless, frequency range is widened, quality improved and yet an output of 2½W per channel achieved, feeding 8 x 5in. speakers with high-flux ferrite magnets.

A number of other manufacturers included solid state models, some unwrapping their offerings at the very last moment so that dealers visiting the exhibition during the first two (reserved) days may have missed a few of the latest releases. Messrs. **Pye, Defiant, RCA Victor, B. and O.** all had quality radiograms with transistorised circuitry, and the range of models from all makers in the luxury class was wide and impressive.

Much more attention has been paid to the basic construction in design. Teak has taken its place in the forefront, with a solid wood styling made a feature of **Ferranti** models, in the TV and radiogram fields.

The long-awaited decision on stereo broadcasting was not announced as expected at showtime but a number of makers include stereo decoders and multiplex tuners, while others state that their models are easily convertible.

Tone controls are much more elaborate than of late and **RGD** have made a feature of their "low-level-listening" compensation which adds bass boost when the volume is reduced by the flick of a switch. The long, low style has been somewhat modified, but length is still a common feature in an effort to obtain stereo reproduction without the need of an extra loudspeaker.

Pye came out at the last moment with transistorised stereograms in a Robin Day design which even pronounced the speaker positioning in their styling.

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TABLE RADIOS

Model	Wavebands	Price	Notes
BUSH VHF/81	L.M.FM	25 gns.	7-valve. Mains. 6 x 4 in. speaker.
BRAUN T1000	13-band	£195	Communications-type. Mains or battery. Portable.
TS45	L.M.FM	—	Transistorised. Can be operated horizontally or hanging. To match L25 speakers. Multiplex fitted.
COSSOR 1102U	L.M.FM	28 gns.	Mains. 2W output. 6 x 4 in. L/S.
DENHAM & MORLEY *Trier*	M.FM.	14 gns.	Mains.
Violetta	L.M.S.FM.	21 gns.	Mains.
Symphonia	L.M.S.FM	25½ gns.	Mains.
DALTRADE *Unitra Rumba*	L.M.S.FM	25½ gns.	6-valve, mains.
FERRANTI 1103	L.M.FM	26 gns.	P.B. station selection FM. AC/DC mains.
GRUNDIG *Malmo*	L.M.S.FM	49 gns.	Press key operation. Lux. selector SW band. 5-valve mains. Light walnut cabinet.
Stockholm	L.M.S.FM	59 gns.	As Malmo, plus stereo decoder. Scandinavian Walnut finish.
LOEWE-OPTA *Venus*	L.M.S.FM	75 gns.	Hybrid—7 valves, 15 transistors. Two large stereo L/S. Multiplex.
Komet	L.M.S.FM	36 gns.	6-valve mains. Flywheel drive. 3W output, concert L/S.
PYE 11/11	L.M.FM	—	Transistorised. Stereo. Two 7 x 5 in. L/S.

RADIOGRAMS

Model	*Wavebands*	*Stereo/Mono*	*Price*	*Notes*
ACE *Venezia*	L.M.S.	S.	69 gns.	Drop doors and lids at each end. BSR deck.
AG636	L.M.S.	M.	36½ gn.	Boat-shaped sapele cabinet. Garrard deck.
ALBA 8000	L.M.	M.	36 gns.	Garrard Autoslim deck.
8001/S	L.M.S.	M.	39½ gns.	Garrard Autoslim deck. Bass and treble correction.
8002/S	L.M.S.	S.	49 gns.	BSR UA16 deck. Balance.
B. & O. *Beomaster* 611	L.M.S.FM	S.	—	Transistorised. Multiplex. Automatic or Single Transcription player. Record storage cabinet. Meter-type indicator.
COSSOR CR1506A	L.M.	M.	41 gns.	Garrard Autoslim deck. 8 x 5 in. speaker.
CR1508A	L.M.S.FM	S.	89 gns.	Garrard Autoslim deck. Two 10 x 6 in. speakers.
DANSETTE RG65	L.M.	M.	29 gns.	Table-gram.MW bandspread. 8 x 5 in. speaker. BSR UA15. Diamond stylus.
DENHAM & MORLEY *Concerto*	L.M.S.FM	M.	39 gns.	Elac changer.
DECCA 575SRG	L.M.FM	S.	77 gns.	Garrard AT5 with Deram pickup. Two 8 x 5 in. speakers in acoustic enclosures. Matt walnut.
700 Mk. II	L.M.S.FM	S.	—	Transistorised.
707	L.M.S.FM	S.	83 gns.	Garrard AT6 deck with Deram cartridge. Two 8 x 5 in. speakers, plus two 3-in. tweeters, with direction control.
800	L.M.S.FM	S	—	Decca ffss pickup.
DR888	L.M.S.FM.TV	S.	—	Combined Gram/TV. 405/625 lines, UHF tuner, Transistorised Gram. Tape Playback. Deram head fitted. 5W per channel. 10 x 6 plus 4 in. unit per channel.
DEFIANT AF75	L.M.FM	M.	50 gns.	Transistorised. Garrard AT5 deck. Low-boy cabinet.
AF85	L.M.FM	S.	65 gns.	As 75, with extra channel and different styling.
AF87	As 85, with Tola veneer finish.			
DYNATRON *Buckingham* RG37T	L.M.2S.FM	S.	129 gns.	Available in Scandinavian and Queen Anne styling. Garrard AT6 with Sonotone cartridge. Adaptable M-plex. Tape compartment—4T deck.
Carlton RG36	As RG37, with period cabinet		175 gns.	Both 7½W per channel.
Dorchester RG35	L.M.FM.	S.	94 gns.	Compact. AT6. teak cabinet.
Hambleden	As RG37, Queen Anne cab.		165 gns.	—
Savoy	As RG37, Chippendale cab.		165 gns.	—
Richmond RG34T	As RG35	—	99 gns.	Satin Walnut, or oiled teak.
Henley	As RG35, but with 12W push-pull output, styled in teak or walnut		109 gns.	Garrard deck.
EKCO SRG431	L.M.S.FM	S.	87 gns.	7-valve. Tone-compensated V/C.
SRG439	L.M.S.FM	S.	69 gns.	6-valve. BSR UA15 deck.
FERRANTI SRG1120	L.M.S.FM	S.	88 gns.	Two 8 in. speakers.
SRG1132	L.M.S.FM	S.	69 gns.	BSR UA15 deck. 8W o/p.
SRG1131	L.M.S.FM	S.	58 gns.	Garrard Autoslim. 6W o/p.
FALCON *Symphony* 66	L.M.S.	S.	39½ gns.	Controls on scale.
Symphony 77	L.M.S.FM	S.	45 gns.	7-valve. Press button.
Harmony	L.M.S.FM	S.	51 gns.	7-valve, press-button. B.S.R. deck.
Hi-Life 606	L.M.S.	S.	54 gns.	6-valve. B.S.R. deck.
Hi-Life 707	L.M.S.FM	S.	60 gns.	6-valve. B.S.R. deck.
F43	L.M.S.	M.	29½ gns.	B.S.R. deck.
FERGUSON 3320	L.M.FM	S.	75 gns.	Transistorised. B.S.R deck. Slide top and drop front.
3324	L.M.	M.	33 gns.	Compact.
FIDELITY RG30	L.M.FM	S	66 gns	B.S.R. Deck. Two 9 x 6 in. speakers.
G.E.C. G979	L.M.S.FM	S.	69 gns.	4-speed changer. Large record storage compartment.
GRUNDIG KSS40	L.M.S.FM	S.	119 gns.	AG1025 changer. Two 11 x 7 in. and two 2½ in. speakers.
RG550	L.M.S.FN	S.	155 gns.	AG1025. Tape recorder compartment.
KS560	L.M.S.FM	S.	185 gns.	Stereo decoder. Reverb Unit.
KS580	L.M.S.FM	S.	275 gns.	As before. Dual 1009 changer, with variable speed. Space for TM45 tape dec. 10 L/S.
HACKER *Serenade* RG16	L.M.FM	M.	75 gns.	Consolette. Garrard AT6. 10 x 6 in. and two 5 in. L/S.
KOLSTER-BRANDES KG021	L.M.S.FM	S.	56 gns.	Tone-compensated V/C. B.S.R.
KG022	L.M.S.FM	S.	69½ gns.	Garrard Deck. Long-line cab.
WG20	L.M.S.FM	S.	59½ gns.	B.S.R. deck. Two 10 x 6 in. L/S
KG026	L.M.S.FM	S.	129 gns.	Dual deck. "Prima Ballerina."
HMV 2316	L.M.S.FM	S.	145 gns.	6 L/S. 2 gm. pickup with diamond stylus. 5W output per channel. Transistorised.
2312	L.M S.FM	S.	83 gns.	Two L/S.
LOEWE-OPTA *Premiere Stereo*	L.M.S.FM	S	165 gns.	Hybrid circuit. 5 valves 17 transistors. Stereo decoder. Man. Auto switch.
Kora-Stereo	As above.	—	159 gns.	As above.
Oslo-Stereo	L.M.S.FM	S.	85 gns.	FM Decoder. 8 valves, 3 transistors.
Paloma-Luxus	L.M.S.FM	S.	139 gns.	5 valves, 15 transistors.
Clivia Luxus	As above.	—	125 gns.	As above. 4 speakers.
Mallorca	L.M.S.FM	S.	115 gns.	Stereo decoder. 4 speakers.
Zurich	L.M.S.FM	S.	—	Stereo decoder. 2 single-ended outputs, 2W per channel.
MARCONIPHONE 4310	L.M.S.FM	S.	83 gns.	Transistorised.
4304	L.M.FM	S.	53 gns.	Valve-operated. 6W push-pull per channel.
MURPHY A891	L.M.FM	S.	62 gns.	Two 10 in. L/S.
A881	L.M.FM	S.	89 gns.	Four speakers.
A682SR	L.M.FM	S.		Garrard Autoslim with Ronette pickup.
MASTERADIO D572	L.M.	M.	36 gns.	Gold-straw grille.
D573	L.M.FM	S.	66 gns.	Paldao cabinet.
McMICHAEL MS207	L.M.FM	S.	66 gns.	Two 8 x 5 in. L/S.
MS208	L.M.FM	S.	—	Paldao cabinet.
INVICTA 8101	L.M.FM	M.	43 gns.	Sliding Tambour door.

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TV AND RADIO SHOW REPORT

RADIOGRAMS

Model	Wavebands	Stereo/Mono	Price	Notes
PAM 5208	L.M.S.FM	S.	89 gns.	Garrard 3000LM, Sonotone cartridge, diamond stylus.
5207	L.M.FM	S.	63 gns.	Garrard Autoslim, Two 8 in. speakers, and tone balance.
PHILIPS 431	L.M.	M.	42 gns.	Less than 20 in. high.
540	L.M.FM	S.	65 gns.	Normal facilities.
541	L.M.FM	S.	79 gns.	Transistorised.
536A	L.M.S.FM	S.	129 gns.	Side and front-facing speakers.
PYE 1207	L.M.S.FM	S.	105 gns.	Transistorised. Robin Day styling.
1203	L.M.S.FM	S.	87 gns.	8 valves. Garrard AT6.
1205	L.M.FM	S.	61 gns.	Small proportions.
REGENTONE SRG25	L.M.S.FM	S.	89 gns.	Cocktail gram. B S.R. UA16. 9-valve chassis.
RGD 211 De Luxe	L.M.2S.FM	S.	115 gns.	Low-listening boost.
STELLA ST320	—	—	—	Narrow styling with drop flap record player.
ST238	—	—	—	Twin elliptical speakers.
SOBELL SG678	L.M.FM	S.	66 gns.	Cocktail cabinet. B.S.R. deck. 6 valves. Two 8 x 5 in. speakers.
SG679	L.M.S.FM	S.	69 gns.	Balfour deck. Drop front and slide top.
ULTRA 6312	L.M.S.FM	S.	77 gns.	Garrard Autoslim deck. 2½W output per channel.
TELEFUNKEN *Bayreuth* 2584	L.M.S.FM	S.	239 gns.	TW504 changer. 14 valves. Multiplex. Two 13½ x 7 in. woofers, 4 medium-treble speakers. AFC on FM.

Of the imported models, super-de-luxe designs caught the attention at prices in the "millionaire bracket" and with many special features. **Saba Electronics**, the West German firm, returned to the British market with a super-gram priced at 298gns.

Only a little cheaper was the **Bosch** *New York* with eight speakers, 15 valves, Garrard Lab. A deck. built-in stereo decoder, a.m./f.m. coverage and 7W output.

Grundig, mounting their own opulent show at the Hilton Hotel, showed a 365gns. stereogram with inbuilt TV (23in.) and space for a tape recorder deck.

Not to be outdone, **Philips** featured their TV/gram, the *Combinado,* incorporating a five-waveband stereogram and 23in. TV chassis and using the AG1025 deck with push-button controls and diamond stylus.

In contrast the sister-firm, **Cossor,** had a four-band stereogram, the CR1508A, only 13in. from front to back with the playing deck mounted on a drop-flap, while **Stella** showed their "flat-dweller's model" which is only 9in. deep at the top.

We were interested in a new British record deck by **Balfour Electronics** fitted in the **Sobell** SG679. Well known in the export field, this auto-changer makes its first appearance on the **G.E.C.** stand.

In the lower price range an attractive range of new designs under the **Falcon** brand was shown by John Street, and the **STC Group** had representative models under the **Ace, Regentone** and **RGD** names.

Alba brought out new show releases, one of them, as stated above, at the very last moment. In addition many of the established models were shown by **Bush, Pam, Decca** and, as ever, **Dynatron.** One of the latter had the rare 4T tape deck incorporated, but no news is yet given of this deck being used in a separate tape recorder.

Services

Of particular interest to *Practical Wireless* readers—concentration at Earls Court on radio and electronics as a career. On Stand 18 a cinema had been arranged, showing a specially produced film to tell youngsters of the opportunities in graphic emphasis. Special staff were constantly on hand to explain apprenticeship schemes and training.

B.R.E.M.A., looking ahead, are sponsoring the training of engineers with a deeper basic grounding in the trade. Developments are outstripping general information and special training is a must for the future.

The larger firms are well aware of this and back the approach wholeheartedly. Making some contribution toward this, **Philips** were holding a novel competition for youngsters on Stand 61, where their toy kits were used to test lads (and lasses) in speed and dexterity of simple circuit wiring.

Service aids were also a feature of the **A.E.S.** stand, where the very fine tool kits shared a place of honour with two new ideas, the plastic "fakir's bed" to act as a simple jig for small printed circuits and the aspirated soldering iron which sucks solder from a joint as the bit melts it. Constructors with experience of printed circuit techniques will realise the value of this device.

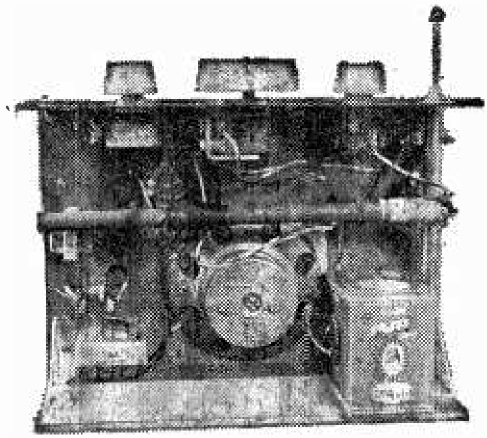
Constructors, too, were welcomed on the **Heathkit** stand, where much of their latest equipment was shown and a staff was always ready with advice.

Dealers and their engineers were well served with advice and demonstrations within the closely guarded confines of the dealer-only stands. Indeed there was said by one cynic to be more of interest here than publicly on show! Brimar, Mullard. R.T.S., A.E.S. and others had some intriguing exhibits.

On the Cossor, Stella and Philips stands, for example, we were shown some very attractive tape recorder designs not yet for general release, their showing being restricted by the ban on goods not of British manufacture, a ban which many critics consider has killed the Radio Show.

Dead, they may think it, but this year's showing was evidence that the British radio industry is far from lying down.

Details of all the new Record Players and Tape Recorders will be published in the December issue.



A T.R.F. Transistor Portable

A SIX - TRANSISTOR MEDIUM AND LONG - WAVEBAND RECEIVER

by F. G. Rayer

WITH a t.r.f. receiver of the type described here there is only one tuned circuit. This simplicity is the great advantage of the t.r.f. circuit over the superhet, as there are no aerial, oscillator, and intermediate frequency circuits to trim or align. There is also some simplification in wiring, compared with a superhet.

The circuit for this receiver is shown in Fig. 1 and it will be seen that VC1, with the associated ferrite rod windings, forms the only tuned circuit No reflexing is employed, Tr1 being the first r.f. amplifier, Tr2 the second r.f. amplifier, and D1 the diode detector. A conventional audio amplifier follows, with Tr3 as first a.f. stage. Tr4 as driver, and Tr5 and Tr6 in the push-pull output stage. Current drain is approximately 10mA with no signal or at very low volume, rising from 20—40mA on peaks, at good volume. A non-miniature 7·5V battery is used, and has a very long life.

The circuit was primarily intended for local station reception, but a fair selection of stations could be received quite well, including some of the more powerful continental transmitters. A telescopic aerial rod is provided, for use when necessary, but it is suggested this item is omitted until the receiver has been tested. To increase sensitivity, fixed regeneration may easily be added, including Tr1 and Tr2, but this is best omitted until it has been found that the receiver performs well without it.

Construction

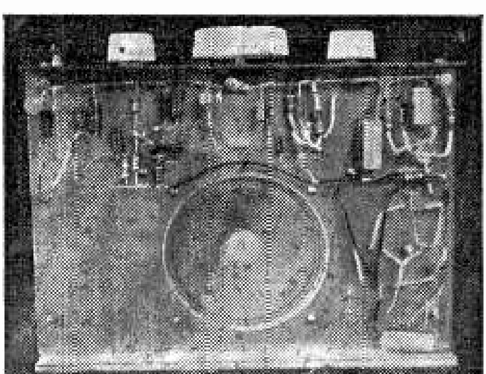
The receiver is built on an insulated panel approximately 8½in. x 6in., but the actual size is not very important. The panel has an aperture to suit the loudspeaker, as in Fig. 2. A further panel 8½in. x 3in. is secured with angle brackets, and drilled for volume control, tuning capacitor, and wavechange switch, as in Fig. 3. To accomodate components, the 8½in. x 6in. panel is set back about ½in. from the edge of the 8½in. x 3in. panel.

A length of 20s.w.g. tinned copper wire is run between tags, as in Fig. 2, to form the positive line, and capacitors and resistors are soldered to this, as indicated in this diagram.

Transistor leads are left nearly full length, and pass through small holes, as in Figs. 2 and 3. If maximum possible volume is required, Tr5 and Tr6 should be held in cooling clips. Good volume can be maintained without these clips, however.

Two mounts for the ferrite rod are cut as in Fig. 3. The aerial connections are numbered in Figs. 1, 2 and 3. Tag 1 on the aerial is the beginning of the m.w. winding. Tag 2 is the junction of the m.w. and l.w. sections, while tag 3 is the end of the l.w. winding. A single base coupling winding is employed, tag 4 going to Tr1 base, and tag 5 to the junction of R1 and R2.

The driver transformer T1 has primary wired to Tr4 collector and negative line. The secondary centre-tap goes to R17 and R18, and remaining secondary leads to Tr5 and Tr6 base wires. The output transformer T2 has centre-tap wired to negative on C12, and remaining primary leads to collectors of Tr5 and Tr6, as in Fig. 2.



Above: A view of the front of the finished receiver. A rear view is shown at the top of the page.

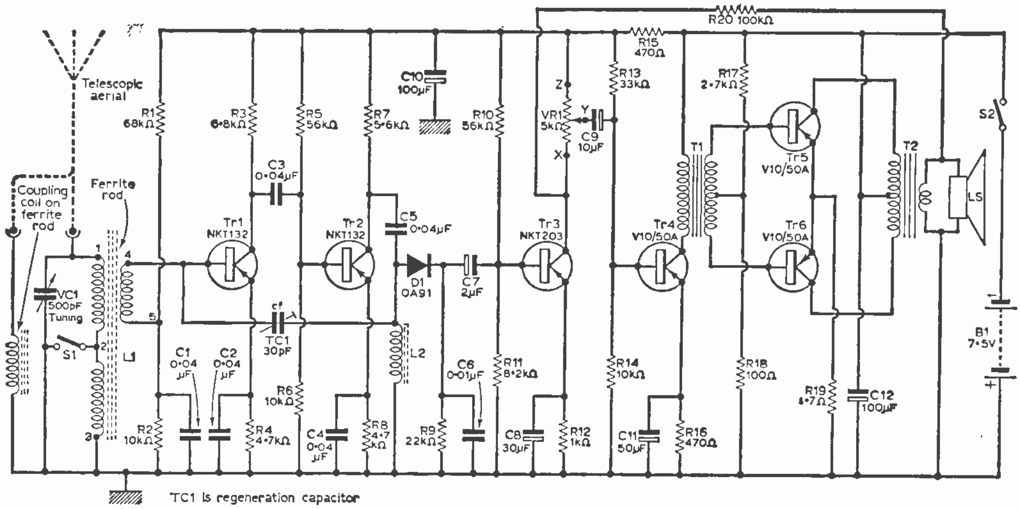


Fig. 1: The dual-wave t.r.f. receiver circuit.

The receiver should first be tested with R20 disconnected. The loudspeaker is then wired to positive line and R20, as in Fig. 3. If there is a reduction in volume, these connections are correct. But if howling begins, the leads from R20 and positive line to the loudspeaker should be reversed.

