

PRACTICAL WIRELESS

MARCH
1970

30

UNIT
BUILT

GENERAL COVERAGE RECEIVER



ALSO:

METAL LOCATOR
FET'S AND THEIR USES

ADCOLA

PRODUCTS LIMITED
(Royal Trade Mark)

**THE RELIABLE
SOLDERING INSTRUMENT!**



SEND COUPON FOR LATEST LEAFLET

**ADCOLA PRODUCTS LTD
ADCOLA HOUSE
GAUDEN ROAD
LONDON SW4
Telephone 01-622 0291/3**

NAME

ADDRESS

.....

.....

.....

PW177

SEMICONDUCTORS

BRAND NEW AND FULLY GUARANTEED

1N914	1/6	2N2905A	8/-	ACV22	4/-	BD121	17/6	MJ481	27/6
1N916	1/6	2N2906	6/-	ACY28	4/-	BD123	21/6	MJ490	22/6
1S021	4/-	2N2906A	8/-	ACY28	4/-	BD124	12/-	MJ491	29/6
1S025	5/-	2N2923	4/-	AD140	8/-	BD115	5/-	MPF102	8/6
1S113	3/-	2N2925	3/6	AD149	11/6	BF117	10/6	MPF104	7/6
1S120	2/6	2N2925	3/6	AD161	7/6	BF117	10/6	MPF104	7/6
1S121	2/6	2N2926	2/6	AD162	7/6	BF167	5/6	MPF105	8/-
1S130	2/6	.. Green	3/-	AF114	5/-	BF173	7/6	MPF105	8/-
1S131	2/6	.. Yellow	2/9	AF116	5/-	BF180	7/-	NK12003	8/6
1S132	2/6	.. Orange	2/9	AF117	5/-	BF181	6/6	NK1216	7/6
1S44	2/-	2N3011	12/6	AF118	12/6	BF184	7/6	NK1217	8/6
2G301	4/-	2N3053	6/6	AF124	4/6	BF194	5/-	NK1261	4/-
2G302	4/-	2N3054	12/6	AF125	4/6	BFX12	4/6	NK1262	4/-
2G303	4/-	2N3055	15/-	AF126	4/6	BFX13	4/6	NK1264	4/-
2G371	3/-	2N3702	3/6	AF127	3/6	BFX29	12/6	NK1271	4/-
2N696	4/6	2N3703	4/6	AF139	7/6	BFX30	9/-	NK1272	4/-
2N697	5/-	2N3704	4/6	AF181	8/6	BFX35	19/6	NK1274	4/-
2N698	4/6	2N3705	4/-	AF186	11/-	BFX88	5/-	NK1674	5/-
2N706	2/6	2N3706	4/6	AF239	7/6	BFX44	8/6	NK1281	5/6
2N706A	2/6	2N3707	4/-	AF526	5/6	BFX84	7/6	NK1403	15/-
2N708	4/-	2N3708	3/6	AF527	8/6	BFX85	9/-	NK1404	12/6
2N929	5/6	2N3709	3/6	AF528	5/6	BFX86	6/6	NK1405	15/6
2N930	7/-	2N3710	4/-	AF529	5/6	BFX87	6/6	NK1613	6/6
2N1090	6/6	2N3711	4/-	AF530	7/6	BFX88	5/-	NK1675	5/-
2N1091	6/6	2N3819	9/-	ASZ21	7/6	BFY10	4/6	NK1677	5/-
2N1131	6/6	2N3820	23/6	BAX13	1/6	BFY17	4/6	NK1713	5/-
2N1132	6/6	2N3906	7/6	BAX16	2/9	BFY18	4/6	NK1773	5/-
2N1302	3/6	2N4058	5/6	BAX31	1/6	BFY19	4/6	NK1781	6/6
2N1303	3/6	2N4059	5/-	BAX38	3/6	BFY20	12/6	NK120329	8/6
2N1304	4/6	2N4060	5/-	BC107	3/6	BFY41	10/6	NK180111	15/6
2N1305	4/6	2N4061	4/6	BC108	3/6	BFY43	12/6	NK180112	19/6
2N1306	5/-	2N4062	4/6	BC109	3/6	BFY50	4/6	NK180113	22/6
2N1307	5/-	2N44254	8/6	BC113	6/6	BFY51	4/6	OA5	2/6
2N1308	6/-	2N4255	8/6	BC116	12/6	BFY52	4/6	OA9	2/-
2N1309	6/-	2N4284	3/6	BC118	6/6	BFY76	8/6	OA70	1/6
2N1507	5/6	2N4285	3/6	BC125	11/-	BFY77	11/6	OA73	2/-
2N1613	5/6	2N4286	3/6	BC126	11/-	BFY90	12/6	OA79	1/6
2N1711	6/6	2N4287	3/6	BC147	3/6	BSX19	3/6	OA81	1/6
2N1889	6/6	2N4288	3/6	BC148	3/6	BSX20	3/6	OA85	1/6
2N1893	8/6	2N4289	4/6	BC149	3/6	BSX21	7/6	OA90	1/6
2N2102	15/-	2N4291	3/6	BC167	3/6	BSX26	10/6	OA91	1/6
2N2147	14/6	2N4292	3/6	BC168B	3/6	BSX27	10/6	OA95	1/6
2N2148	12/6	40361	12/6	BC168C	3/9	BSX28	6/-	OA200	2/-
2N2160	12/6	40362	12/6	BC169B	3/6	BSX29	13/6	OA202	2/-
2N2193	5/6	3N128	18/6	BC169C	3/9	BSY26	4/-	OC26	6/6
2N2193A	5/6	3N140	19/6	BC1821	4/6	BSY27	4/-	OC28	8/6
2N2194	5/6	3N141	21/6	BC12121	5/-	BSY28	4/-	OC29	15/-
2N2217	6/6	3N142	16/6	BCY30	5/6	BSY29	4/-	OC31	6/6
2N2218	6/6	AAZ13	2/6	HCY31	5/6	BSY38	4/6	OC36	6/6
2N2219	6/6	AAZ15	2/6	HCY32	7/6	BSY39	4/6	OC44	4/6
2N2220	5/-	AAZ17	2/6	HCY33	4/-	BSY40	6/6	OC45	2/-
2N2221	5/-	AC107	6/-	HCY34	4/6	BSY51	8/6	OC71	2/6
2N2222	6/6	AC126	4/-	HCY38	4/6	BSY52	9/-	OC72	2/6
2N2368	5/-	AC127	5/-	HCY39	7/6	BSY53	8/6	OC75	4/6
2N2369	5/-	AC128	4/-	HCY40	6/6	BSY54	10/6	OC81	4/-
2N2369A	5/6	AC176	5/-	HCY42	3/-	BSY95A	3/6	OC83	4/6
2N2539	4/6	AC187	12/-	HCY43	3/-	BY100	4/6	OC81D	4/6
2N2540	4/6	AC188	12/-	HCY54	7/6	BY100	5/6	OC84	5/-
2N2646	11/6	ACV17	5/-	HCY70	4/6	BYZ10	9/-	OC139	6/6
2N2904	8/-	ACV18	5/-	HCY71	8/6	BYZ11	7/6	OC140	6/6
2N2904A	8/-	ACV19	5/-	HCY72	4/-	BYZ12	7/6	OC200	6/6
2N2905	8/-	ACV20	5/-	HDY20	25/6	BYZ13	5/-	OC201	7/6
		ACV21	5/-	HD116	35/-	MJ480	20/6	OC202	10/6