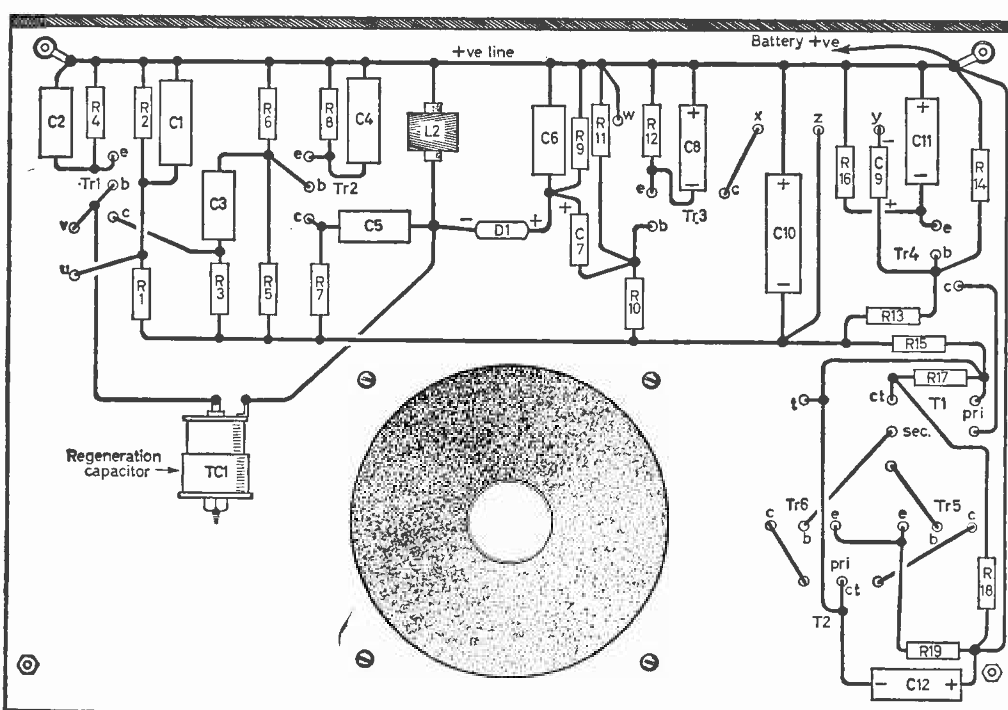


Fig. 2: Component layout and wiring on the front of the panel.

COMPONENTS LIST

Resistors:

R1	68kΩ	R11	8·2kΩ
R2	10kΩ	R12	1kΩ
R3	6·8kΩ	R13	33kΩ
R4	4·7kΩ	R14	10kΩ
R5	56kΩ	R15	470Ω
R6	10kΩ	R16	470Ω
R7	5·6kΩ	R17	2·7kΩ
R8	4·7kΩ	R18	100Ω
R9	22kΩ	R19	4·7Ω
R10	56kΩ	R20	100kΩ

All 10%, ¼W carbon

VR1 5kΩ potentiometer with s.p. switch (S2)

Inductors:

L1 Dual wave ferrite rod with coupling winding

L2 R.F. choke 10–20mH

Transformers:

T1 Push-pull driver transformer

T2 Push-pull output transformer

Capacitors:

C1	0·04μF paper	C7	2μF electrolytic
C2	0·04μF paper	C8	30μF electrolytic
C3	0·04μF paper	C9	10μF electrolytic
C4	0·04μF paper	C10	100μF electrolytic
C5	0·04μF paper	C11	50μF electrolytic
C6	0·01μF paper	C12	100μF electrolytic

TC1 see text

VC1 300pF air spaced variable (any value 250 to 350pF will suit)

Transistors:

Tr1	NKT132	Tr4	V10/50A
Tr2	NKT132	Tr5	V10/50A } matched
Tr3	NKT203	Tr6	V10/50A } pair

Miscellaneous:

D1 OA91. S1 s.p.s.t. rotary switch Loudspeaker 3½in. dia. 2–3Ω. 7·5V battery. Telescopic aerial. Two 1in. knobs. One 2in. knob. Paxolin sheet: 8½in. x 6in.; 8½in. x 3in. Plywood 6¾in. x 2⅞in. Angle brackets, bolts, etc.

Aerial

If the telescopic aerial is required, it is mounted with long 6B.A. bolts fitted with extra nuts, so that it can be extended vertically. The simplest method of connecting the aerial is to take a lead from it to tag 1 on the rod aerial, as in Fig. 1. This was found to be satisfactory. It does mean, however, that hand capacity effects, due to proximity with the aerial, slightly upset tuning. This may be overcome, if wished, by fitting an aerial coupling winding on the centre of the ferrite rod. This

—continued on page 666

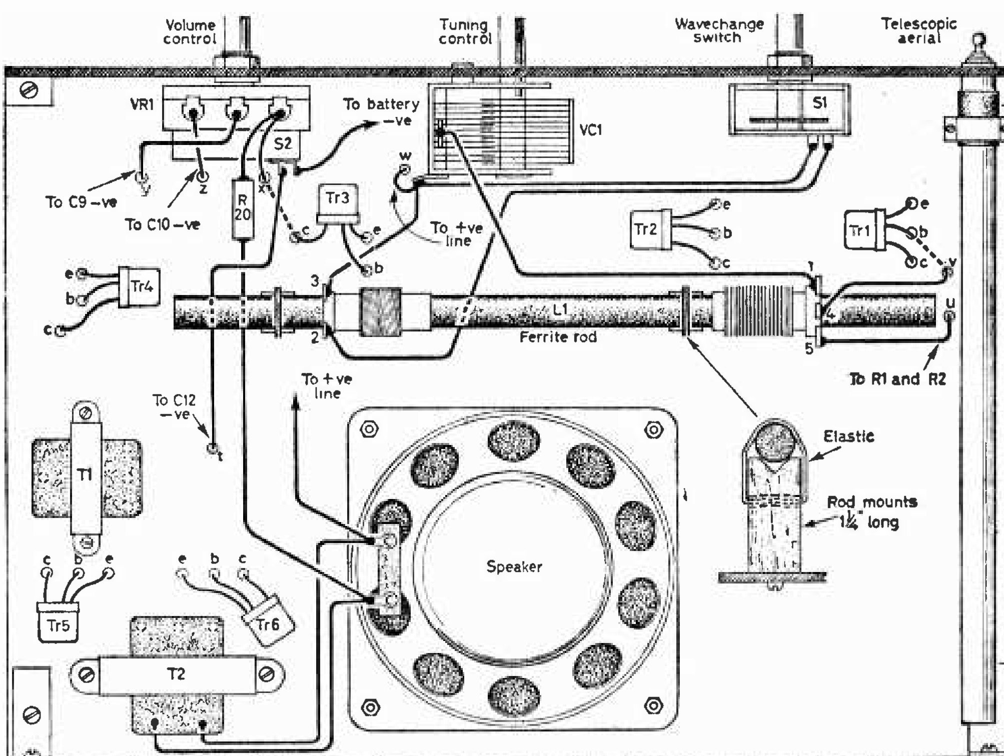


Fig. 3: The rear of the panel on which side most of the larger components and the transistors are mounted.

on the Short Waves

MONTHLY NEWS FOR DX LISTENERS

All times are in G.M.T. All frequencies are in kc/s.

The Broadcast Bands—by John Guttridge

MOST stations are prepared to give something in return for a good reception report. This normally takes the form of a verification or QSL card, although some stations send a letter instead. Stations not issuing verification cards or letters are not usually interested in receiving reception reports.

TYPICAL QSL CARDS

QSL cards normally take the form of a design or perhaps photograph on one side with verification details on the reverse. Several of the short wave clubs issue certificates to members who can produce various sets and combinations of cards.

Often these clubs insist that the cards bear certain details before they will accept them for certificates. For example, the International Short Wave Club says that a card is not a proper verification unless it contains the date, time and frequency involved.

From time to time stations issue special cards to mark special occasions—the opening of a new transmitter or studio perhaps. These are worth obtaining as only a limited number are issued.

Several stations, especially Latin American ones, also send colourful pennants to listeners submitting reception reports. Regular reporters are occasionally even more favoured by stations, gifts of items such as gramophone records being made sometimes.

Here are details of the verifications given by a few stations. *Radio Voice of the Gospel* in Ethiopia sends a card with a simple design and the station's name and address on one side. On the reverse there is space for time and frequency details only, although the date is normally written in. Also on the reverse of the card there is a mass of technical information about the station.

On the front of the card produced by the Canadian Broadcasting Corporation's *International Service* there is an outline map of Canada which shows transmitter and studio location pictorially. The back of the card is printed in English and French with space for frequency, time and date. A separate card is issued for correct reports on Northern Service transmissions.

Radio Havana, Cuba, uses a colour picture postcard printed on the reverse in English and French. Frequency and date are the only details given. A pennant is also sometimes sent by this station.

One of the most disappointing cards is that produced by *Radio Pakistan*. This has remained unchanged for several years and carries a simple design but no verification details.

One of the most colourful verifications comes from *Radio Clube de Goiania* in Brazil which sends several picture postcards, a letter of verification and a pennant.

HAPPY BIRTHDAY!

Just celebrating its first birthday is the Sudbury World Communications Club. The club publishes a monthly called "*Contact*" and has a subscription of 10s. One service offered to members by this club is the free supply of report cards. Anyone interested in joining should contact the club secretary, Mr. D. J. Wilson, at 23 Newman's Road, Sudbury, Suffolk.

RADIO CANADA CLUB

A different kind of short wave club is that run by *Radio Canada*. To qualify for membership you must send five separate reports of any Radio Canada short wave transmission to the Radio Canada Short Wave Club, C.B.C. International Service, P.O. Box 6000, Montreal, Canada. These must be numbered from one to five consecutively at the top.

To remain a member you must send in at least one reception report every two weeks. Members receive a membership certificate, pennant, stickpin and Radio Canada short wave programme schedule.

DX NEWS

D. Greer, of Billingham, County Durham, reports good reception of *Cairo Radio* in English between 2132—2227 on 9,495/11,915. He says the station verifies reception reports with a QSL card and a programme schedule. The station's address is U.A.R. Broadcasting and TV, Maspero, Cairo, Egypt.

Still in the Middle East, news comes from *Kol Israel*, Jerusalem, Israel, that its English transmission now includes a Hebrew language lesson. It is aired on Sundays at 2015 on 9,009.

Transmitting to the Middle East between 1100 and 1400 G.M.T. is the *Osterreichischer Rundfunk*, Wien IV, Argentineierstrasse 30a, Austria. This transmission is on 17,750. Other frequencies which can be heard in Europe are 6,155/[illegible],245/ 9,770/11,785.

According to *Radio New York Worldwide* the

Trans-World Radio station at Bonaire in the Netherlands Antilles is now testing on short wave. Frequencies reported are 9,715/11,855/15,435.

In common with a number of other short wave stations Radio New York Worldwide itself made several frequency changes on September 6. Transmissions to Europe is from 1200—1815 on 17,760/15,440, 1815—1830 on 15,440 and 1830—2145 on 11,875. The beam to Africa is from 1200—1930 on 17,760 and 1940—2145 on 15,290.

The Amateur Bands—by David Gibson G3JDG

IT is indeed strange that DX can be heard and worked on 14Mc/s, and that there is a great deal of activity on 144Mc/s, yet 28Mc/s in the middle appears to be far more "allergic" to the sun's activity than the bands on either side of it.

However SWLs and amateurs are urged to check 10 metres as it is already beginning to stir, and reports of EDX and DX are getting more frequent every week; even W's have been heard! One Sunday morning brought DL7QB5 & 6, YO5NR 558 and SP8AOV 589. (Numbers signify the R.S.T. reports).

For the vigilant ones a good DX'er to listen for is 5N2JKO. Heard but not worked—VQ2AP, HZ2AMS, 5B4CZ, 5N2JKO. Also of interest is the beacon station GB3LER and 29·00Mc/s, situated at Lerwick in the Shetland Isles. A date for your diary is Dec 5th to 6th which is the R.S.G.B. 21/28Mc/s phone contest.

"TWENTY"

The 14Mc/s band at the moment is fading out from about 0100 on, although some good DX comes in during the day and evening. Notably loud signals (5+7 to 5+9) were OA4KY, KZ5KY, YSIO, Ti2iO, Hi8WSR, KG4AM, CN8GB, HK4EB, VP7NS, HPIMN, VE1FY and YV5A1P. KG4AM, incidentally, is the American base at Guantanamo in Cuba. All the above on 'phone SSB or AM.

Should you hear the calls K3UIG/K7UGA, it will mean you're listening to Senator Barry Goldwater—yes he is active on the band, very much so!

ON 7Mc/s

The other band explored this month was 7Mc/s and as usual lived up to its reputation of being both lively and noisy. Using the P.W. 7Mc/s transceiver (P.W. June, '64) the following stations were worked on a 60ft. end fed wire:—YUIAV, LZZKSK, UA3CD, YUIAR, YO2ADG, UB5VNU, YUIAST and OH5VF/Ø. Maximum input—5W and the receiver an O-V-1. The latter station, OH5VF/Ø, is situated on Aaland Island, (Look it up in an Atlas!)

Expeditions are often organised to various islands and are well worth searching for. At the moment Christmas Island is in the capable hands of VK9DR, and Lord Howe island is another favourite spot.

RALLIES GALORE

Dates to listen on for your "sked" diary—Sept. 13th there will be three mobile rallies. Listen on 160 metres and 2 metres for the talk-in stations. R.S.G.B. Mobile Rally, Woburn Abbey, Beds. Reading A.R.C. Rally, near Pangbourne, Berks. International Mobile Rally, Holland.

The 1964 VK/ZL Oceana contest, Oct. 3—4th 'phone section, Oct. 10th—11th c.w. section. If you haven't heard or worked Australia or New Zealand try these dates in October.

Just a reminder too that R.A.E. evening classes will be starting shortly and now is the time to check up and enroll.—See Club News page, last month.

THE G3JDG GEAR

Finally, in order that readers can assess results, the following is the equipment used for this column. TX—120W a.m./c.w. RX—single conversion s'het r.f., f., i.f., det/b.f.t., o./p. Antennas—160/80/40/20/10—60ft. end fed wire, maximum 12ft. high; 20 metres Dipole; 10 metres cubical quad 12ft. high.

Anything of interest on the amateur bands will be welcome plus gen on the gear, transmitting or receiving.

Twin Triode Two

—continued from page 635

The rectifier MR1 is a modern contact cooled type, the E250/C50 rated at 250V 50mA.

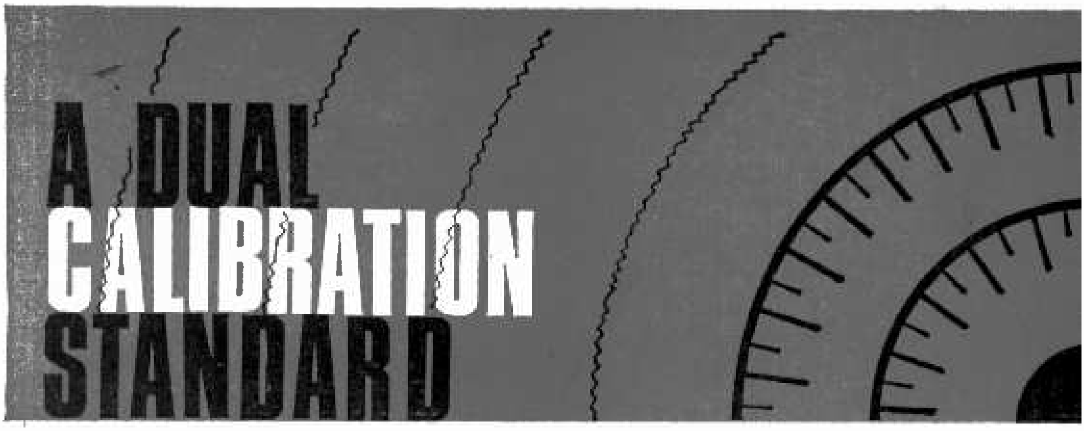
Layout and Wiring

Layout is again not critical but to minimise hum the following points should be noted. Heater leads should be put in first, twisted and kept close to the chassis. The leads before the grid of the first 12AX7 should be screened and the screened braiding earthed at one end only. Hum in the prototype was almost inaudible with normal volume settings. The layout is given in Fig. 2 but can be altered fairly freely to fit other chassis.

Power Requirements

The power supplies are quite conventional and little needs to be said about it. Initial smoothing is done by C10 R11 and thereafter the h.t. is split and smoothed further by L1, C8 and C9. Both valves have centre tapped heaters and for 6·3V operation have pins 4 and 5 strapped together for one lead and pin 9 taken to the other lead.

The performance is hard to assess without instruments but with such vigorous music as the *1812 Overture* the system is an improvement on a commercial record player in the £16 class. Volume is ample to overload an eight inch speaker rated at four watts. ■



A DUAL CALIBRATION STANDARD

WITH home-built receivers and signal generators the lack of accurate dial markings is often a nuisance and limitation. The unit described here enables receivers or signal generators to be calibrated at 100kc/s points from 100kc/s (3000 metres) to 30Mc/s (10 metres). The original frequency from which calibration is made is taken from the long wave Light Programme transmitter on 200kc/s (1,500 metres) and a high degree of accuracy can be achieved.

The 1Mc/s signal gives calibration marks at 1Mc/s, 2Mc/s, 3Mc/s, 4Mc/s and so on up to 30Mc/s and is particularly useful for short wave equipment. The 100kc/s or 0·1Mc/s signal provides calibration marks at 100kc/s, 200kc/s, 300kc/s, 400kc/s, etc., which allow medium wave equipment to be calibrated and also fill up at 0·1Mc/s intervals between the 1Mc/s marks over the short wave bands.

Equipment of this kind often employs 100kc/s and 1Mc/s crystals. These have high stability but are expensive. In the unit shown here tuned coils are employed instead of crystals. Provided the unit is always set to harmonic resonance with the 200kc/s Light Programme, before use, a high degree of accuracy is obtained—better, in fact, than that expected from ordinary ready-made receivers or signal generators. The method of use is described later.

CIRCUIT: POWER SUPPLIES

The circuit is shown in Fig. 1 and uses a 6C4 triode. This needs 6·3V 0·15A for heater and about 10mA at 200V to 300V for h.t. As the unit is employed with a receiver it is intended that these supplies be drawn from the receiver power pack.

The three power supply leads are fitted with small clips. The h.t. negative and 6·3V return is clipped to the receiver chassis. To obtain 6·3V the 6·3V clip is attached to a heater circuit tag. The h.t. positive lead is taken to any convenient h.t. positive point, such as the smoothing choke.

The receiver must have 6·3V valves so that 6·3V may be drawn. It should also be of the usual a.c. type with all power supplies obtained from a mains transformer. The unit must not be attached to an a.c./d.c. receiver or to a set deriving h.t. directly from the mains.

A two-way switch is fitted so that 100kc/s or 1Mc/s signals may be obtained at will. The 150pF and 100pF variable capacitor trimmers have to be set initially by referring to the 200kc/s Light Programme but are then left untouched.

COILS

The dual-frequency coil is shown in Fig. 2 and is wound on a 3in. piece of ⅜in. diameter ferrite rod, using 34s.w.g. silk-covered wire throughout.

The 1Mc/s coil has 80 turns, tapping B being 20 turns from end C. A layer of glued paper is wound

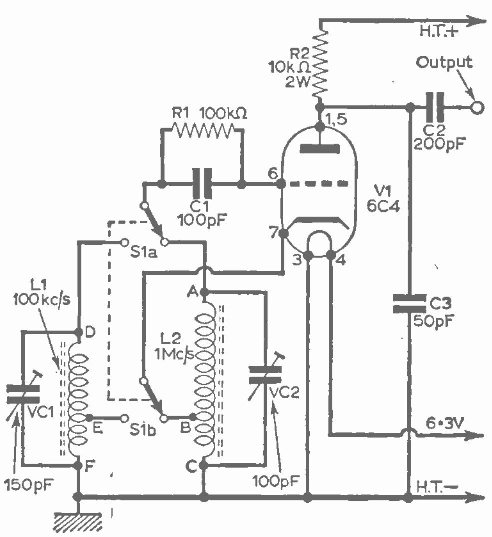
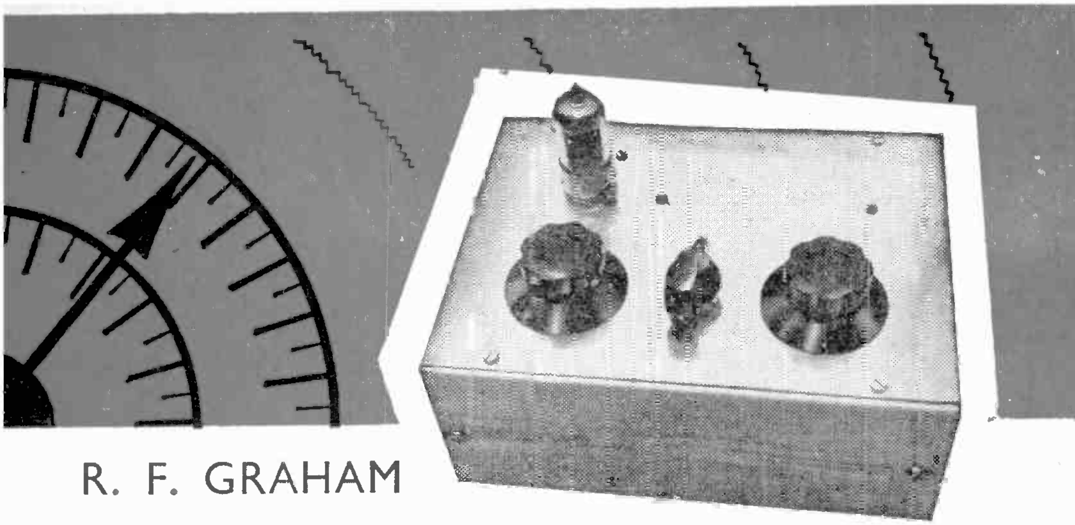


Fig. 1: The simple, single-valve circuit.



R. F. GRAHAM

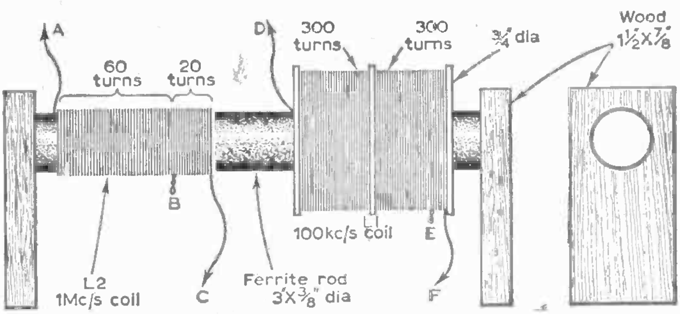
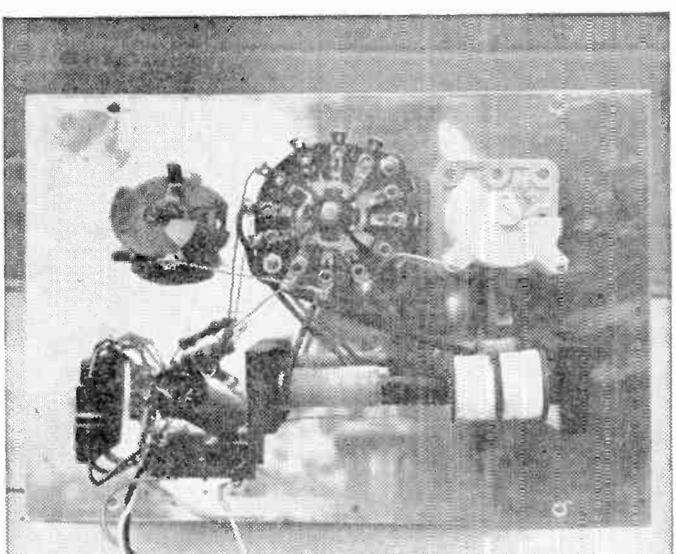


Fig. 2: Coil winding details for L1 and L2.



A rear view of the finished instrument.

round the rod first. The turns are wound closely side by side. The ends are secured with adhesive tape, and touches of cement.

For the 100kc/s coil, three $\frac{1}{16}$in. thick paxolin washers $\frac{3}{4}$in. in diameter are cut. They are a tight fit on the rod, and are cemented in place with winding spaces $\frac{3}{8}$in. wide between them, the wire passes through a small hole near the rod, end D. The first space is filled by winding 300 turns. The wire is then taken over into the second space, and 250 turns are wound, and loop E is made. A further 50 turns are then wound on, and the coil terminated at F. The windings should be fairly tight, and reasonably even, and each is covered with adhesive tape.

Two small pieces of wood have $\frac{3}{8}$in. holes, to take the ends of the rod. Screws passed through the aluminium panel hold the wooden pieces in position.

CONSTRUCTION

The unit is built and wired on a 5in. x 7in. aluminium panel, all parts and connections being shown in Fig. 3. The panel is afterwards screwed to a 5in. x 7in. aluminium box (see component list) so that the whole is completely rigid.

A 4-sided chassis, 5in. x 7in. and 3in. deep, could be used, but wiring will be less easy. The actual layout is not important, and a rigid box, case or cabinet to hand may be used.

A tag strip anchors h.t. positive

COMPONENTS LIST

Resistors:

R1 100kΩ ½W R3 1kΩ–2·2kΩ
R2 10kΩ 2W

Capacitors:

C1 100pF mica or ceramic
C2 200pF mica or ceramic
C3 50pF mica or ceramic
C4 2-16μF electrolytic
C5 2-16μF electrolytic
VC1 150pF s.w. variable
VC2 100pF s.w. variable

Miscellaneous:

V1 6C4 valve
MR1 250V rectifier
T1 Mains transformer. Secondaries: 250V and 6·3V
S1 2-pole, 2-way rotary switch

Universal chassis box, 7in. x 5in. x 3in. plus 7in. x 5in. panel (Home Radio, Mitcham). Two-way insulated tag strip. 3in. x ⅜in. ferrite rod. 2oz. 34s.w.g. silk-covered wire. One B7G valve-holder. Three knobs, wire, etc.

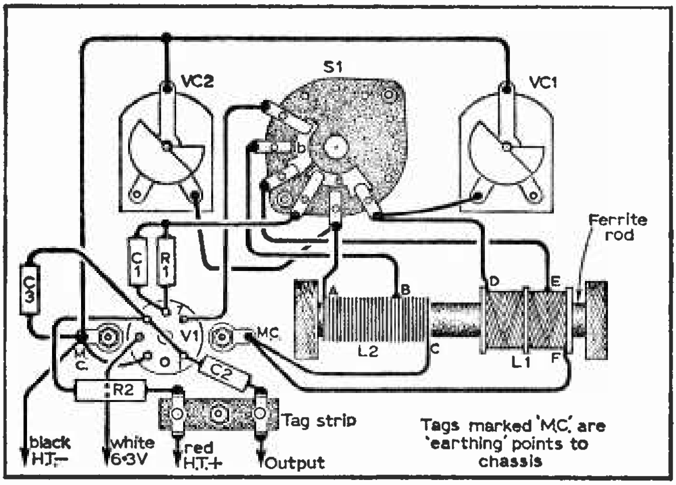


Fig. 3: The complete wiring diagram of the unit.

and output leads. Black flex is suitable for chassis (h.t. negative), with red for h.t. positive, and white or some other colour for heater. These three leads are twisted together and fitted with clips.

The coil and capacitor values are such that the capacitors are about ¾ closed. If smaller variable capacitors are to hand, they may be used if pre-set or fixed capacitors are wired in parallel with them, to make up the required total. A 200pF or 250pF capacitor may be used for the 100kc/s circuit, instead of 150pF, if to hand. But a value larger than about 150pF is not recommended for the 1Mc/s circuit, or adjustment is too critical.

Points marked MC go to the chassis. Leads are short and direct. If the switch has more than two poles, unwanted tags can be ignored.

If wished, an initial test can be made to see that the circuit oscillates on both bands. To do this, a meter is included in the h.t. positive lead. The current will be around 7mA to 12mA or so, depending on h.t. voltage, and it should rise by several milliamperes if the variable capacitor to which the circuit is switched is momentarily shorted. If this rise is not found, wiring should be checked.

The panel should be screwed to the chassis box, with power and output leads passing through a grommet. A 5in. x 7in. plate is screwed on the chassis bottom, using self-tapping screws.

HARMONIC GENERATION

When the unit is switched to 100kc/s and tuned to 100kc/s it gives an output on 10kc/s, 200kc/s, 300kc/s and each multiple of 100kc/s. These harmonics grow progressively weaker, until they can no longer be detected. With a sensitive receiver, they can be heard to 30mc/s. The second harmonic of 100kc/s falls on 200kc/s, which is the Light Programme transmitter frequency. To adjust the unit to 100kc/s, the long wave light programme is tuned in on a receiver, and the unit output lead is placed near the receiver, or is wound round the receiver aerial lead. The 150pF capacitor is then rotated until a whistle is heard in the receiver. This falls in pitch as the tuning approaches 100kc/s and ceases when tuning is exactly at 100kc/s. If tuning proceeds, the whistle re-appears rising in pitch. The capacitor is thus set at the 100kc/s point, where the heterodyne whistle vanishes. This is most easily done accurately when the programme is momentarily silent.

The 100kc/s signal can now be picked up by the receiver at 100kc/s points. That is, 300kc/s (1000m.), 400kc/s, 500kc/s (600m.), 600kc/s (500m.), and so on. The 10th harmonic, which is 1000kc/s (300m.) or 1Mc/s is tuned in carefully on the receiver. The unit is then switched to 1Mc/s and the 100pF capacitor is rotated until the unit signal is accurately tuned to the receiver. Harmonics of the 1Mc/s signal can then be tuned in on the receiver, and will be strongly heard throughout the short wave bands.

If the receiver permits, the unit can be tuned by picking up the MSF frequency transmissions on 2·5Mc/s and 5Mc/s, or these may be used as a check after initial adjustment as described.

The 100kc/s marks will not be wanted throughout the short wave ranges, but are useful for calibrating a particular band, such as an Amateur band. For example, the 3·5Mc/s Amateur band extends from 3·5Mc/s to 3·8Mc/s and the 100kc/s setting of the unit will give marks at 3·5Mc/s, 3·6Mc/s, 3·7Mc/s and 3·8Mc/s. With the 7Mc/s band, the 1Mc/s signal will give a mark for 7Mc/s. and the 100kc/s will give 7·1Mc/s. In the same way, 14Mc/s and other bands may be accurately found and marked on the receiver.

For best accuracy, the receiver and unit are switched on for twenty minutes or so before calibration, and the unit is always re-adjusted to zero beat with the long wave Light Programme, or MSF, before using it to calibrate a receiver or generator. The accuracy is then easily higher than the accuracy with which the average receiver or generator tuning scale can be read.

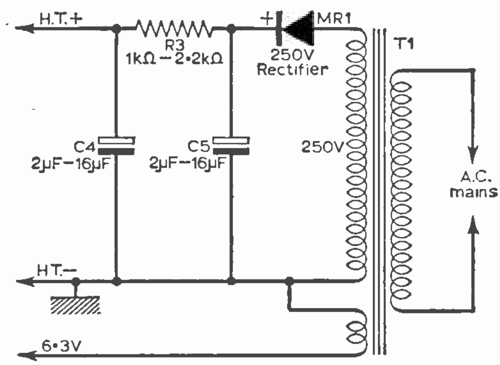
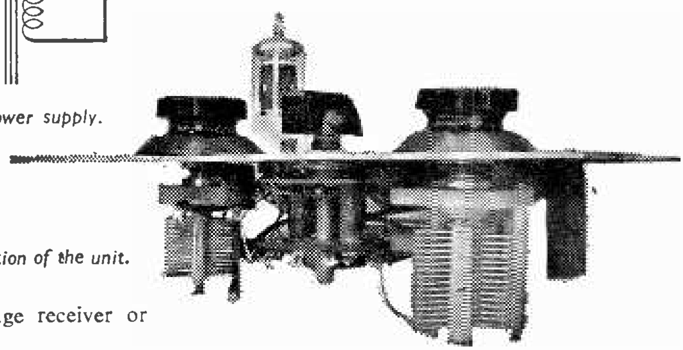


Fig. 4: The circuit of a suitable power supply.



An edge-on view showing the construction of the unit.

RECEIVER ADJUSTMENT

T.R.F. receivers may be readily calibrated, because if the reaction control is just sufficiently advanced, the harmonics can be tuned in as whistles.

Superhet receivers having tuning meters or beat frequency oscillators are also easily calibrated, because the signals can be observed on the meter, and heard with the b.f.o. on.

With the popular domestic type superhet, a tuning meter can be improvised by connecting a meter between the intermediate transformer and h.t. line, with a 0·01μF Capacitor from i.f.t. to chassis. A meter range of 10mA or so is normally suitable, and the receiver must have the usual a.v.c. circuit. Or oscillation may be induced by twisting an *insulated* wire round the intermediate frequency amplifier grid and anode circuits, adjusting this until oscillation is heard. (This is a crude form of b.f.o.)

Some adjustment of coupling between the unit and receiver may also be necessary. With low multiplies, the signal is strong, and the output lead may be placed near the receiver. But with high multiples, it may be necessary to take the lead to the aerial socket, removing the usual aerial. This should be checked before beginning calibration.

GENERATOR CALIBRATION

To calibrate a signal generator, the generator and unit are both coupled to the aerial circuit of the receiver. The receiver is only used to listen for heterodynes between the generator signal, and marker harmonic, so exact calibration of the receiver is not necessary.

The generator and receiver are tuned to 1Mc/s points and the generator is adjusted to zero beat with the unit harmonic. The 1Mc/s points may thus be marked on the generator scale. The 0·1Mc/s (100kc/s) divisions are then filled up with the aid of the 100kc/s signal.

FREQUENCY WAVELENGTH

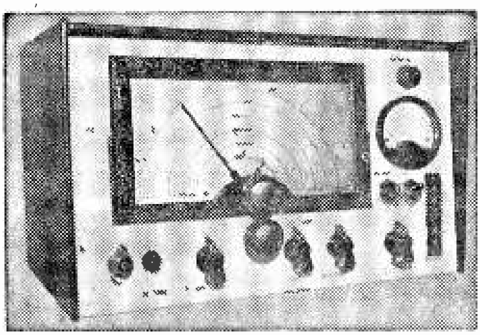
If it is wished to obtain wavelength markings, this can be done by noting that wavelength in metres=

$$\frac{300{,}000}{\text{kc/s}}$$

For example, 1200kc/s is 250m, and 1500kc/s is 200m. A megacycle is 1000kc/s. So 10Mc/s is 30m, 12Mc/s is 25m, 15Mc/s is 20m, and so on. In general, kc/s and Mc/s markings are preferred on equipment.

Fig. 4 shows the circuit of a suitable power pack, so that the unit may be employed with battery or transistor receivers or signal generators, or without drawing power from a mains operated receiver. ■

THE "TEN-FIVE"



A 10-transistor double-conversion communications receiver

• s-meter •

• b.f.o. •

• mains powered •

BY A. S. CARPENTER G3ABG

CONTINUED FROM PAGE 521 OF THE OCTOBER ISSUE

THE receiver is constructed on a sheet of polished paxolin size $9\frac{1}{2}$ x 6 x $\frac{1}{16}$in. to which metal front and rear runners are bolted. Use of a thicker board is not advised or the various i.f. transformer fixing lugs will be inaccessible. A metal sheet must not be used.

The largest component mounted on the board is the 3-gang tuning capacitor and this is positioned so

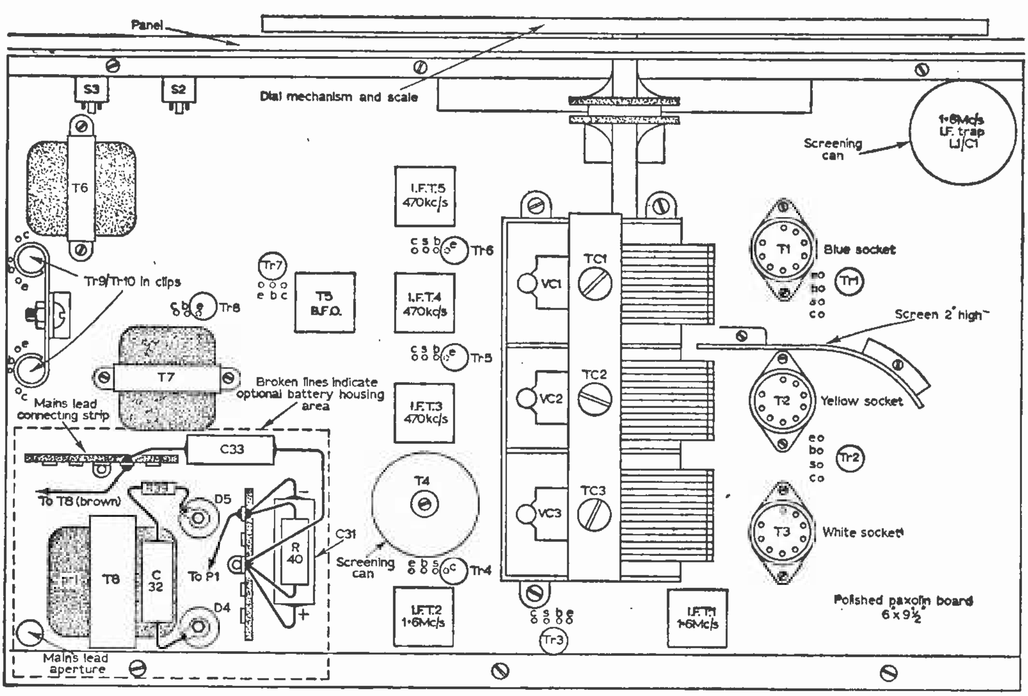


Fig. 3: Top panel layout; note orientation of transistors.

that the dial mechanism is suitably spaced from the front panel which is fitted fairly well on, in the construction. This front panel is also allowed to extend ½in. deeper than the front runner and thereby brings the various controls to a more convenient operating height whilst also improving the appearance due to the sloping front effect obtained.

A diagram giving the top layout of the receiver is shown in Fig. 3 and it is doubtful if this can be much improved upon. The 1·6Mc/s wavetrap and first converter lie along one side of the 3-gang unit, coils being placed as close as possible without the moving vanes being fouled. A curved aluminium screen is erected between the aerial and interstage coils to prevent unwanted coupling. The signals proceed around the rear of the ganged unit (the 1·6Mc/s amplifier) to the second converter and main 470kc/s i.f. strip which lies along the other side of the 3-gang, the metal casing of which asssits in screening.

Panel connections are required for the b.f.o. and audio stages so these are placed conveniently at one corner. This leaves a 3 x 3½in. area free at the rear corner and here it is convenient to accommodate the powering section, battery or mains unit.

Above deck the neat appearance is due to the fact that practically all the wiring is accommodated below.

Mounting the Main Components

The first constructional step is to prepare the board which requires some cutting to accommodate the 3-gang capacitor and dial mechanism. A diagram giving basic essentials is shown in Fig. 4 which should be used only as a guide, checking as the work proceeds by tentatively placing the items in position. The narrow slot shown running across the board allows the moving vanes to disengage fully and is best left uncut until the other work has been done. Once the ganged unit is bolted home rigidity is regained.

Six sub-miniature i.f. transformers have to be mounted and eight holes have to be drilled for each, seven of which may be made with a 1/16in. drill, the central one—used to apply a trimming tool to the core—requires to be larger. This hole also requires small "keys" which may be clearly seen on the underside (see inset diagram, Fig. 2b). A "sure fire" way of obtaining exact drilling points for these items is to press a piece of thin card against the pin and lug ends. The resultant "impression" is then pricked with a needle and the piece of card used as a template. I.F. transformer orientation may be seen at Fig. 5 whilst the mounting line may be seen at Fig. 4.

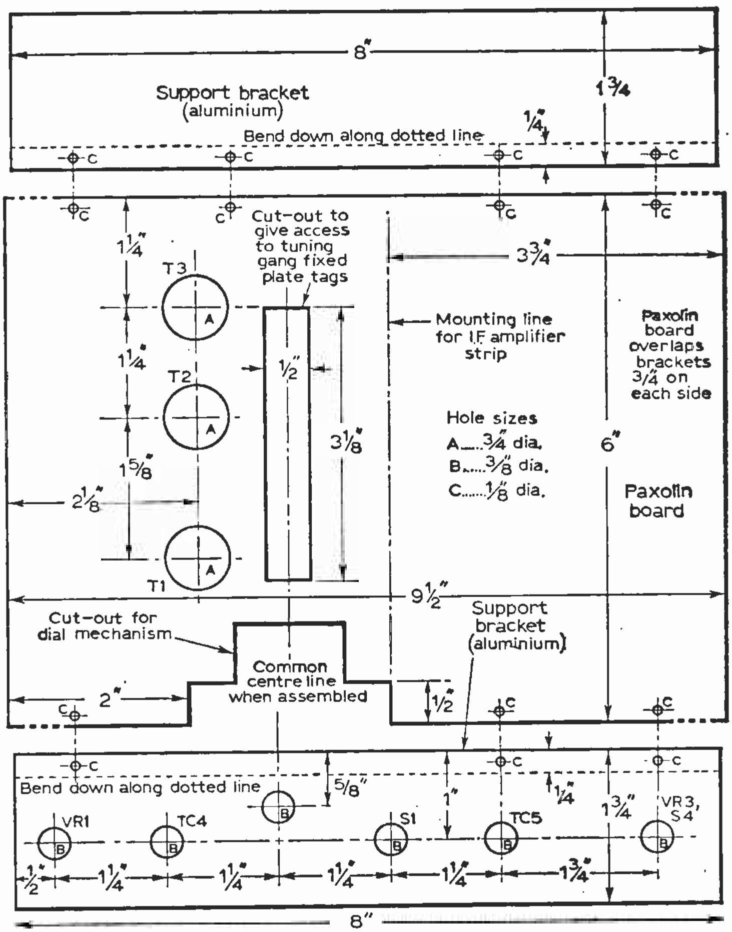


Fig. 4: Dimensions of the paxolin board and its aluminium supports.

When these transformers are correctly located the locking lugs are bent over on the underside and a round blob of solder applied to each lug whilst maintaining pressure from above. Great care is necessary to ensure that solder does not run down the core stems and a small piece of p.v.c. sleeving inserted in each will prove beneficial.

The noval valveholders used for the plug-in

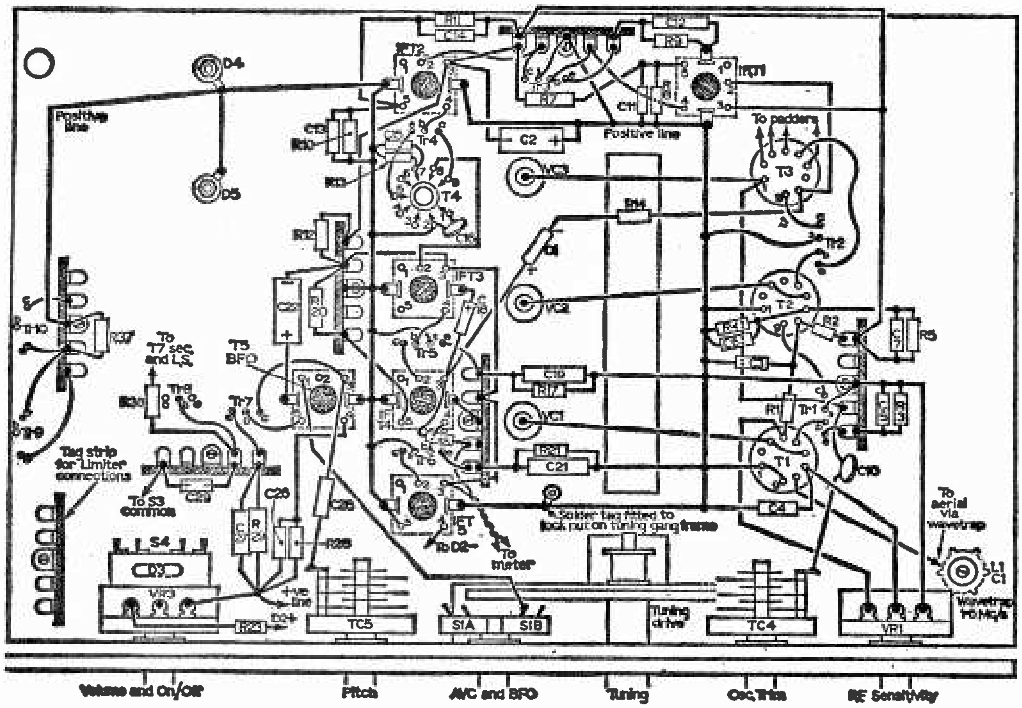


Fig. 5: An underside view showing most of the wiring. Note positive bar and orientation of i.f.t.'s.

coils must be of low-loss construction and may be mounted as shown.