MULLARD INTEGRATED CIRCUITS		THYRISTORS	
FCH211 Hexuple DFI Inverter Gate	28/6	1 AMP. 50V 5/-, 100V 5/6, 200V 7/-, 400V 9/6.	
FCH221 Triple 3 Input DFI Line	28/6	3 AMP. 50V 6/-, 100V 7/6, 200V 8/6, 400V 10/6.	
FC101 3 Input JK Flip Flop	35/-	ZENERS. 1/2 WATT 2-33V 4/6.	
1AA241 Operational Amplifier	47/6	400m/w 3.0-33V 4/-	
TAA243 Operational Amplifier	47/6	INTEGRATED CIRCUITS—R.C.A.	
IAA 263 1 linear AF Amplifier	18/6	CA3005 30/-, CA3011 20/-, CA3012 25/-,	
IAA 300 1 linear A.F. Amp	47/6	CA3013 30/-, CA3014 30/-, CA3018 25/-,	
TAA320 Most 1F Preamp	15/6	CA3019 25/-, CA3020 27/6, CA3021 42/6,	
IAA 350 Wide-band Lim Dif Amp	45/-	CA3022 35/-, CA3023 32/6, CA3026 27/6,	
		CA3028A 25/-, CA3028B 35/-, CA3035 35/-,	
		CA3036 20/-	
		FAIRCHILD	
		1900, 914 11/-, 1923 14/-, 1701C 17/6, 1702C 45/-,	
		1709C 27/6.	
		DATA SHEETS FOR RCA DEVICES 2/- per type	
		Presets std., horiz. or vert.	
		Potentiometers. Log/1 in	
		SPEAKERS (3 ohm)	
		10in. x 6in. 37/6.	
		9in. x 4in. 23/6.	
		8in. x 5in. 19/6.	
		7in. x 4in. 15/6.	
		5in. x 3in. 12/6.	
		3in. 9/6, 5in. 14/6.	
		8in. 27/6, 12in. 39/6.	
		Post and Packing 2/9	
		THERMISTORS	
		R53 (SIC) 25/6	
		K151 (IK) 2/6	
		All various Mullard Thermistors in stock.	
		VEROBOARD	
		15 Matrix -1 Matrix	
		2 1/2 in. x 3 1/2 in. 3/6 4/-	
		2 1/2 in. x 5 in. 4/3 4/9	
		3 1/2 in. x 3 1/2 in. 4/3 4/9	
		3 1/2 in. x 5 in. 5/6 5/6	
		2 1/2 in. x 17 in. 12/6 12/6	
		3 1/2 in. x 17 in. 16/- 21/6	
		Cutter 9/-	
		RESISTORS	
		1/4 watt 5% .4d.	
		1/4 watt 10% .6d.	
		1 watt 10% .6d.	
		2.5 watt 5% .1/6	
		5 watt 5% .2/-	
		10 watt 5% .2/6	
		SEND ad. STAMP FOR CATALOGUE	
		P.P. for Components 1/6 per order.	