Locating the 1·6Mc/s Wavetrap and T4

These coils *must* be screened but the methods used differ. To mount the coil L1 drill a 0B.A. hole to accept the threaded section of coil stem.

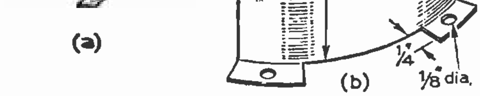


Fig. 6(a): The type of tag strip used in the construction of the "Ten-Five"; (b): details of the coil screen.

Next take the coil container lid and drill a similar hole centrally plus three further ⅛in. holes spaced at 120°, fairly close to the rim. Also drill holes in the paxolin board to agree, then mount the coil from above through the lid and secure both thumb tight on the underside, using the polystyrene nut provided. Pass a 6B.A. bolt through one of the ⅛in. holes and fit a solder tag and nut on the underside—this tag "earths" the can when screwed into the lid later. The two remaining holes are required for coil leads.

To fit T4 press its pins against a piece of card to obtain a template, then, using this, drill nine $\frac{1}{16}$in. or smaller holes to accept the pins, orientating the coil as shown in Fig. 5. Place the coil in position, then splay out the pins on the underside to lock it firm. Next take the freed coil container and saw it off carefully just above the threaded portion so that it is 1¼in. long. Drill a 0B.A. hole centrally in the bottom to accept the threaded coil stem and place in position. Before locating the polystyrene nut add a metal washer and a twist of wire for soldering to. Apply the lock nut and tighten. Solder a lead through to the positive bar as convenient to "earth" the can.

Wiring Notes

Full point-to-point wiring plans are not given, for it is thought that readers capable of constructing a receiver of this complexity will not be handicapped; it is doubtful, too, if all the wiring could be accommodated on a single plan. All wiring needs to be both short and direct, particularly in the tuned converter section. It is important, too, to use modern, physically small resistors and capacitors, etc., to ensure efficiency and ease of construction. The locations of most of the components may be seen in Figs. 3 and 5.

Extensive use is made of small tag strips (Lektrokit. part No. 2231), see Fig. 6(a), seven of these being required on the underside of the board and two above. Use is also made of a thick, plain, tinned copper wire which forms a rough square below deck and is the positive bar. A screen is also required, as mentioned earlier, between aerial and interstage coils and this is shown in Fig. 6(b).

The Front Panel

Essential details regarding the panel may be seen in Fig. 7. It is secured to the "chassis" by means of additional ⅜in. nuts placed over the various control shafts. The top may be held by locking it to the dial (holes are provided) and with brackets if required. Items fitted direct on the

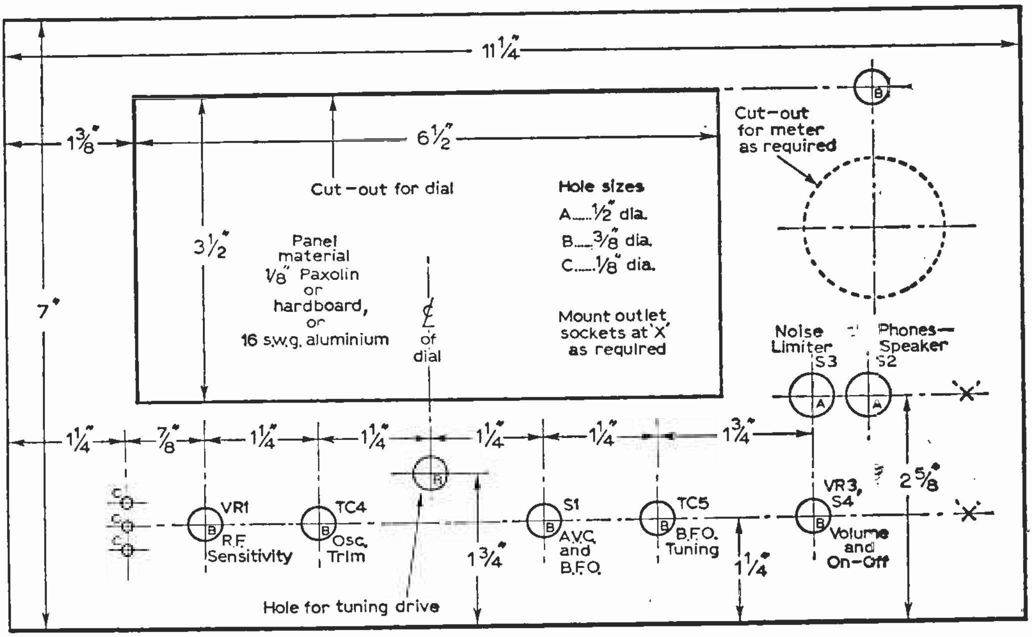


Fig. 7: Front panel control layout and dimensions.

A photograph showing the layout of the prototype receiver is shown on page 661.

Fitting the Transistors

The ten transistors are best mounted by letting their shells stand upright above the top of the board, $\frac{1}{16}$in. holes being drilled close together through which each sleeved lead-out wire is passed. This gives a firm anchorage. Four such holes are needed for transistors 1, 2, 3, 5 and 6 and three for the others. The locations and correct orientation may be seen by referring to the diagrams. A pair of tweezers (the type used by printers' compositors is ideal) will be found extremely useful in this connection. Transistors 9 and 10 must be fitted with copper clips and the white spots designating the collectors should be carefully checked before sliding the clips fully home.

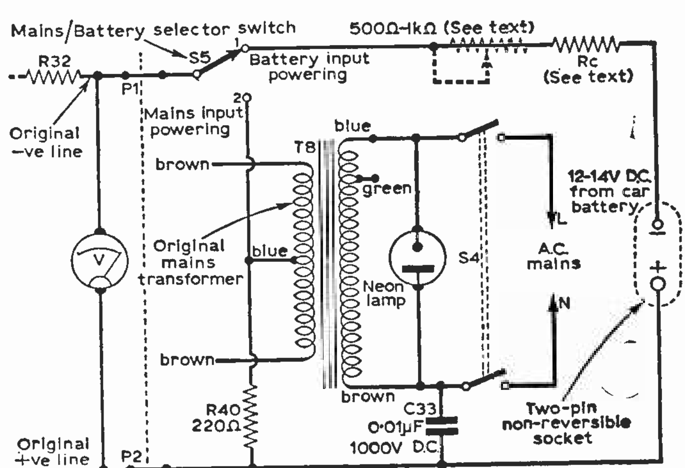


Fig. 8: Modifications for mains/battery operation. See page 661.

panel are: the aerial socket, S2, S3, VR2, the signal/tuning meter and the two outlet sockets. Later the finished unit may be placed in a small cabinet which may be either of metal or of wood, etc., lined with aluminium foil. This cabinet will require a lift-up top so that coil changing can be effected.

Testing the Receiver

After making certain all connections are correct, particularly in the power supply section, whether this be battery or mains, a milliammeter set to read 0—50mA should be inserted in series with the negative supply. Phones and speaker should be connected and VR2 set to "min". The "on/off" switch is then closed, whereupon a reading should be obtained approximating to 12mA if the function switch is set to "LS". Should the reading be much higher, say 30mA, switch off immediately and investigate. If all is well rotate S1A to bring in the b.f.o. and adjust VR2 for a full-scale tuning meter deflection, after which the a.v.c. may be switched in, i.e. b.f.o. "out". A few spot voltage checks may next be made, referring to Figs. 2a, b and c as necessary, allowing for slight discrepancies caused by resistor tolerances, transistor variations, etc. At this stage connection of an aerial is unlikely to produce any signals since alignment will be well out. If "howling" results reverse the connections to T7 secondary.

Circuit Alignment

The constructor who has got this far will be able to align the receiver. Some results might be obtained without a signal generator but these are likely to be very poor ones; even a generator only covering up to about 2Mc/s is better than none at all.

I.F. Stages

Initially the first converter is made inoperative, say, by short-circuiting a winding of T3, then with the noise limiter "out" and a.v.c. "in" a low value 470kc/s modulated signal is applied via a 0·01μF capacitor between the positive bar and pin 5, i.f.t.2, and should be heard via the loudspeaker if the volume control is well advanced. Only the smallest perceptible reading on the signal/tuning meter is required and it might also be necessary to short-circuit pins 1 and 2, T4. An alternative form of indicating device consists of a meter inserted in the line from −9V and the output transformer centre tap and adjusted to read 0—50mA or as appropriate.

The cores of i.f.t.5, 4, 3 are then carefully adjusted for maximum deflection on the indicator used, using a suitable non-ferrous trimming tool. As the circuits come into line, generator output is attenuated so as not to cause the a.v.c. system undue disturbance and the cores retrimmed for maximum reading.

With the generator set to 1·6Mc/s the short-circuit to T4 is removed and its core adjusted to resolve the signal: should two settings be possible choose the one giving largest output. Lock T4 coil stem firmly with a 6B.A. bolt and transfer generator to pin 7, T2. Peak i.f.t.2 and i.f.t.1, using the cores.

R.F. Alignment

This is carried out on the basis of core adjustment first at the low frequency end of the band, followed by trimmer adjustment at the high frequency end. In this case commence with the highest range to be used, i.e. range 5 (Table 1) and with TC4 set so that with its pointer upright the vanes are about 25% enmeshed.

1. Connect the generator via a standard dummy aerial (or 400Ω resistor) to the aerial socket and inject a 10·5Mc/s signal with the vanes of the tuning gang fully enmeshed and the converter stage *operative*.
2. Adjust the core of the oscillator coil (T3) to resolve the signal (see note re "second channel" later).
3. Set generator to 31·5Mc/s and fully disengage vanes of the tuning gang (VC1/2/3). Set oscillator trimmer for maximum output. Repeat these operations.
4. Set generator to low frequency tracking point (Table II). Tune it in, using VC1/2/3 gang, then adjust the yellow and blue cores for maximum output (see note on "pulling" later).
5. Adjust generator to the high frequency tracking point and tune it in, using VC1/2/3 gang capacitor. Adjust interstage and aerial trimmers for maximum output.

Second Channel

Two responses can usually be found on short-wave ranges and the one requiring minimum core or trimmer in circuit is the correct one. To check move generator pointer on completion above and below its setting (3Mc/s), when a second response will be noted. This should be higher in frequency than the one used for the initial adjustment.

Pulling

Detuning of the oscillator can occur when aligning the signal circuits (pulling) but may be overcome by slightly rocking the tuning gang capacitor when making adjustments.

TABLE II
Tracking Points

Range	L.F. Band end	L.F. Tracking point	H.F. Band end	H.F. Tracking point
1	175 kc/s	192 kc/s	525 kc/s	472 kc/s
2	515 kc/s	566 kc/s	1545 kc/s	1390 kc/s
3	1·67 Mc/s	1·83 Mc/s	5·3 Mc/s	4·5 Mc/s
4	5·0 Mc/s	5·5 Mc/s	15·0 Mc/s	13·5 Mc/s
5	10·5 Mc/s	11·5 Mc/s	31·5 Mc/s	28·5 Mc/s

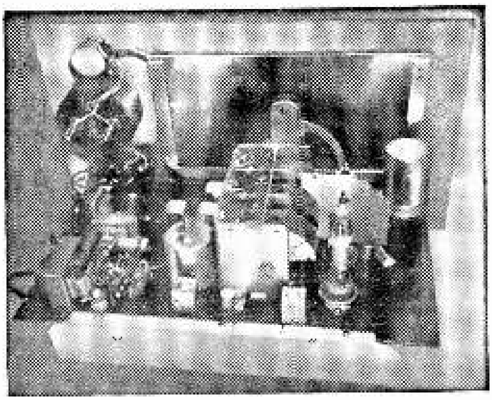
Note.—Uses of Ranges 1 and 2 is not envisaged here but is included for completeness.

I.F. Wavetrap and B.F.O.

There is a small break in the coverage between ranges 2 and 3 to assist stability due to use of a 1·6Mc/s i.f. and a signal of this frequency applied should not be heard. The wavetrap is adjusted, however, using a large signal, by means of L1 core for minimum response.

To adjust the b.f.o. rotate S1 to "b.f.o. in" and with an unmodulated signal set the core of i.f.t.5 to obtain the required beat note in conjunction with TC5.

With the receiver completed it only remains necessary to house it suitably along the lines mentioned earlier and to mark up the scale as required, for which purpose a crystal marker is undoubtedly most useful. The "20" and "40" metre bands should appear at a little more than mid-scale with "80" at about "1" on the appropriate ranges and as indicated by the bandset pointer. Reception on the highest frequency bands will greatly depend on conditions, on the kind of aerial used and so on, whilst appreciating that receiver sensitivity falls off in this region. A lot of DX listening is done on "20", however, and here excellent results are assured.



A rear view of the finished receiver.

Further notes and portable operation

Functionally it is not easy to improve the "A.C. Ten-Five" to any great extent—at least, not with components generally available to constructors—and the only modifications so far, found worth while have merely added to the versatility of the receiver. One useful addition—when the mains-powered system is adopted—is to fit a coloured warning lens and lamp to the front panel.

This has been done to the prototype and a Bulgin D841/250V neon signal lamp will easily fit into the corner occupied by the "S" meter. The leads from the signal lamp should be soldered across the primary winding of the mains transformer and it should here be noted that low voltage dial lamps should on no account be used in conjunction with the secondary winding of T8.

One of the most appealing features of the receiver however it its low current and voltage requirements and it is thought not unlikely that some users would like to utilise it in their cars by powering it from the battery thereof.

Going "portable" can be great fun and with the aid of a car it is, of course, quite easy to find a pleasant and favourable reception area far from surrounding buildings and high above sea level. An effective aerial can easily be transported (a 2 dipole for 14Mc/s is only 34ft. long) and may be very simply erected whereupon searching for Dx can be a pleasant and healthy pastime!

To enable the "A.C. Ten-Five" to run from a 12V car battery it is necessary to add, basically, a function selector switch, a resistor and a simple non-reversible 2-pin socket. These items may be fitted to the rear chassis flange—on the side occupied by the mains transformer—with the switch positions legended on to the back of the cabinet. At the home station the switch will be set to "Mains" but when moved to a distant field location it will be moved to "Battery". It will also then function as an On/Off Switch. A pair of small hooks screwed into the cabinet back outside and at each end will be found useful around which to wind the flexible power supply lead when not in use.

The modification to the original receiver wiring merely entails breaking the negative feed supply line from the mains transformer and reconnecting it via the added switch. The scheme is illustrated in Fig. 8 where S5 is the "Mains/Battery" switch. The location of the added neon warning lamp is also indicated.

The additional resistor is Rc and the inclusion is a necessary one since a potential of 14V might be available from a healthy battery—as would probably be the case at the time of year when outdoor working is most likely. The value of Rc depends largely on whether headphones are likely to be in use or a speaker and the value chosen might be 800Ω for the former mode and 80Ω for the latter. Ideally Rc should be made a fixed value item of say 100Ω or thereabouts and wired in series with a 500Ω—1kΩ variable resistor so that adjustments may be made. It would then be beneficial to fit a monitoring voltmeter or, alternatively, to include test point terminals to which an external meter may be connected. These changes are indicated by the broken lines in Fig. 8. In any case the voltage across points P1 and P2 should be monitored, 10V being the maximum permissible d.c. voltage.

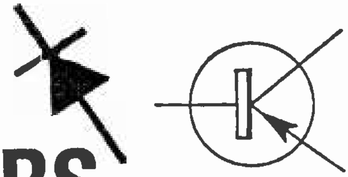
It is advisable when making voltage checks to disconnect the aerial from the receiver and to set the volume control to minimum. In passing it may be noted that should the function selector switch be accidentally left at "Battery" on returning to the home station no harm will be done even if the mains supply is connected. The receiver will not function of course but R40 (already fitted) will adequately load the mains transformer secondary.

A non-reversible 2-pin plug and socket arrangement will also be needed at the car end of the battery feed lines and care must be taken to ensure polarities are correct. Modern cars employ a positive "earth" and sometimes the courtesy lamp provides a convenient take-off point. Mobile listening is not envisaged here since this would raise the problem of suppression. The receiver should not be used close to a station transmitter,

—continued on page 666

PART 2—JUNCTION TRANSISTORS AND TRANSISTOR PARAMETERS

Understanding SEMICONDUCTORS



BY LESLIE MOORE

CONTINUED FROM PAGE 529 OF THE OCTOBER ISSUE

THE junction transistor makes use of p.n. junctions in a manner which relies on the physical dimensions of the crystaline materials used.

The rectifier circuit, in the last article, functions because of one basic fact which is shown diagramatically in Fig. 11a.

When the p type material is made positive with respect to the n type, current flows through the junction. It can be said that electrons pass from the n type to p type material or holes pass from p type to n.

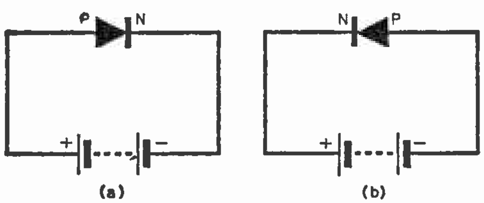


Fig. 11(a): Here, current flows, but at (b) only leakage current flows.

If the bias were to be reversed as in Fig. 11b, ideally no current flows. Apparently when a reverse bias is applied to a diode junction an extremely small amount of current does flow. This is in the order of "micro amperes" or millionths of an amp. The amount of "leakage current" flowing depends on the materials from which the junction diode is made. The most common materials in use are germanium and silicon; a germanium junction produces more leakage current than the silicon.

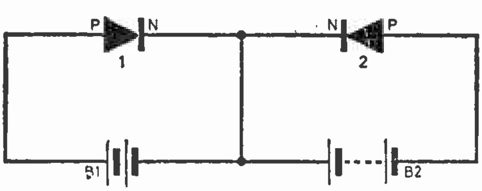


Fig. 12: Joining the two circuits of Fig. 11 produces the same current flow through each transistor, i.e. flows through diode 1 and only leakage current through diode 2.

The two circuits, a and b, in Fig. 11 joined as in Fig. 12 would produce the same current flow through each diode as before.

Joining the two pieces of n type material together gives exactly the same effect as the circuit in Fig. 12.

We have now a three terminal device consisting of a piece of p type material on each side of a piece of n type, which in operation, gives the effect of two semiconductor diodes "back to back".

By making the n type material extremely thin the p type materials will have an increased electrostatic effect upon each other.

Because of the decreased thickness of the n type, the hole flow in the equivalent circuit of Fig. 12 is shown in Fig. 13.

In Fig. 12 holes passing from the p type material to the n type were conducted back to the source of supply, B1.

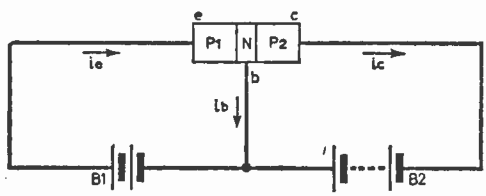


Fig. 13: When the n-type material is made extremely thin, current flows through both junctions.

In Fig. 13 holes passing from the p type to n type are split up. The negative potential of the second piece of p type material provides an attraction greater than that of B1; although a potential barrier exists at the second junction the holes are attracted through and conducted to B2. A small number of holes are attracted by B1.

The names of the semiconductor component parts of the transistor are of great importance. With reference to Fig. 13.

P_1 is known as the emitter, denoted by e;

P_2 is known as the collector, denoted by c;

N is known as the base, denoted by b.

The sum of the currents in the base and collector is equal to the current flowing in the emitter.

Fig. 13 shows the common base connection of a transistor.

Obviously it would be impractical to draw small boxes as in Fig. 13 to represent transistors in

circuit diagrams, Standard symbols for transistors have been devised, two of which are shown in Fig. 14.

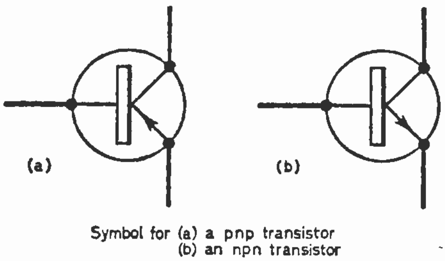


Fig. 14: Circuit symbols for (a) a p-n-p transistor and (b) an n-p-n transistor.

'The type of transistor that has been dealt with is the p-n-p transistor. It would have been as easy to deal with the n-p-n type which operates with the opposite potential to the p-n-p.

Transistors are most commonly used in the "grounded emitter" connection where the emitter is common to both input and output.

Before transistor circuitry is discussed relationships between transistor parameters must be understood.

TRANSISTER PARAMETERS

Fig. 15 shows a p-n-p transistor in the common emitter connection.

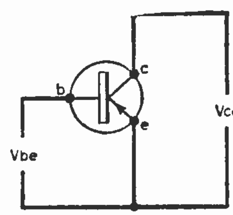


Fig. 15: A p-n-p transistor in common emitter connection.

When the base of the transistor is made positive with respect to the emitter, the emitter-base junction would act as a diode under reverse bias. By making the collector negative with respect to the emitter, holes are attracted through the base providing the collector-emitter voltage is large enough to overcome the effect of the base voltage.

An increase in the base-emitter voltage would give a larger resistance to the effect of the collector-emitter voltage to the hole conduction through the base-collector junction.

A decrease in the base-emitter voltage would give less resistance to hole conduction, hence the collector current would increase.

If the base were made too positive with respect to the emitter, so that the collector potential would not have any effect whatsoever on holes present in the emitter, no collector current would flow. Under this condition the transistor is said to be "cut-off".

Reversing the base-emitter bias would have the effect of "saturating" the transistor, i.e., maximum collector current will flow for the collector-emitter voltage applied.

Under normal use then, the base must be kept slightly positive with respect to the emitter.

There are several parameters in a transistor circuit that are of great importance. They include:

base current Ib

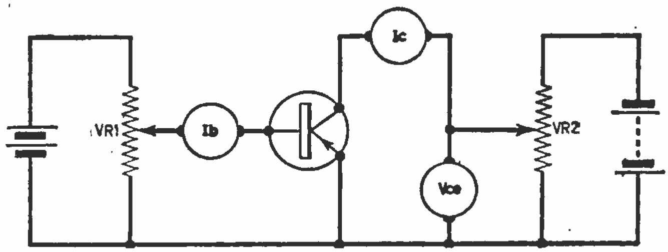


Fig. 16: A circuit for obtaining static output characteristics.

base-emitter voltage Vbe
collector current Vbe
collector current Ic
collector-emitter voltage Vce

The static output characteristics are found by using a constant value of base current and plotting values of Ic against Vce on a graph. Several curves

—continued overleaf

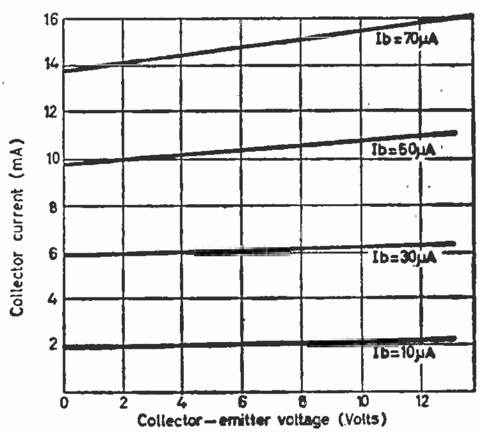


Fig. 17: Typical static output characteristics.

A T.R.F. TRANSISTOR PORTABLE

—continued from page 645

winding is connected from the aerial to the receiver positive line.

When the rod aerial is not in use, the receiver should be turned because of the directional properties of the ferrite aerial. If the rod aerial is extended, this directional effect is much reduced.

Regeneration

As this is so easily added, the extra sensitivity obtained may be felt worthwhile. To obtain regeneration, a very small capacity is added between the negative end of D1 and base of Tr1, at tag 4. Two lengths of 26s.w.g. insulated wire, twisted together, were found to provide a suitable capacitor. A 30pF air spaced beehive trimmer was also found satisfactory.

To adjust regeneration, the capacity is slowly increased until the receiver just fails to go into oscillation. With correct adjustment, sensitivity is quite high.

The actual positions of the windings on the ferrite rod are not very important, except that these will influence waveband coverage, and the tuning positions at which stations are found.

Cabinet

The receiver lends itself well to construction to suit an existing cabinet. A case can, however, be made with ¼in. thick wood for sides and bottom, with 3-ply or ⅛in. hardboard for front and back. The front should have an aperture, covered with silk, and the whole cabinet can be finished with self-adhesive material of the required colour. A strap type handle is fitted, and the receiver is inserted as a single unit from the top.

A shelf to carry the battery is held by two brackets, as in Fig. 3. This item can be of 3-ply or hardboard, and it is slightly less than 8½in. x 3in. It also allows the receiver to stand upright, when removed from its case. ■

UNDERSTANDING SEMICONDUCTORS

—continued from previous page

are usually plotted for several different values of base current.

Fig. 16 shows a circuit used for obtaining the output characteristics.

Base current is kept at a constant value by use of VR1. VR2 controls the actual value of collector-emitter voltage.

The "curves" produced from this are seen in Fig. 17.

Abbreviations μA and mA mean microamp and milliamp.

The slope of the lines plotted increases with base current, therefore the output resistance decreases as the base current increases.

Base current governs the output resistance which, for the majority of transistors, may be anywhere within the region of 5,000Ω to 50,000Ω.

Input static characteristics are obtained by plotting values of Vbe against Ib for several values of Vce.

A typical curve for the input characteristics is shown in Fig. 18.

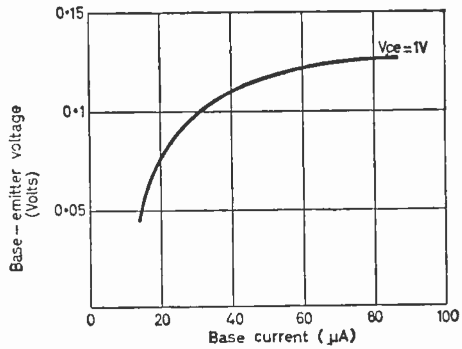


Fig. 18: Typical static input characteristics.

The use of these curves and other relevant information provided by transistor manufacturers is of great importance in the design of transistor circuitry.

Part 3 follows next month

THE "TEN-FIVE"

—continued from page 661

whether fixed or mobile, either since no transistor protection circuitry is incorporated.

On Taking Off

Nothing is more exasperating than to arrive at a distant site and on unpacking find an essential lead is missing! To prevent this from happening an inventory should be drawn up and checked prior to setting out both on the outward and return journeys. Some of the items required at a portable location extra to the receiver are: (1) The battery/car power supply lead. (2) Phones and/or speaker. (3) The coil set. (4) A high resistance d.c. voltmeter with leads! (5) Insulating tape. (6) A suitable aerial already fitted with receiver lead-in and plug plus sectional masts with guys. (7) Screwdriver. (8) Sidecutters. (9) Sharp pocket knife. (10) Mallet.

Other useful items might be: A map, watch, compass, a.t.u., notebook and pencil, etc.

And finally, if an even smaller tuning rate to that catered for is required, fit a Jackson epicyclic reduction unit to the bandspread dial pointer spindle. This is the lower of the two shafts. The already 48:1 bandspread ratio will then be still further beneficially reduced, a facility soon found extremely useful when exploring the highest frequency ranges. And all ranges are tuneable, of course, with a much quieter background when the receiver is transported to an area well clear of fluorescent lighting and other man-made electrical interference! ■

A COMMENTARY BY HENRY

PRACTICALLY WIRELESS

No. 3 Help!

"MY set won't go. What's wrong?" came the *cri-de-cœur*. Although there must be a strong temptation to answer "Kick it!" it says much for the panel of experts who advise our Editor that the reader in trouble is more likely to be gently quizzed on symptoms and guided as to tests.

The quiz may be quite explicit. When did the set fail? Did it succumb slowly or cut out like a snuffed candle? Any smell of burning? Anything lighting up? Any preliminary symptoms, strange noises, sparks, flashes, etc.?

The guidance is even more precise: exact tests are indicated to eliminate stages. Correct voltage readings—and, sometimes more important, voltage readings that may be expected when things are *not* correct—may occupy a page of notes.

And all for free!

Readers who have had occasion to solicit the Query Service will be able to bear this statement out. Some will probably bridle at the cheeky picture drawn below. They are the gentlemen who offer complete case histories of their receivers or who tell, in all the gory details, of the tests that proved ineffective. They would bridle even more at the suggestion that half their tests were not needed

Strange noises, sparks, flashes, etc?

and some of their conclusions could even have obscured the fault.

I am reminded of the reader who ripped his precious tape recorder to bits. The fault was a gradual one: first, recording was obviously weak and possibly noisy, although playback seemed normal. Then, as recording deteriorated, playback, too, began to fail. This must be a deep and serious fault, he thought, flourishing his screwdriver. By the time he had reached an irrevocable stage of dismantling he was forced to call for aid.

The expert at this point is rather reluctant to suggest the fault may only be a minor one. He uses the utmost tact when he says: *"Did you clean the recording head?"*

And, sure enough, that was the origin. A simple thou'-thick layer of oxide! But by the time our reader had reassembled and discovered where the surplus parts should have fitted he had a couple of real faults. His pile of correspondence is still growing.

Other correspondents omit the essential details: model and make of the receiver. Still more are impossibly vague about the fault. *"The set bursts into oscillation"*, says one. *"There's a horrible noise"*, says another, and *"The picture went all funny"*, complains a third.

There are precise instructions about sending in queries. Each must be accompanied by the relevant coupon and a stamped, addressed envelope. Only one subject must occupy each query. But the Editor is too tactful to demand that the description both of the set and the symptoms should be sufficiently detailed to give his advisory panel half a chance at diagnosis.

There need never be any shame at having to appeal to our omniscient Editor. It isn't that he has a bottomless well of

His "in" tray overflows daily.

electronic knowledge beside his desk. But he does have a telephone—several in fact. And he does know who to ask when somebody cries in despair for that esoteric item of information which has eluded all the local dealers.

His answer may not come by return of post. Like the fan mail of a pop star his "in" tray overflows daily. He has been known to shy like a hedged pony at the sight of a Christmas postman. But, unlike the aforesaid fan mail, every query that reaches the office is dealt with, the stupid and the studious alike receiving the best attention.

When all else fails, and the combined efforts of Editor and panel cannot ferret out the vital fact, there is one last-ditch expedient. The desperate reader can insert his own advertisement or appeal to other readers through the correspondence columns. Obviously the former will be quicker; four bob a line is not much to pay when the family is clamouring for music and pictures. The vast readership of *Practical Wireless* and *Practical Television* makes it pretty certain that some Good Samaritan will come forward with the answer to the problem.

Which reminds me—anybody got a circuit of the Super 5-Star X-Band Special to spare?

The "Spectreuphon"

SOME IDEAS FOR EXPERIMENTS WITH CHROMASONIC DISPLAYS

BY I. J. KAMPEL

CONTINUED FROM PAGE 539 OF THE OCTOBER ISSUE

FIG. 8 indicates the circuit for the stereo Spectreuphon unit. The block diagram of Fig. 1b (page 536, October) indicates what is to be done. Basically there are two units as described last month, one for each channel. The left-hand channel controls the lights on the left of the visual unit, and the right-hand channel the lights on the right. Here, instead of six bulbs on each channel (treble, mid and bass), four are used, as there are six channels. In the second unit, Sk5, though controlling different bulbs, is as Sk1; Sk6 in a similar manner, as Sk2; Sk7 as Sk3. The fourth socket does not exist as it is directly coupled to Sk4, the common negative. The volume control potentiometers on the two units are ganged. The figure indicates crossover networks on each channel, to improve audio. If these exist at the speaker cabinets or are not required, simply connect the single speaker of each channel directly across the appropriate 50Ω pot.

To save space, the complete circuit has not been given, as the circuit is identical to sections on Fig. 2.

Visual Units

There are many ways in which the lights might be displayed. The author, however, favours the method to be described first.

A length of aluminium is bent to make a long reflector, and fitted into a rectangular tracking, which may be metal or wood (see Fig. 9a). Holes of suitable size and spacings are then drilled in the reflector, and bulbs screwed in, and soldered in place if they are at all loose. The reflector itself will then form the common negative contact, with the various positive leads going to the point contact of the bulbs. The end elevation is shown in the figure, and the width should be about 3in.

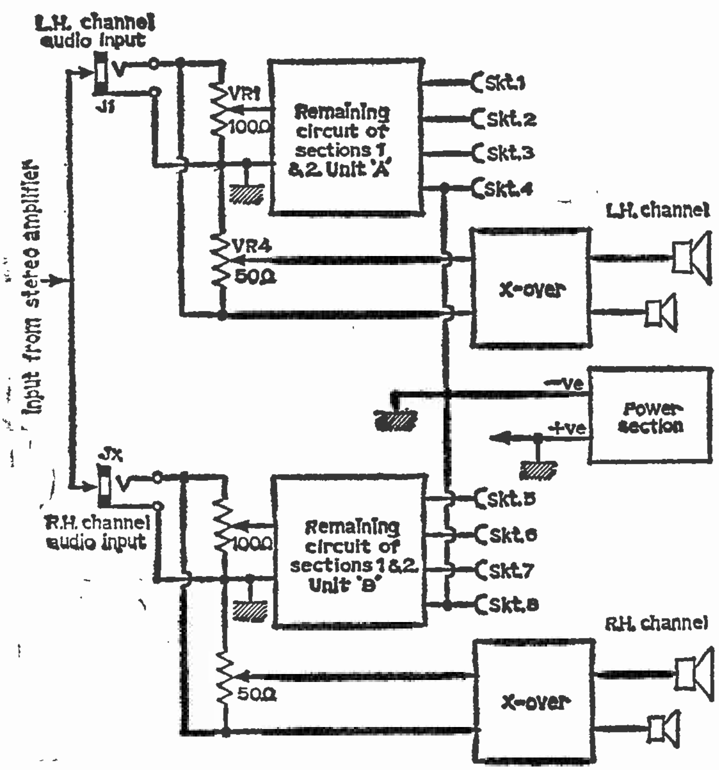


Fig. 8: The stereo Spectreuphon unit.

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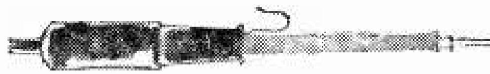

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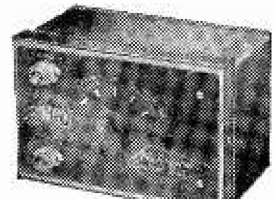

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to 4in. This tracking is then affixed to a wall of light colour—preferably white—by means of screws in the wall, fitting into key-hole slots on the tracking. Adjust bulb position for best focus. A multi-way cable then leads off to the *Spectreuphon.*

A length, or several short lengths of frosted glass, is placed on a lip at the bottom of the tracking. This glass should be the sort which either has 'ribs' on it, or the type which is covered with hills and indentations, helping to scatter the light. This glass far improves the effect of the lights, causing angular shades and pin-points of shades, rather than a general area of colour. The unit may be anything from 3ft. to 6ft. long, though 6ft. is a little long for the 18 bulb, mono version.

This system, throws down the wall—or screen below if a coloured wall—the various changing colours, so using part of a whole wall as a focal point.

Another method of presentation is to use the bulbs as projection lamps, and project the lights on the wall. Except where the colours cross, however, only plain patches of light will be obtained. A suitable lens system would be required for this method of course. To create a more interesting effect, if the bulbs shine on to a moving, irregular reflective surface, some very interesting results may be obtained.

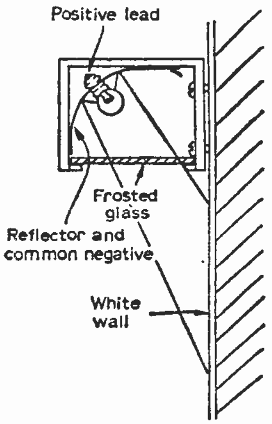
Fig. 9b is an interesting method of display. Here the coloured lights shine onto a cone, the side of which is covered with irregular pieces of mirror glass. This cone, mounted on a turntable, is revolved slowly by an electric motor. The device is either hung, or placed at least four feet up from the floor—this will vary according to the angle of the cone—in the centre of the room. This will produce remarkable effects, though best suited for mono, as no difference would be noticed if it were stereo.

The fluctuating, dancing colours then slowly revolve around the room, darting across all the walls, changing, subtly mixing colours of the rainbow, responding to the mood of the music!

Fig. 9c is another similar omnidirectional unit. Here, the device is mounted on the ceiling. Coloured lights on a dome-like surface, shine through a revolving, irregular, transluscent plastic material. A hoop holds this firm if necessary, on the diameter, and the spindle passes through the centre of the lights dome, to the motor beneath. It should be remembered that a very slow motor is required. Lampshades, of indented plastic material, might be used for this purpose of deflecting the lights.

Again, another method that might be employed, is to mount the lights in a circle, and have a system of slowly revolving mirrors behind.

Fig. 9a (below): The stationary wall-mounted display unit.



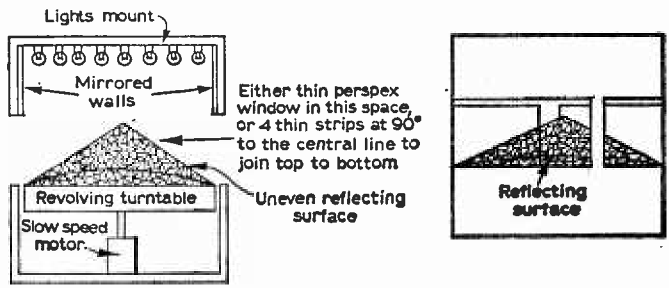
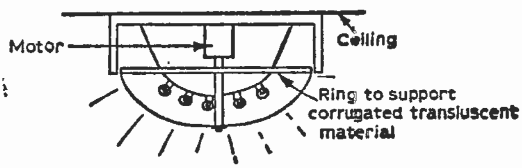


Fig. 9b (above): A lights display using a revolving reflecting surface.

Fig. 9c (right): Another revolving device which is suspended from the ceiling.



For an interesting, compact unit, if a little less dramatic, bulbs mounted behind a transluscent screen of ground glass or perspex, can be quite effective (see Fig. 10). Perspex may be suitably ground, on one side, using 180 grade abrasive powder. Bulbs may have individual sockets, or be bus-barred.

If a very thin piece of copper or phosphor-bronze is taken, bulbs may be soldered on to this as indicated in Fig. 11. Here, firstly a blob of solder is made on the sheet in the place the bulb is required. The underside of the sheet is then heated by means of a soldering iron, directly beneath the solder. This is best done with the aid of a firm metal plate, with a hole in it large enough to take the soldering iron bit. The bulb may then be pressed on to the sheet until it melts on, the iron removed as soon as it does this.

This sheet is then bolted on to a firm base-plate, and holes drilled through to take the side-contact (positive) wires, a hole beside each bulb. This is then placed behind the screen, with crinkled tin-foil placed behind to help scatter the light. The base-plate is of course the common negative.

There are many different methods of display, however, for the stereo version, a system in which there is a definite left and right is more suitable, so getting the benefit of colour shift and positional emphasis. However, a six-colour omnidirectional method could be very effective.

Positioning of Finished Unit

The shaded areas on Fig. 12, indicate the areas effectively covered by each of the two speakers. Therefore, only the area which is covered by both (double-shaded) is effectively covered by both speakers. For this reason, listeners to stereophonic sound should be within this area. The distance between the two loudspeakers should not be less than 6ft., and in most rooms, not more than 12ft. If an imaginary equilateral triangle is drawn, with its two base corners the cones of the two loudspeakers, the third corner of this triangle indicates the ideal listening position. Speakers should also be at the same level.

It is a pity that so many stereophonic units to-day, for the sake of compactness (and perhaps economy), house the whole unit in one cabinet, with the speakers sometimes less than 3ft. apart. This may seem very handy to those with no experience of stereophonic sound, but this means, that on a unit with speakers placed 3ft. apart, the ideal listening position is about $2\frac{1}{2}$ft. away from the unit, on the central line between the speakers!

On the diagram, position 'a' is the ideal position for stereo listening, with positions 'b' next rated.

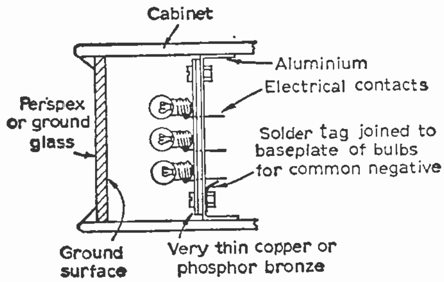
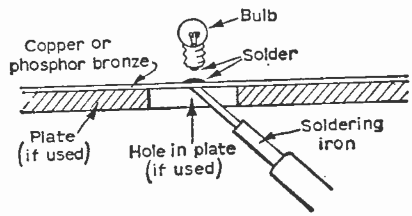


Fig. 10 (left): A compact arrangement using a perspex screen.

Fig. 11 (below): The technique of soldering the bulbs to sheet copper or phosphor bronze.



Next comes any other position in the shaded area, preferably on the central line 'c'.

This positioning applies equally well for two-speaker mono systems as for stereo systems. Unless an omnidirectional method of light display is used (such as the revolving reflector), this should be placed centrally between the two loudspeakers—this is most important in stereophonic systems to get the benefit of colour shift.

By the term "colour shift", it is meant that there will be a shift of colour from one side of the 'screen' to the other if there is a matching directional audio shift. This only occurs of course, when stereo-amplifier is used in conjunction with stereo-Spectreuphon.

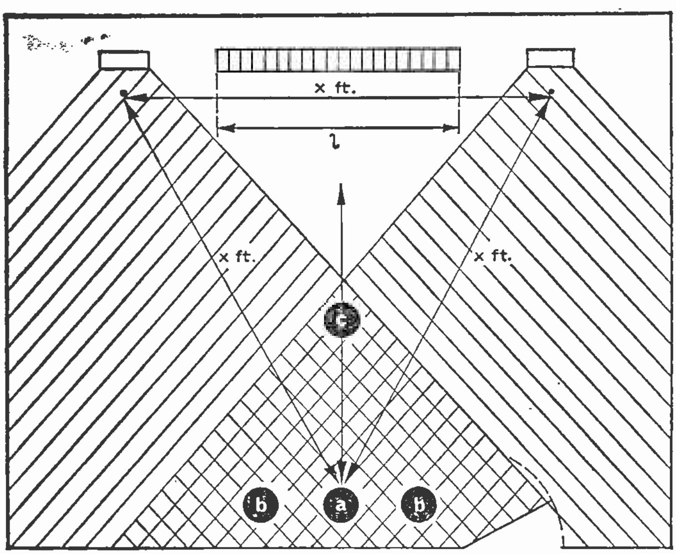


Fig. 12: The double-shaded section of this illustration indicates the optimum reception area for listeners to stereo reproduction.

Choice of Speakers

Care should be taken in the choice of speakers. Table 2 should be taken as a rough guide rather than a ruling. Those systems marked * or D.N.C. should stick to 3 or 25Ω impedances, as these systems require divider network coils. These coils, if not home-made, are sometimes diffi-

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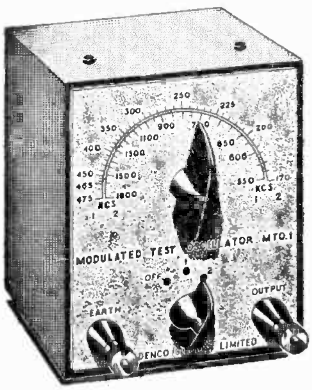

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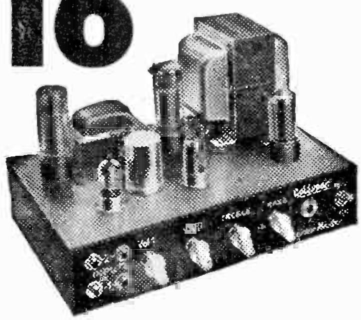

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FREQUENCY RESPONSE: ± 2 db. 25-20,000 c/cs. Bass Control. ± 12 db at 50 c.p.s.
NEGATIVE FEEDBACK: is employed with 20 db feedback in the main loop.
HUM AND NOISE LEVEL: 70 db down.
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SENSITIVITY: 12 millivolts for full output. Thus being suitable for any type of mike or pick-up.
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POWER CONSUMPTION: 150 watts.
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MULLARD VALVES: One GZ34, one ECC83, two EF86, two EL34.

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EON WORKS 164 TOWN STREET RODLEY YORKSHIRE Tel. 34703 cult to obtain, certainly more so to match any other impedance. With other systems, the impedance has little effect.

It is important to have good cabinets for 6in. and larger diameter speakers, to get full resonance benefit. With the two-speaker mono *Euphon* circuit, the importance of this can not be too greatly stressed. This unit will not give the required effect with an inadequate bass cabinet for the l.f. speaker.

Extra care in the choice of the h.f. speaker for this system is also required, especially if a speaker in-hand, is to be utilised. It must be remembered that when a small diameter speaker is normally quite capable of good reproduction, even at high volume, it may appear 'tinny' when fed selected h.f. signals, if they are too high for it to cope with. Then there is no bass to smooth things out, and save that speaker-cone consequent fretting. Only a small cabinet for the h.f. speaker is required in the *Euphon* system (Section 2/Fig. 2).

Except in the case where the original single speaker on the existing mono source is being used, all speakers on this feeder unit, should be cut-out. Consequently, if there is no plug or switch on the speaker of the audio source, a switch should be fitted to cut it out.

If the divider network (Fig. 7) is to be used, it is best to actually mount this in its speaker cabinet, as otherwise a three-core cable is required. The coils should be mounted away from any metalwork, and function best if placed at right-angles to each other. This should also be remembered in the two speaker, two cabinet, mono Spectreuphon, as Fig. 2.

A fact so often overlooked, is that for good reproduction, when great care is taken elsewhere, *screened cable should be used between speaker and source.*

Choice of Colours

Red, blue and yellow, the primary colours, would seem the most suitable for the three channels of this unit. With a stereo unit it is up to the individual to decide whether he uses six distinct colours, or three on each side. For colour shift, the latter would seem more suitable. The red and blue mix very well together, producing many different shades, but some are of the opinion that the yellow introduces too much light, and that orange is a little less severe. Experiment is the only way. Bulbs can be coloured quite successfully with dry-ink pads. A solvent known as carbon tetrachloride will remove this ink when it has dried, if required. Many other solvents will also clean the bulbs.

The switch S3 allows any of the colours to be on any of the ranges, with any other colour on any other range—in other words—all combinations of colours to ranges. A six-way six-pole switch may be used in the stereo version, or any other switching device to give other combinations.

Whether the colours are arranged in banks, in systematic patterns, or at random, is purely a matter of personal taste. The author prefers a systematic pattern.

TABLE 2

D.N.C.	System	No. of Speaker cabinets	No. of speakers	Diameter	Tweeter
	Mono	1	1	6"–12"	
*	Mono (x-over)	1	2	6"–12"	1"–2"
*	Euphon	2	2	8"–12"	2½"–5"
	Stereo	2	2	7"–12"	
	Stereo	2	4	7"–12" (x2)	1¼"–3"

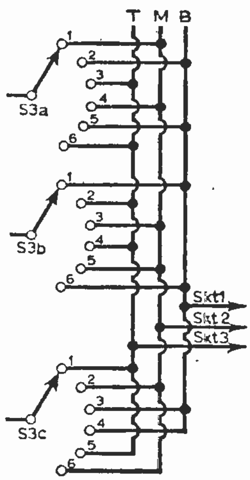
Control Panel (Mono)

Two toggle switches—sound and light—are required. Also, four or five potentiometers, according to whether the *Euphon* circuit is used or not, and then there is the six-way rotary switch, for colour combinations, graded 1 to 6. A table might then be constructed for colours and ranges on the six positions. The audio circuit will function if the lights circuit is not even connected to the mains. There is therefore no need to disconnect when lights are not in use, to use the audio alone.

Control Panel (Stereo)

Two toggle switches—sound and light—are again required. Six potentiometers for sensitivity controls, one ganged potentiometer for volume control, and the rotary switch, have to be catered for. Again, audio is independent of mains.

In the mono "Spectrephon" circuit (Fig. 2) given in last month's issue, the switching of S3 a, b and c (Section 3) was unfortunately drawn incorrectly. A revised diagram of that part of the circuit is shown below.



We have been advised that the term "Chromasonic" (as used in the heading of this article) is, in fact a registered trade name and company and that any commercial equipment manufactured under that name has no connection with the present article.

In recent years, however, the word "chromasonics" has come into general use as descriptive of this type of electronic equipment. ■

wide-range ELECTRONIC TIMER

BY J. McCARTHY

THIS timer is designed to be cheap, and is extremely accurate. As it stands, it performs a timing function from about half a second to ten minutes. At the end of a run, one of two operations may occur, i.e. (a) a light, which was originally off, is pulsed on for about one second or (b) a light, which was originally off, is switched on for an infinite period till it is switched off manually.

Very few components are required and the timer can be built for less than 15s.. The original components were obtained from an Automat T3 timer for less than 2s. 6d. on the surplus market.

The basic circuit, in Fig. 1, is that of the ubiquitous cathode-follower bootstrap whose principle will now be explained: Initially, the current through the valve is small, giving a voltage almost equal to the cut off voltage of the valve (grid base) across rk. A low d.c. voltage exists across C when it is discharged, the remainder being dropped across R. When Vc has risen by a volt, the grid potential rises by 1V and also the voltage across rk rises by 1V. This means that the difference of voltage between Vc and VRk is equal throughout the timing period which means C charges linearly. Also since Vc increases by the grid-base in one time constant and since the grid-base is roughly 15—25V for the valves used and the relay requires, say, a basic voltage of 30 to energise, between 2 and 1 1/5 of the length of the time constant RC is "passed through" before the valve operates sufficiently for the relay to energise. If a resistor of equal resistance to the relay coil is connected in series with it, the relay's operating voltage is effectively doubled, and since the capacitor's charging curve is approximately linear, the length of the timing period is also doubled.

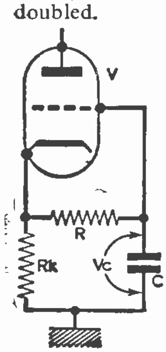


Fig. 2 shows: (a) the charging curve of a simple RC circuit, (b) the idealised curve of a cathode-follower bootstrap, (c) the actual curve and (d) the effect of doubling the relay's operating voltage. The slight curve in (d) is due to the combined effects of the curvature of the Ia-Vg curve of the valve, and leakages in C.

Fig. 1: The basic cathode-follower bootstrap circuit. (NO—normally open contacts; NC—normally closed.)

The simplest functional circuit is shown in Fig. 3, and operates as follows: when C1 has charged sufficiently for V1 to conduct, the relay falls-in, the contact RL1.NO short-circuits and discharges the capacitor C1, also the relay coil is disconnected by RL1.NC from the circuit. However, due to time constant RL1.C2 it remains in for a few seconds. This enables C1 to be completely discharged at the end of every timing period. This

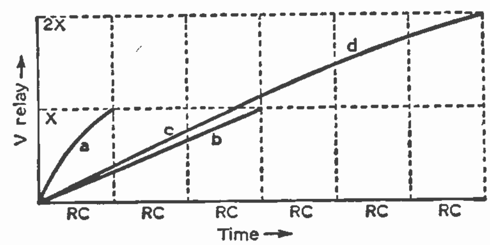


Fig. 2: Here relay voltage is plotted against time; a, b, c, d —see text.

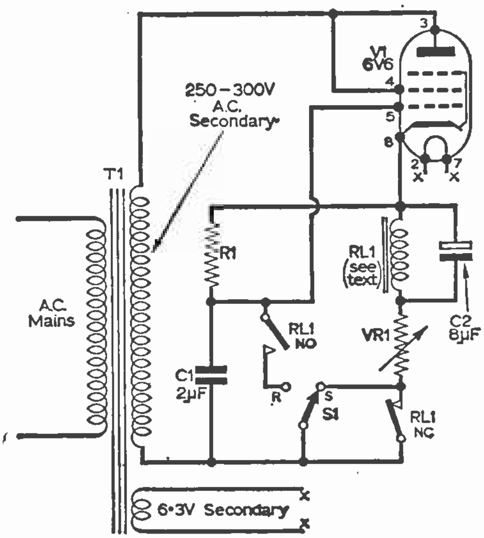


Fig. 3: A practical timer circuit.

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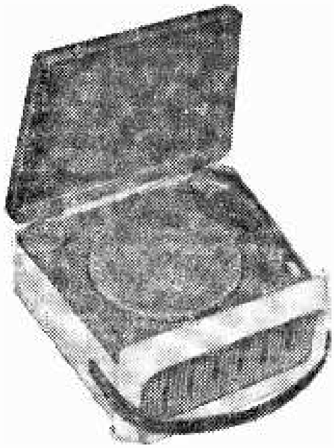

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4	9500	15	12/-
5	6000	3	8/-
5	6000	5	8/-
5	7000	3	8/6
5	7000	5	8/6
5	7500	3	9/-
5	8500	3	9/6

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5	9500	5	10/6
5	9500	15	12/6
5	8500	25	10/6
5	9500	35	11/6
6½	7000	3	11/-

Elliptical Size	Gauss in lines	Imped. in ohms	Price
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5 × 3	7000	3	8/-
5 × 3	9000	3	8/6
5 × 3	9500	35	11/-

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6 × 4	6000	3	8/6
6 × 4	7000	3	9/-
6 × 4	8500	8	9/6
6 × 4	9500	3	10/-
6 × 4	9500	35	12/-
7 × 3½	7000	3	9/6

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7 × 4	9500	3	11/-
7 × 4	10000	3	12/6
7 × 4	10000	15	13/6
7 × 4	9500	30	12/6
7 × 4	9500	35	12/6
8 × 2½	6000	3	8/6

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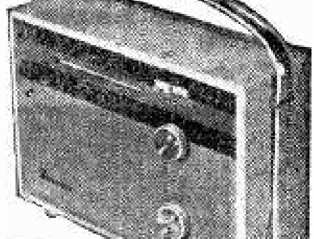

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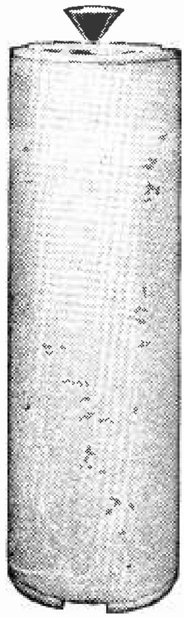

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sequence only occurs with the function-switch at "R" (repeat). If the switch is at S (single), the relay "jams" with the external circuit on permanently. The circuit is "unjammed" by moving the switch to "R". The relay in the prototype was a 6.5kΩ relay marked JL.288567. This had the following contacts: 1 pair NO light duty, 1 pair NO heavy duty, 1 pair NC light duty. A Siemen's high speed relay with a resistance of only 500Ω was found to operate, although this introduces problems in that it only has a one-pole two-way light-duty set of contacts. This means that the function-switch becomes a 2p 2W type which may be purchased for about 2s. in toggle form, also the external contacts must be home-made, unless the timer is only to be used as a metronome. A suitable circuit for one of these relays is given in Fig. 4.

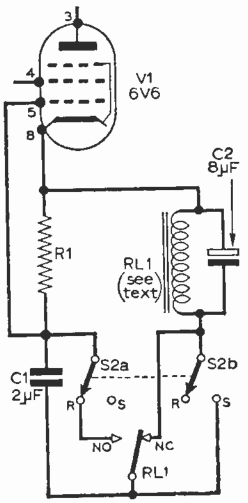

Fig. 4: A suitable circuit employing a 500Ω Siemen's high speed relay.

The method of finding the values of R1 and VR1 for Fig. 3 will now be given: Temporarily connect a 2kΩ resistor at "R" and connect a variable resistor with a value between 10kΩ and 20kΩ in the position of VR. Set VR1 to minimum. In this position, the timer should operate at about two times a second, increase VR1 slowly until the timing interval becomes unstable, then reduce VR1 till stability is again evident. Measure the value of VR1 with a 6·5kΩ relay, this was found to be 6kΩ. Resistors should be placed in parallel with VR1 till the maximum value of VR1 is similar to the measured value.

The required value of the shunt resistance is found by the following formula:

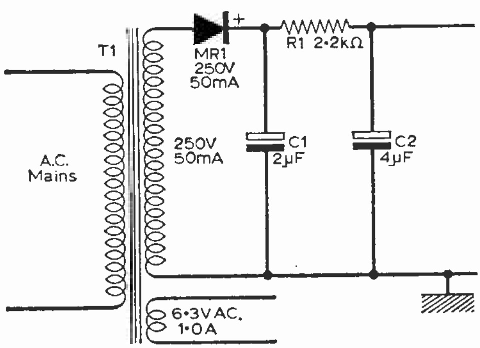

Fig. 5: A power pack for the timer.

$$\frac{1}{Rt} - \frac{1}{Vr} = \frac{1}{Rp}$$

where Rt is the measured value. Vr is the variable resistor's maximum value and Rp is the value of the shunt resistor. This variable-resistor is now the timing-fine control.

The resistor R1 depends on the length of the timing-period required, table 1 gives a list of resistors for R1 compared with time. The first three resistors give substantially the same time interval since most of the time is taken up by the time-constant rla.c2. If inversion of the heavy duty pair is affected, by converting to NC, this

Table 1: Values of R1 in Fig. 3 for different timing periods.

R1	Minimum timing period—seconds	Maximum timing period—seconds
2kΩ	1/4	5/12
4kΩ	2/7	5/12
8kΩ	2/7	5/12
100kΩ	1	4
235kΩ	2	8
470kΩ	5	14
940kΩ	9	26
2MΩ	20	62

may be used as an enlarger timer giving times from 1 second to 7 minutes in five overlapping ranges.

The timing period may be increased far above this by increasing the values of resistor or capacitor (do not use electrolytics however and use only best quality paper capacitors). New electrolytics, however, may be used if great accuracy is not required but remember that they can vary by $^{+100\%}_{-50\%}$.

Should the relay be unable to fall-in, due to low emission of the valve, a small rectifier of about 20mA rating (which may be purchased surplus for a few shillings) may be connected in series with a 25kΩ preset potentiometer and placed between the anode and cathode of the valve. Set the preset to maximum, the timer function-switch to position "R", and make R1 between 100kΩ and 500kΩ. Decrease the value of the 25kΩ preset potentiometer until the timer starts to operate cleanly, reliably, after the same time interval (±10%).

The timer can be run off either a.c. or d.c. for h.t. although for reliable operation with relay resistances in excess of 4·5kΩ, at least 300V d.c./r.m.s./a.c. is required. A suitable rectifier circuit is given in Fig. 5. The poor smoothing is deliberate in that as the valve current increases the relay vibrates slightly (with the 8μF capacitor disconnecter, this is actually audible), the vibration serving to "unstick" any contacts which may have been slightly welded together by sparking. If a d.c. supply is used, the low current rectifier and preset resistor necessary in cases of low-emission valves may be replaced by the preset resistor alone. With an a.c. supply, a transformer supplying 300V upwards is required.

In the actual circuit a 6V6 was used although any output tetrode or pentode would be satisfactory, although ventilation must be good if octal valves are used as they can get extremely hot. If a valve of the ECL class is used, the triode section may be paralleled with the pentode if the symptoms of low emission are shown—as an alternative to the rectifier and preset resistor combination.

Construction

The timer was built in a case of 8½in. by 6in. by 3½in. deep which is about the minimum size in which an octal valved timer may be placed, although a considerable decrease in size will be expected if a miniature valve is used.

Due to the shallowness of the box, slight difficulty is experienced in mounting the valve, this problem is most simply solved as follows: a valveholder with a metal rim is used, one end is bent upwards at right-angles and the holder bolted to the chassis by the end. The fixing of the relays varies with the type. Large relays are fixed by brackets, the approximate dimensions of which are shown in Fig. 6(a).

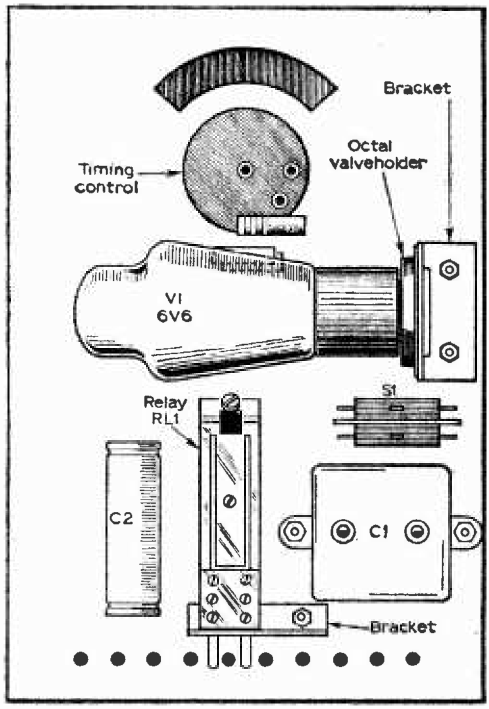

Fig. 7: A suitable layout of components for the timer.

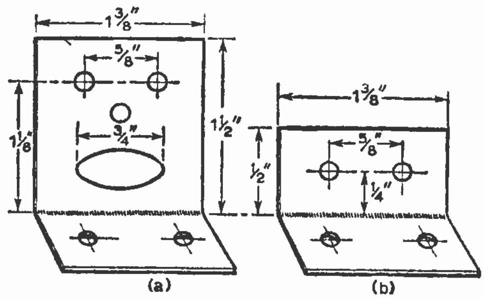

Fig. 6 (a): A bracket for mounting large relays; (b): dimensions of a bracket for a Siemen's relay.

Siemen's high speed relays are fixed by brackets as in 6(b). The layout diagram is shown in Fig. 7 showing fixed positions of both octal and minature valves. The layout is not in the least critical but excellent insulation of wires and valveholders is essential, tag strips should not be used and all connections should be floating. In the prototype, the leads going out—that is the heater, the h.t., the charging resistor R1, and the leads to the external circuit, went through holes in the lid of the box, to which all the parts are affixed, to a Belling-Lee plastic screw-connector on the lid.

As was earlier stated, the wires to which the charging resistor are connected are brought out externally and not switched from resistor to resistor. This method gives greater flexibility of control of the timing period although there is no objection to switched control.

Finally, a note on the more unorthodox uses of this timer. If the insulation of a capacitor is considered faulty, it could be connected in place of R1 and the time measured between the insertion of the capacitor and the operation of the relay. If the interval is greater than half an hour, the insulation is at least 200MΩ and may be considered safe as a coupling capacitor. It must be remembered that the charging surge of the capacitor may be sufficient to operate the timer once or possibly twice in quick succession if its value is greater than 0·01μF. The actual testing proceeds immediately after this occurs.

Extension of Range I

If it is necessary to increase the range of a timer to several hours, as may be used for experimental purposes, it becomes expensive to supply paper capacitors of several hundred microfarads and a different approach to circuit design is required. In the circuit shown in Fig. 8 two timers are used in cascade. The first timer is set to "repeat" and gives pulses of say, 1 second duration, at say, 2 minute intervals. If a second timer set to, say 20 seconds is fed with these pulses, the second timer will operate at 20 × 2 minutes or 40 minutes. Similarly, a period of many hours may be recorded by means of this technique. Although an extra valve is required, the overall cost of an extra valve,

THE 'REALISTIC' 7

Transistorised Portable Receiver made to the highest professional standard. Comprises 7 Mullard Trans. plus Crystal Diode. 350 milliwatt output to 4in. speaker.—I.F. frequency 470 Kc/s.—fully tunable over medium and long wavebands. Two-tone plastic cabinet with handle—size 7 x 10 x 3¼in. fitted socket for car aerial. Complete with full instructions.

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P. & P. 4/6 extra. (Circuit diagram 2/6, free if all parts bought.) **Also De Luxe Model** with superior PVC covered wood cabinet and full view tuning dial.

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Takes a PY32 or 33. Contains: Filament transformer and smoothing choke, mains dropping resistor, Brimistor, smoothing capacitor 100-200-16-16mfd, 275V/w, 350V surge. Also 16-16 mfd, 275 V/w and sundry capacitors, resistors, etc. On metal chassis, size 6 x 4½in. x overall height 5½in. No circuit available.

WIRECOMP'S PRICE 12/6 (less rec. valve) **23/6** with rec. valve P. & P. 3/6

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7in. Stand. play, 1,200ft.	12/6
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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 6¾ x 12 x 10¼in., weight 10lbs. Operates on 6 U2 torch batteries. 4 speeds—16⅔, 33⅓, 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/grey) 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 12in. records.

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1P1	7/6	6K7G	5/6	30L1	7/6	ECC83	6/9	EZ81	6/9	U78	5/-
1P10	5/6	6K8G	6/-	35L6GT	7/6	ECC84	6/6	HVR2	9/6	U142	7/6
1P11	6/-	6Q7G	5/6	5763	7/6	ECC85	7/6	N17	5/6	UBC41	8/6
1R5	5/9	6SL7GT	6/-	80	6/-	ECF80	6/6	N18	5/6	UCH42	9/6
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1U5	5/6	6X4	5/-	DF91	2/-	ECH81	10/-	PCC84	7/6	UY41	7/6
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3V4	6/-	9D7	9/6	DH77	5/-	EF41	9/-	PCL82	6/9	W142	8/6
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EL34, 27/6, EL84, 15/-, N709, 15/-, 6V6G, 15/-, Push-Pull O.P. Transformer, 21/-, 12in. 3Ω (or 15Ω) Speaker, 30/-, P. & P. 1/6. 12in. P.M. Speakers 3Ω, 24/6. Baker's "Selhurst" 12in. 15Ω 15W Stalwart, £5.5.0. 15in. Auditorium 15 Ω 50w, 18 gns.

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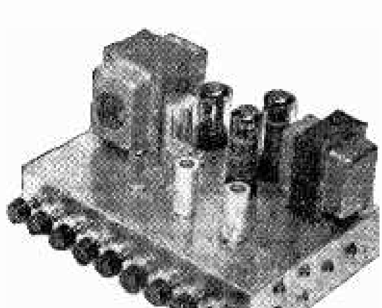
Postages and packing 6d. Over £1 post free C.O.D. 4/-

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, EL34, EL34, GZ34. In the 15 watt amplifier ECC83, ECC83, EL84, EL84, EZ81. An extra valve ECC83 is used in the tremolo circuit. The chassis is complete with baseplate and is solidly made of 18 gauge steel, finished silver grey hammer. Size 12 x 8 x 6½ inches high.

PRICES—

50 watt with tremolo	£21.10.0
50 watt less tremolo	£20.10.0
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Add carriage 10/- any amplifier. Send for free descriptive leaflet.

STROUD AUDIO

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2μF block-paper capacitor and relay is far less than one 300μF or thereabout, paper capacitor.

With reference to Fig. 8, the operation of the circuit is as follows: The circuit on the left of the dotted line is normal and gives pulses of duration fixed by C1 at intervals determined by VR1 and VR2. With each pulse, the contacts RL1 NO2 close and C3 gains a little charge each time until V2 conducts sufficiently for RL2 to operate.

The calibration of the unit is as follows: Calibrate VR1 and VR2 as normal, then adjust VR3 to minimum, at this point, RL2 should operate on the first click of RL1. Then increase the value of VR3 slightly till RL2 works on the second click of RL1 and mark with a symbol, such as 2X. Continue around the dial until calibration is complete.

The circuit to the left of the dotted line in Fig. 8 is in every way identical to Fig. 3 with the exception of VR1 replacing R1. VR2 is calculated by experiment as is VR1 in Fig. 3.

VR3 is decided by the factor of multiplication of this section of the circuit and by the duration. The RL1 NO2 contacts are closed. With a typical conduction period lasting two seconds due to C2 and a maximum multiplication of ten, the circuit requires a maximum time constant of 20 seconds. If a 2μF capacitor is used, a maximum resistance of approximately 2M Ω is required. To double the multiplication factor, twice the value of resistance or twice the value of capacitance is required. With the timing factor remaining con-

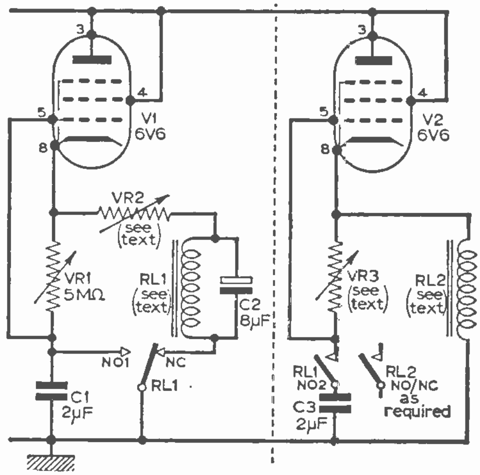


Fig. 8: Using two timer circuits in cascade to provide long timing periods.

stant, the resistance may be multiplied by the factor by which the capacitance is divided and vice versa. This means that the product RC remains constant where the timing period remains constant.

The coil resistance of RL1 and RL2 may be anything greater than about 500Ω, but the higher the better, the same limitation regarding contacts applying as before. ■

CLUB NEWS

ACTON, BRENTFORD AND CHISWICK RADIO CLUB
Hon. Sec.: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, London, W.3.
At the next meeting of this society, members will take part in a discussion on subjects of their own choosing. This meeting will be on 18th October.

BADEN-POWELL HOUSE SCOUT AMATEUR RADIO GROUP
Hon. Sec.: A. Watts, G3FXC, 8 Thornycroft Court, Kew Road, Richmond, Surrey.
A new scout amateur radio club has recently been formed at the headquarters of the British scouting movement, Baden-Powell House, London.

The group intends to take part in many ham activities and the permanent club station, G3TGS, will be used for demonstrations to visiting scouts to provoke an interest in amateur radio and to encourage contacts between scouts who are licensed operators.

Meetings are held on the third Thursday of each month and begin at 7.15 p.m. Recently members have been kept busy preparing GB3BPH for "Jamboree-on-the-Air" to be held on the weekend of 17th and 18th October.

BRADFORD RADIO SOCIETY
Hon. Sec.: E. G. Barker, G3OTO, 63 Woodcot Avenue, Baildon, Nr. Shipley, Yorkshire.
Members of this club attended the first meeting of the new session at Cambridge House, Bradford, on 15th September.

CHESTER AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: P. J. Holland, Field House, 19 Kingsley Road, Gt. Boughton, Chester, Cheshire.
Apart from the sale of surplus equipment held on the 8th, all of this Society's meetings for September were devoted to lectures. Altogether members attended three lectures on the 15th, 21st and 29th September. The lecture on the 15th was given by Mr. Gilbert of the G.P.O. and that on the 21st by Mr. B. Poole (G3JAZ) whose subject was "Modifications to the HRO".

GUILDFORD AND DISTRICT RADIO SOCIETY
Hon. Sec.: D. H. Mead, G3OXI, 41 Egley Road, Woking, Surrey
"Amateur Matters" was the title of the talk given to members at the meeting on 1st September, when the speaker was Mr. S. W. Smith of the G.P.O.'s Radio Interference Branch.

Later in the month on the Guildford Model Engineering Society's Open Days, members operated the club station, GDRS, for demonstrations to visitors.

HARLOW AND DISTRICT RADIO SOCIETY
Hon. Sec.: G. O'Donald, Harlow Road, Roydon, Harlow, Essex.
The Harlow and District Radio Society Mobile Rally was held recently at a village near to Harlow. From 10 a.m. on Sunday, 27th September, mobile visitors were talked-in on 160m by G3ERN to enjoy a full and interesting day of events.

MELTON MOWBRAY AMATEUR RADIO SOCIETY
Hon. Sec.: D. W. Lilley, G3FDF, 23 Melton Road, Asfordby Hill, Melton Mowbray, Leicestershire.
Members of this Society met during September to attend the Annual General Meeting, held on the 24th.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY
Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorkshire.
To encourage enrolment for the R.A.E. course being held at the Percival Whitley College of Further Education, members of this Society manned a demonstration station there from 7th to 10th September.

Later in the month, on the 16th, members heard an interesting talk given by Mr. G. E. Craven on "Cathode Ray Oscilloscope". At the last meeting of the month members enjoyed a ragchew.

At a meeting on 21st October, members of local clubs will be invited to hear a tape recorded lecture made by that famous American amateur Mr. Stewart S. Perry (W1BB). "DXing on 160m" will be the title of Mr. Perry's recording and anyone interested in attending is invited to contact the Secretary to make suitable arrangements for seating.

READING AMATEUR RADIO CLUB
Hon. Sec.: R. G. Nash, G3EJA, "Peacehaven", 9 Holybrook Road, Reading, Berkshire.
The most recent of the 'mobile picnics' to be held by this Club, was on 20th September, when members and their families welcomed visitors from other societies to the venue on the banks of the River Thames at the Childe Beale Trust Pavilion, Lower Basildon Berkshire.

The next meeting at the clubroom was on the 26th, when Messrs. Green and Davies demonstrated some of their equipment designed for the amateur.

RODING BOYS' SOCIETY
R. Marchant, 154 Essex Road, London, E.10.
Although membership of the amateur radio group of this Society is now large enough for the limited space available at their headquarters, visitors to the meetings will always be welcomed and sufficient interest from local enthusiasts would prompt a search for better facilities.

SLADE RADIO SOCIETY
Hon. Sec.: D. T. Wilson, 177 Dower Road, Four Oaks, Sutton Coldfield, Warwickshire.
On 4th September, members of Slade faced a team from Wolverhampton A.R.S. in a friendly quiz.

Later in the month Slade Radio Society held what they called a "Television Spectacular", when members, their families and visitors saw a live entertainment staged in the club's headquarters in Erdington, Birmingham. The show included a panel game, a guitar group and a brass band and was held on 18th September. Part of the audience saw the performances in a "studio" and the remainder viewed the whole show on television receivers in a separate room. Television cameras in the studio televised the show and relayed the pictures by closed-circuit television to the second audience.

October began for members of Slade with an exhibition of their equipment on the 2nd. There were two prizes to be won in competitions for the best made equipment, the Enterprise Trophy and the Craftsman's Cup.

SPEN VALLEY AMATEUR RADIO SOCIETY
Hon. Sec.: N. Pride, 100 Raikes Lane, Birstall, Leeds.
The meeting for 17th September was devoted to a junk sale.

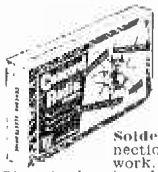
The next meeting was on 1st October when members heard a lecture on "Transistors" given by Mr. M. Taylor.

WESSEX AMATEUR RADIO GROUP
Hon. Sec.: P. Cutler, G3MXF, 43 Langside Avenue, Wallisdown, Poole, Dorset.
This Group reports a current membership of over 50 of whom 31 are licensed amateurs.

The club's new Heathkit transmitter is on the air at every meeting under the callsign, G3FVU.

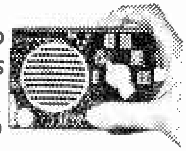
★ ★ MANY BARGAINS ★ ★
DUE TO MOVING TO LARGER PREMISES

MAKE 5 DIFFERENT TRANSISTOR RADIOS FOR 35/-



NO EXPERIENCE NECESSARY. No Soldering. Only 8 connections for first radio to work. Just look, you get Giant 4 colour box, 1ft. 2in. x 10¼in. x 2¼in. containing Radio Book, A.B.C. Plans, Cabinet, Carrying Case, Loudspeaker **(alone 17/6)** Earphone, 4 Semi-conductors, Coils, Condensers, Resistors, Tuner, Switch, Screws, etc. **YES—EVERYTHING!** Loud, clear English and Foreign reception. As supplied to Educational Authorities, H.M. Forces, etc. TESTIMONIALS GALORE. **Mr. R. O'D. of Londonderry, writes:**—"*. . . I received your components and I must say that I am very satisfied with them. I have it already set up! . .*" **COMPLETE HOME RADIO COURSE, Originally £6. SEND ONLY 35/- plus 2/6 post etc. (C.O.D. 3/- ex.)**

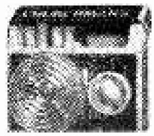
NEW RADIO ANYONE CAN BUILD IN 2-3 HOURS 19/6



EVEN THE OLDER CHILDREN BUILD THEM! . . . no soldering—only 16 connections! then hear it reach out bringing in station after station, loud and clear. Palm-of-hand size 4¼ x 2¾ x 1¼in. Many Testimonials: **M.H. of Bradford, writes:** "*. . . I have just completed one of your sets successfully, it is the first time I have ever tackled anything like a radio, and I must state here and now, I am amazed how easy it is to a layman like me. Your instructions and plan have obviously been very carefully thought out so that even the most dim can follow them . . .*" **Direct from Manufacturers to You. SEND 19/6 plus 1/6 post etc. (C.O.D. 2/6 ex.).**

PARTS AVAILABLE SEPARATELY

AMAZING CIGARETTE RADIO! ONLY 18/6



Yes, a perfectly ordinary packet of cigarettes !—but watch your friends' astonishment on hearing it fetch in station after station, loud and clear! **Still holds 10 Cigarettes**—yet cleverly conceals highly sensitive, fully transistorised circuit **(including tiny battery).** Even a young boy can assemble it in under 2 hours. **No soldering. No experience necessary. Only 16 connections to make.** Ideal for taking to work with you. From our bulging testimonial file, **Mr. D.B. of Huddersfield writes:**—"*. . . I have fitted the parts in and it is working wonderfully . . .*" ALL PARTS including Semi-Conductors, A.B.C. Plans, etc. **ONLY 18/6 plus 1/6 post, etc. (C.O.D. 2/6 ex.).** (Parts available separately).

READ WHAT SATISFIED CUSTOMERS SAY

R.C. of HARRINGAY writes *Received with thanks Skyroma . . . Very pleased. Working well.*

L.S. of LONDON W.8 writes *. . . given it a good try out and I am very pleased with the results.*

D.R. of GLASGOW writes *. . . it is a lovely little thing and as clear as a bell.*

J.W. of BRIGHTON writes *. . . I have recommended your radio to many of my friends.*

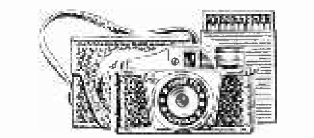
B.M. of HARROGATE writes *. . . I would like to thank you . . . It is a real bargain.*

S.B. of SOMERSET writes *. . . delighted with this radio . . . glad if you could send one more.*

T.F. of STEVENAGE writes *I would just like to say how pleased my son is with this radio.*

W.H. of MIDDLESEX writes *Thank you for my dear little radio. It is a real treasure to me.*

MINIATURE SPY CAMERA



ONLY 19/6 NO MORE TO PAY

World shattering Purchase by our FOREIGN AGENTS makes this exclusive scoop yours for ONLY 19/6. This exciting little 2 speed camera is not a toy but a precision-made photographic instrument in chromed steel and leather with minute milli-Magnifying Lens—each 14mm. film takes 10 pictures—size 1¼ x 1¼ x 2in.—Only **19/6.** P. & P. 1/6 ex

FREE Leather Carry-case. Six Rolls of Film.

TRANSISTOR POCKET RADIOS

ONLY 28/6
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BULK PURCHASE ENABLES US TO MAKE THIS FANTASTIC OFFER—AND WITH MONEY BACK GUARANTEE ! ! ! The "SAN REMO" . . . so tuned that it brings the voices of star entertainers and vocalists dramatically to life—in your home, office, etc. Only 4¾ x 2¾ x 1¼in. Fits easily into your pocket or handbag. Works for months off 1/2 battery. Should last a lifetime, anyone can assemble it in an hour or two with our easy plan. Miniature speaker, carrying case—everything only **28/6,** 2/6 P. & P. C.O.D. 2/6 extra. (Parts can be bought separately.) Limited period—so rush your order before it's too late. DEMONSTRATIONS DAILY.

THE MINUTE TRANSISTOR RADIO MIAMI

ONLY 17/6

Unbelievably small—outrageously cheap. You will be amazed at the fine quality of tone and volume of this great little radio. **Only a fantastic 3½ x 2¼ x 1¼in., the MIAMI** will bring you great entertainment for months on an 8d. battery. Simple assembly plan with each set. **ONLY 17/6. YES 17/6. Plus 2/6 P. & P. (C.O.D. 2/- extra).** Satisfaction Guaranteed. Demonstrations given daily. Parts available separately if required.

AMAZING NEW INVENTION AUTOMATIC CAR LIGHTER

ONLY **10/-**

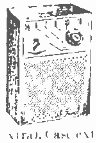
We have been lucky enough to purchase 1,500 only of these **fully automatic Car Cigarette Dispenser/Lighters** because of a **frustrated export shipment. Originally** made to sell at about 45/-! Robust and ingeniously designed in **heavy chromium.** Holds packet of cigarettes (any make and size) you reach out **with one hand.** press a button and a lighted cigarette is in your hand! Can be fitted by **anyone** in 2-3 minutes. For 6 or 12 volts full connecting details—only one wire to connect! Each one in own coloured box, brand new and untouched. **Only 10/-. add 2/- P. & P. (C.O.D. 2/6 extra).**

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 4¼ x 2¾ x 1¼in. Receives M.W. stations loud and clear. Every radio is fully tested before despatch. Price ready built 25/-. P. & P. 1/6 extra. Free earpiece with set.

FOR ONLY 25/-
No more to pay

Fabulous ST. TROPEZ MK. 6
The Sensational Pocket Radio



This fantastic offer will amaze you—the beautifully compact **ST. TROPEZ,** measuring 4¼ x 3 x 1¼in. receives perfectly in bedroom, office or garden—over all medium waves including Luxembourg. Under 1d. per hour running cost. **ANYONE** can assemble it in one or two hours using our simple A.B.C. plan. **25/-** (P. & P. 2/- extra). Case extra. Parts can be bought separately.

CONCORD ELECTRONICS LTD. (Dept. P.W.11) 9 Western Road, Hove, Sussex

LETTERS TO THE EDITOR

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.

THE ROLE OF BROADCASTING

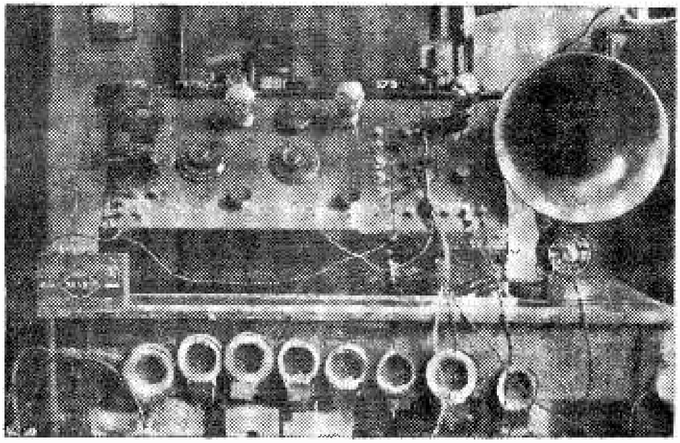
SIR,—I heartily agree with your editorial on the role of broadcasting (July P.W.). There is undoubtedly a large audience for continuous pop music which must be satisfied. What disturbs me is the fact that, hiding behind a cloak of respectability and desire to serve the public interests while maintaining the highest standards, the BBC spends very large amounts of money on pop artists and programmes of popular music in an attempt to compete with the existing commercial stations. Let there be an end to this hypocrisy! A commercial network using authorised frequencies should be set up to provide programmes of continuous pop music. The BBC should then channel its resources into programmes of a high standard which inform and educate as well as entertain and thus provide a service which does fulfil the true function of broadcasting.—J. A. D. LOWRIE (Edinburgh 12).

THE GOOD OLD DAYS

SIR,—I expect the photograph shown on this page will interest some of your readers. It is a copy of a very old print that I made of my set when the BBC first started up. I applied for and obtained an experimental licence. My first sets were crystal with basket coils and I made up several of these and sold them to friends. My photograph shows a straight three, h.f., d., l.f. For h.t. I used lots of 4·5V torch batteries.

I also made a very successful one valve crystal reflex which I turned into a portable set. With accumulator and torch batteries it almost needed a porter to carry it and I was granted a separate licence for it when I took it to Leeds on holiday.

One memorable night I recall is when I sat up to hear the first BBC relay broadcast from America. Those were the days when I was supposed to be experimenting for the elimination of atmospherics!—F. GRIFFITHS (Middlesex).



The majesty of a bygone age: this magnificent receiver was built by F. Griffiths in the earliest days of the BBC.

A READER'S THANKS

SIR,—Recently I had a request published in your "Letters to the Editor" page asking for information concerning the No. 19 set.

The response to my request has been tremendous and I would like, through your pages, to express my sincere thanks to those many readers who have helped me.

Although I have answered and am still answering letters received, would those readers who do not receive a letter within the next few weeks please accept this as acknowledgement of their services (some readers will already have received letters) as I have recently been transferred and fear that I may have mislaid some of the letters received.—T. L. RICHARDS (South Canterbury, New Zealand).

H.R.O. BANDSPEADING

SIR,—I have been a keen H.R.O. owner for some time now and I know it is a grand receiver for the SWLs as well as the ham. However, I wonder if any reader of P.W. has ever thought of adding a four-gang bandspread capacitor in parallel with the main tuning gang. I came across the idea when I purchased a few extra bandspread coils for my set. On trying two of these coils I found the bandspread set screws in all but one of them were

loose, the threads being stripped completely. Putting the coils back in the H.R.O. resulted in a lot of crackling in the speaker and I found that the loose screws were the cause, hence my thought of trying an alternative method of bandspreading.

I think the value of the H.R.O. tuning capacitor is 225pF. The problem is what value of band-spread capacitance would be needed to obtain the desired results?

Perhaps one of your readers has already made this modification to his H.R.O. receiver and would be good enough to let us SWLs have a bit of gen. on same as I am sure that many readers of *Practical Wireless* who have an H.R.O. would welcome this information with open arms.—A. TAYLOR (Blackburn, Lancashire).

PRE-WAR FIELD DAYS

SIR,—It was indeed delightful to read P. O. Hubbart's letter in the August issue of P.W. about pre-war field days.

I believe that the field day in 1938 was my first and that I went out to Shirley Hills with G3FP. I was an active SWL in those days and a keen radio enthusiast, Ron Haddow, used to pick me up in his Aerial four-square sidecar and we would go to the Thornton Heath Short Wave Society meetings.

I have not heard from Croydon hams for many years, although I have had the pleasure of contacts with G5BZ and G61X since coming to South Africa.

I believe that G4AA was lost in a Beaufighter in the early days of the war and that Alvar Liddell became a budding baritone and made several records.

I am not active but still hold a call sign—ZS11Q—and I was formerly ZS5YF and G3BYF. I do dabble with radio occasionally and I really would welcome a line or two from some of the old-timers, and the SRCC meeting place at South Croydon would certainly be in for a visit should I ever manage a trip to Britain.—P. J. W. SAWYER (98 Woodley Road, Plumstead, C.P., South Africa).

CORRESPONDENTS WANTED

SIR,—I am about to build the G.P. Communications Receiver described in the January, 1963, issue of P.W. and would like to correspond with any reader who has already built this receiver.—H. BINFIELD (4 Elm Road, N. Colerne, Chippenham, Wiltshire).

SIR,—I would very much like to hear from other readers who have an interest in DX-ing and radio construction and are about 17 years of age.—DESMOND WALSH (Ballylynch, Carrick-on-Suir, County Tipperary, Ireland).

SIR,—I would like to correspond with someone of my own age (14) and in any country. I am very interested in transistor circuitry.—RONNIE SNG (327-H Potong Pasir, Singapore 13, Malaysia).

SIR,—I would be delighted to correspond with any other P.W. reader of about my own age (15) on anything concerning radio. My main interest is SWL.—PHILIP REILLY (62 Grantham Street, Kensington, Liverpool 6).

SIR,—I am interested in electrical and radio service technology and would like to correspond with radio service men from any country.—V. A. SUNDARAMURTHY, B.Sc. (13 Veeraperumal Koil Street, Mylapore, Madras 4, S. India).

SIR,—I started radio when I was seven. I am now 11 years old and would like to correspond with any radio constructors of my own age.—TIMOTHY PEARSON (37 Sunningdale, Round Green, Luton, Bedfordshire).

SIR,—I am interested in radio and amateur radio and would like to correspond with enthusiasts of any country. I am 15 years old.—KEITH BIRSE (20 Murphy Street, Invercargill, New Zealand).

SIR,—I would like to correspond with other P.W. readers who are about my own age (16). I am a keen SWL and I am studying for the RAE.—WILLIAM MORROW (Hill Street, Ballina. County Mayo, Ireland).

SIR,—I am 16 years old and have recently purchased a CR100 receiver. I would very much like to correspond with anyone who owns one of these receivers.—R. CORR (53 Cecil Avenue, Enfield, Middlesex).

REQUESTS FOR INFORMATION ARE INSERTED IN THIS COLUMN ON THE UNDERSTANDING THAT READERS USING THE SERVICE UNDERTAKE TO REPLY TO ALL OFFERS RECEIVED AND TO RETURN ALL DATA NOT REQUIRED. BECAUSE OF THE LARGE NUMBER OF REQUESTS RECEIVED, ILLEGIBLE WRITING WILL AUTOMATICALLY DISQUALIFY LETTERS FROM PUBLICATION. FOR THE SAME REASON, WE CAN NO LONGER GIVE SPACE FOR REQUESTS FOR PAST ISSUES OF PRACTICAL WIRELESS.

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

. . . information on different faults peculiar to the B.2 Type 3 Mk. 2 receiver.—T. PRICE, The Rose Gardens, Wallingford, Berkshire.

. . . a good course of home study for the R.T.E.B.—R. D. DAVIS, 48 Kings Road, Sutton Coldfield, Warwickshire.

. . . the circuit diagram and/or operating manual for the 88 Walkie Talkie and information on the power supply and l.f. amplifier unit No. 1 ZA 21531.—J. W. PURKIN, 13 Walnut Grove, Redcar, Yorkshire.

. . . data on receivers R3118, 62B, A109, R220.—A. MCROBERTS, 12 Banner Road, Glasgow, W.3.

. . . coil pack connections in table receiver Jonell NY02204 and any information on a GEC radio, serial No. 304631 and a valve marked "E BVA 142".—G. A. WOODS, 456 Longmoor Lane, Fazakerley, Liverpool 9.

. . . the wiring diagram with data and instructions on how to convert a Pye Domestic Radio Receiver Battery Type Vibrator, Model PE39B, SR No. 128507 (6V accumulator) to a mains supply of 230V a.c.—E. P. ADJOKATCHER, Accra Line District Office, G.P.O., Accra, Ghana.

. . . the service sheet for English Electric TV model No. 16C14.—I. L. PELLAR, 13 Severn Avenue, Tutshill, Chepstow, Monmouthshire.

. . . circuit details for a 'scope built around a CV1526 (701D) tube.—M. J. WOOD, 21 Homelands Road, Sale, Cheshire.

. . . a service sheet or the valve line-up of the Scott Sixteen.—C. ORPIN, 29 Belmont Road, Whitstable, Kent.

. . . information on the U.S. Air Force Pulse Generator TD58/GPN.—F. B. NORMAN, 33 Burlington Road, Sherwood, Nottingham.

. . . circuits for Receiver Model 3/II, Power Supply Type 3 Mk. 2 a.c. 90V to 260V. 6V Transmitter tuning 3-8Mc/s. Receiver tunes 3-15.5Mc/s.—L. O. TULLY, 120 Victoria Street, Fairfield S3, Brisbane, Queensland, Australia.

. . . circuit and data concerning the PCR-3 Communications Receiver.—G. HUSSEY, 66B Trinity Street, Fareham, Hampshire.

. . . details of the cord drive for Ekco type U.199A.—P. DORRINGTON, 383 Spen Lane, Leeds 16, Yorkshire.

. . . a copy of the circuit diagram of the R1155 communications receiver.—A. J. Mulley, 59 Coote Lane, Lostock Hall, Preston, Lancashire.

DON'T MISS THESE BARGAINS

Transistor ferrite rod aerial with medium and long wave coils with circuit. **7/6.**

Oscillator Coil and set of 3 I.F. transformers for transistor set with circuit. **12/6.**

Midget 3in. P.M. Loudspeaker 3 ohm **12/6**, 80 ohm **13/6.**

Midget 208 pF +176 pF two-gang Tuning Condenser with trimmers for transistor set Price **9/-.**

Push-Pull Transformer. Sub-miniature **8/6.**
0005 mfd. Single Tuning Condenser. Solid dielextric ¼in. spindle for transistor or Crystal set, with spindle tapped 6 BA. **2/6.**

Zenerdiodes for voltage control and stabilisation. Complete with circuit diagram **3/6** each.

Pre-Amplifier. Made to Mullard design to suit the 10 watt amplifier made to specification. New Unit. Simply needs valves. Type EF86. **37/6** each.

46 Sets (Receiver/Transmitter pack set). Unused sets complete except for crystals. Packed with parts and easily rebuildable into other gear. **19/6** each. Post 3/-.

Battery Charger Kit. Comprises 5 amp. transformer, 5 amp. rectifier, metal case and meter to charge 6 or 12 volt batteries up to 5 amps. With variable charge rate. **39/6** each. Post and insurance, 3/6.

Mains Transformer. 250-0-250 at 80 mA. 6.3 volts, 5a. (normal mains input). **12/6** each. Carriage **2/6.**

Output Transformer. Standard pentode matching type. **4/6** each. **40/-** per doz.

Slide Switch. Sub-miniature but dplt. **2/-** each. **18/-** per doz.

T.C.C. or Dubilier Tubular Condensers.

.5 mf 500 v.	10/- doz.
.25 mf 500 v.	7/6 doz.
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.0001 mf 1,000 v.	5/- doz.
.001 mf 1,000 v.	6/- doz.
.002 mf 1,000 v.	7/6 doz.
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.02 mf 750 v.	8/6 doz.
.01 mf 1,000 v.	10/- doz.

Battery Charger Rectifier—selenium 12.15 v. 5 amp. **9/6.**

Metal Chassis—punched for Mullard 510 Amplifier, complete with inner screening sections and stove enamelled. **12/6** set.

Twin Twisted Lighting Flex—equivalent 14/36, rubber insulated cotton covered **12/6** per 100 yard coil.

Moving Coil Meters.

0-500 microamp. 2in. flush	17/6
250-0-250 microamp. 2¼in. surface ..	27/6
750 microamp. 2¼in. surface	17/6
0-30 milliamp. 2¼in. flush	17/6
0-100 milliamp. 2¼in. flush	15/-
0-300 milliamp. 2¼in. flush	15/-
0-500 milliamp. 2¼in. flush	15/-

Filament Transformer. 6.3 v. 1½ amps.. **6/6.**

Neon Lamp—midget wire ended. Ideal mains tester, etc. **2/-.** Ex. Govt. **1/6.**

Phillips Trimmers—0.30pF. **1/-** ea. **9/-** doz.

Heavy Duty Test Prods—red and black with plug-in lead attachments, **6/6.**

Low Resistance Head Phones. Ideal crystal sets, etc. **7/6**, plus 2/6.

Cold Cathode Valve CV413. Voltage regulator or trigger switch—unused but ex-equipment. **2/-** each.

Tag Panels. Ideal for constructors, experimental circuits, etc. 3 of each of 12 different types, **5/-.**

Slydlok Panel Mounting Fuses with carrier, 5 amp. **2/-** each. 15 amp. **2/6** each.

Metal Rectifier. 250 v. 60-80 milliamps ideal for mains set or instrument or to replace that expensive valve. **4/6.**

Piano Key Type Switches. 3 key type **3/-**, 4 key type **3/9**, 5 key type **4/6**, post and packing 1/- regardless of number ordered.

500 MW Amplifier. Uses 3 transistors, 2 of which are in Glass B push pull for battery economy. Ideal little unit for baby alarm, record player, intercom, etc., etc. **19/6.** Speaker **12/6** extra.

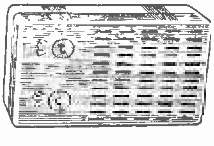
Electrolytic Condenser—Bargain. Subminiature type 50 m.f.d. 6v. made by T.C.C. **7/6** per dozen (minimum quantity supplied).

Transistor Set Cases. Finished in two tone with handle and back. Size 10¼ x 7¼ x 3. **15/-** each plus 2/6 Carriage and Insurance.

MAINS POWER PACK

Designed to operate transistor sets and amplifiers. Adjustable output 6v—9 to 12 volts for up to 500ma (class B working). Takes the place of any of the following batteries. PP1-PP4-P6-PP7-PP9 and others. Kit comprises: mains transformer-rectifier, smoothing and load resistor 5000 and 500 mfd condensers, zener diode and instructions. Real snip at only **14/6** plus 2/6 post.

OUR BARGAIN OF THE YEAR



A Complete kit of parts to build transistor 2 wave superhet receiver at only 39/6.

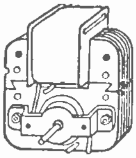
"CORONET" Mk. IV

It fully covers the medium waveband and that part of the long waveband to bring in B.B.C. Light. The circuit includes a highly efficient slab aerial and 2½ in. P.M. speaker. Overall size approximately 4¾ x 2½ x 1¼in. Supplied complete with carrying case.

Infra Red Heater

Make up one of these latest type heaters, ideal for bathroom kitchen bedroom, etc. They are simple to make from our easy to follow instructions—uses silica enclosed element designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and metal casing as illustrated **10/6** plus 2/6 post and insurance.

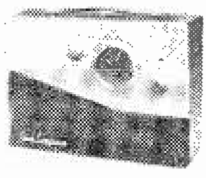
MOTOR BARGAIN



Silent running mains motor by very famous maker. Ideal for gramophone, tape recorder, fan, etc., etc. 200-250 volts. A.C., shaded pull start. Size approximately 2¾ x 2¼ x 1¾in. 2,750 r.p.m. Spindle diameter 5/32in. Spindle length ⅞in. Brand new guaranteed. Price **12/6**, plus 1/- post.

THIS MONTH'S SNIP

GOOD COMPANION Mark III



The 6 transistor set with the 8 transistor performance. Incorporating all the latest requirements. Anyone who can solder can make it. Many thousands already in use all over the country. Full coverage of Long and Medium wavebands. Fine looking cabinet, size 11 x 8 x 3 in. Q.P.P. Output approx. 750 mW. Excellent reception of difficult stations like 208. Variable feed back gives excellent tone. Complete kit everything for ONLY **£4.19.6**

Post and ins. 5/-

YAXLEY SWITCHES

NUMBER OF WAYS OR POSITIONS

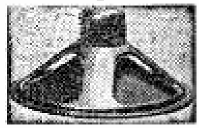
Poles	2 way	3 way	4 way	6 way	8 way	10 way	11 way	12 way
1 ..	2/8	2/10	3/1	3/6	4/-	4/6	4/6	4/8
2 ..	3/33	3/8	4/1	4/11	6/-	7/-	7/-	7/6
3 ..	3/11	4/6	5/2	6/9	8/-	9/6	9/6	10/3
4 ..	4/6	7/4	6/2	7/10	10/-	12/-	12/-	13/-
6 ..	5/9	7/-	8/3	10/9	15/-	17/-	17/-	18/6
8 ..	8/-	8/8	10/4	13/8	18/-	22/-	22/-	25/-
10 ..	10/-	10/6	12/5	16/9	22/6	27/-	27/-	30/-
12 ..	12/-	12/6	14/6	19/8	27/6	32/-	32/-	36/-
14 ..	14/-	14/6	17/-	22/6	—	—	—	—
16 ..	16/-	16/6	19/6	25/6	—	—	—	—

5 way 1 pole, 3/6; 2 pole, 4/9; 24 way 1 pole. 15/-; 2 pole, 22/6.

Last opportunity to build this Pocket Radio

Constructor's parcel: comprises moulded two-tone cabinet as illustrated, tuning dial, two gang tuning condenser, printed circuit. Costing value 57/6—offered while supplies last at only **19/6** plus 2/6 post. Suitable for your own circuit or to build original circuit. All parts available at highly competitive prices. Do not miss this tremendous bargain.

Speaker Bargain



12in. High-fidelity loudspeaker. High flux permanent magnet type with standard 3 ohm speech coil. Will handle up to 10 watts. Brand new, by famous maker. Price **27/6** plus 3/6 post and insurance.

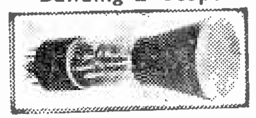
Waterproof heater wire

16 yds. length, 70 watts, self regulating temperature control. **10/-**, post free.

Fluorescent Light Kits

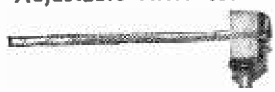
For pelmet lighting, etc. Kit consists of: Super silent choke; 2 chrome clips to hold tube; 2 bi-pin holders for tube and starter with a starter holder. Kit A for 80 watt tube at **27/6.** Kit B for 40 watt tube at **19/3.** Kit C for 2 x 2 ft. 20 w lamp **25/-.** Kit D for 1 x 2 ft. 20 w lamp **15/6**
Post and Insurance 2/6 per kit.

Building a 'Scope



3in. oscilloscope tube. American made type No. 3FP7. 6.3 v. 0.6 amp. heater electrostatic deflection brand new and guaranteed with circuit diagram of 'scope, **15/-** each. Plus 2/6 post and insurance.

Adjustable Thermostat



Suitable for controlling furnace, oven, immersion heater etc. Can also be used as a flamestat or fire alarm. Made by Sunvic, approximately 17in. long and adjustable over a range 0 to 550F. The contacts are rated at 15 amps., 230 volts. Listed at £3 or £4 each, these are offered at only **8/6**, plus 2/6 postage and insurance.

Ice-Stat

This is a small thermostat which cuts on and off at around freezing point. Has many uses, one of which could be an ice warning device to be fitted under your motor car. Price **7/6**, post 1/-.

Refrigerator Thermostat

Standard type with adjustment for all normal refrigerator temperatures. **7/6**, plus 1/- post.

Simmerstat Heater Regulator

Suitable to control elements, heater, soldering irons and boiling rings up to 2,500 watt. Complete adjustable, normal price 55/- each, special snip price **12/6**, plus 1/6 postage and insurance.

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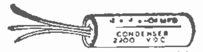

Stop your drill or other appliances interfering with your or your neighbours' radio or television. Simple instructions given. **1/6** each. **12/-** dozen.

Timer Kit

Special offer of all components except metal box to make mains operated interval timer for photography etc., **12/6** plus 2/6 post.

Flood Lamp Control

Dim and full switch for controlling photo flood lamps: Gives two lamps in series, two lamps full brilliance and lamps off. Similar control of other appliances. With circuit **3/6** plus 9d. postage.

Where postage is not definitely stated add 2/- all orders under £3.

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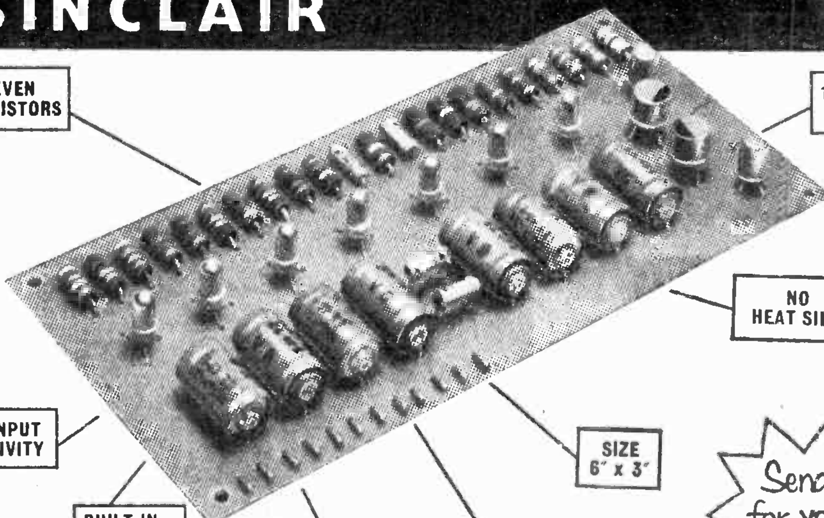
Post orders to: 43 Silverdale Road, Eastbourne, Sussex

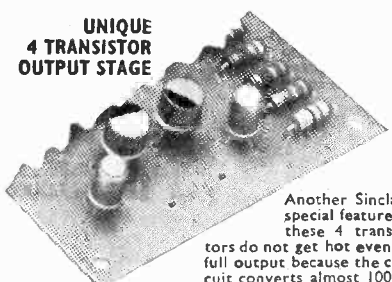
Breakthrough

SINCLAIR



Send for yours today

UNIQUE 4 TRANSISTOR OUTPUT STAGE



Another Sinclair special feature—these 4 transistors do not get hot even at full output because the circuit converts almost 100% of the power from battery or mains unit into audio power for the loudspeaker.

PWM *is the answer!*

The SINCLAIR X-10 is the only amplifier in the world which gives you the benefits of this unique system. The use of Pulse Width Modulation (P.W.M.) ensures much better transient response—it is instantly noticeable the moment you hear it—no falling off in the higher audio frequencies, no intermodulation distortion and a response curve so flat you could draw it with a ruler! Eleven transistors, four of which are used in a new type of output stage and P.W.M. plus many other circuit refinements result in an amplifier which is compact, rugged, stable and does not require a heat sink—and it costs so little. Used in pairs the X-10 brings new depths to stereo listening and there are no channel matching problems.

Price, inclusive of all parts and Instruction Manual for building X-10 **£5-19-6**

READY BUILT AND TESTED *including Instruction Manual* **£6-19-6**

Mains Power Supply Unit (A.C. 200/240V) *will power one or two amplifiers* **£2-14-0**

THE SINCLAIR X-10 MANUAL

Supplied with every Sinclair X-10 (whether purchased built or in parts for home construction) the X-10 Manual explains how the amplifier functions and how to add the correct tone and volume control system to suit your requirements exactly. A variety of systems is shown, none of which will add more than a few shillings to the original cost of your Sinclair X-10 amplifier, and because it is so simple to modify this part of the assembly, further matching is very easy should you change your type of pick-up or other input.

Order form and further Sinclair designs on next pages

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We have the largest display of Service Sheets for all makes and types of Radios, Televisions, Tape Recorders, etc., in the country, and can supply by return of post.

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I also require list of Manuals at 1/-.

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I enclose remittance of ....

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TRANSISTORS now half price. unmarked but tested packets of 16: unmarked, untested packets of 40: duds suitable as diodes packets of 80. All packets **10/-** each, postage 1/-. Four packets post free C.W.O. K. R. WHISTON (Dept. PWT), New Mills, Stockport.

RATES: 7/3 per line or part thereof average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Wireless," Tower House, Southampton St., London W.C.2.

RECEIVERS & COMPONENTS

(continued)

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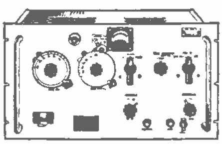

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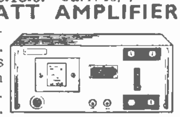

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(continued)

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Measures by Meter
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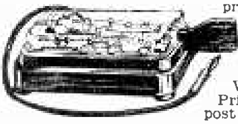

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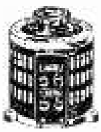

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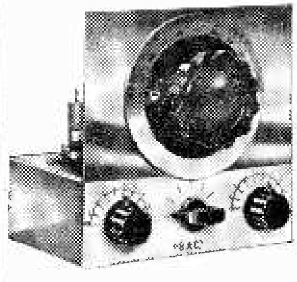

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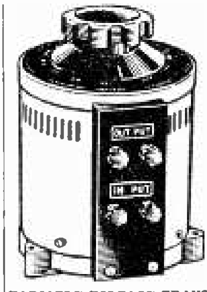

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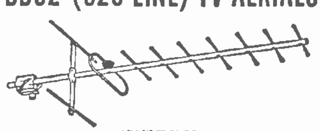

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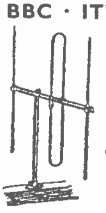

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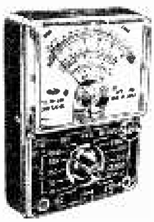

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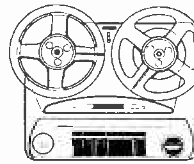

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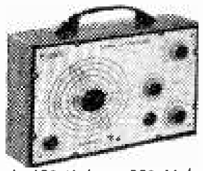

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PLEASE NOTE that we can supply no blueprints other than those shown in the above list. Nor are we able to supply service sheets for commercial radio, TV or audio equipment.

QUERY SERVICE

The P.W. Query Service is designed primarily to answer queries on articles published in the magazine and to deal with problems which cannot easily be solved by reference to standard text books. In order to prevent unnecessary disappointment, prospective users of the service should note that:

(*a*) We cannot undertake to design equipment or to supply wiring diagrams or circuits, to individual requirements.

(*b*) We cannot supply detailed information for converting war surplus equipment, or to supply circuitry.

(*c*) It is usually impossible to supply information on imported domestic equipment owing to the lack of details available.

(*d*) We regret we are unable to answer technical queries over the telephone.

(*e*) Be clear and concise.

(*f*) **We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.**

QUERY COUPON

This coupon is available until 7th November, 1964 and must accompany all queries in accordance with the rules of our Query Service.

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