A. MARSHALL & SON
28 CRICKLEWOOD BROADWAY, LONDON N.W.2
01-452 0161/2/3 CALLERS WELCOME

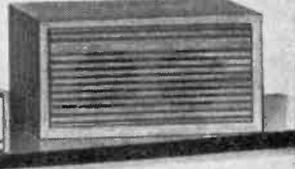
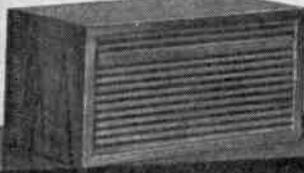
Post & Packing U.K. only. 1/6. Europe 10/-. Commonwealth (Air) 13/-

COMPLETE STEREO SYSTEM

FOR ONLY

39 GNS

CARRIAGE 35/-



The Premier Stereo System consists of an all transistor stereo amplifier. Garrard Model 2025 auto/manual record player unit fitted stereo/mono cartridge and mounted in teak finish plinth with perspex cover and two matching teak finish loudspeaker systems. Absolutely complete and supplied ready to plug in and play. The 10 transistor amplifier has an output of 5 watts per channel with inputs for pick up, tape and tuner also tape output socket. Controls: Bass, Treble, Volume, Balance, Selector. Power on/off, stereo/mono switch. Brushed aluminium front panel. Black metal case with teakwood ends: Size 12 x 5 1/2 x 3 1/2 in. high (Amplifier available separately if required £14.19.6. Carr. 7/6.)

SPECIAL OFFER CARTRIDGES

	SHURE	
	List Price	Premier Price
M5D	£8.10.6	£6.19.6
M44-5	£14.9.1	£10.10.0
M44C	£12.19.5	£9.9.0
M44E	£17.8.4	£13.19.6
M5SE	£20.15.1	£15.15.0
M75-6	£17.8.4	£13.19.6
M75E	£25.18.10	£21.0.0

AUDIO TECHNICA

A.T.33.7 stereo	£10.14.3	£7.19.6
A.T.7S stereo	£22.0.0	£15.0.0
A.T.7X elliptical	£25.0.0	£18.0.0

Post and Packing 1/6 each

"NOVA" TRANSISTOR STEREO AMPLIFIER

A superb stereo amplifier offering every facility for the hi-fi enthusiast. Output 10 watts per channel. Frequency response 40-20,000 Hz ± 3dB. Inputs for radio, P. U. Ceramic, P. U. Magnetic Tape. Separate bass and treble controls, Volume and Balance controls Mono/Stereo Switch. Also features headphone socket and tape output. Teak case with attractive illuminated front panel. Size 14 1/2 x 9 1/2 x 3 1/2 in. A.C. 200/250V.



WONDERFUL VALUE
AT 25 Gns. Carr. 10/-

PICK-UP CARTRIDGES

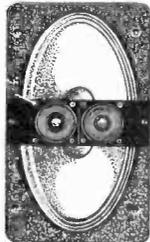
AT MONEY SAVING PRICES!

GOLDRING G800 (Stereo)	£8.19.6
SONOTONE 9TABC/D (Stereo)	£2.15.0
ACOS GP9-1/SC (Mono compatible)	£1.13.5
ACOS GP9-1 (Stereo)	£2.8.7
ACOS GP9-4 (Stereo)	£2.14.8
B 8 R X3M (Mono compatible)	£1.16.5
B 8 R X3H (Mono compatible)	£1.16.5
RONETTE 105 (Stereo)	£1.15.0
RONETTE 106 (Stereo)	£1.15.0

All complete with mounting brackets and instructions. Post and Packing 1/6 each.

WIDE RANGE OF HI-FI STEREO EQUIPMENT ON DEMONSTRATION

All leading makes available including Rogers, Armstrong, Dulc, Wharfedale, Goodmans, Goldring, Shure, etc. etc.



E.M.I. 13 x 8 in. HI-FI SPEAKERS

Fitted two 2 1/2 in. tweeters and crossover network. Impedance 3 and 15 ohms. Handling capacity 10 watts. Brand new.

99/6 P. & P. 7/6

Also available without tweeters

49/6 P. & P. 7/6

SANYO M48M Cassette Tape Recorder

A truly compact lightweight recorder size 8 x 4 1/2 x 2 1/2 in. 5 transistors and 1 diode. A.C. Bias. 2 1/2 in. speaker. Record level indicator. Earphone socket. Complete with carrying strap, remote control microphone with pouch and tape cassette. Output 300mW. Operates on 4 U11 batteries.



PRICE
£21

P. & P. 7/6

"NOVA" 5 WATTS PER CHANNEL STEREO AMPLIFIER.

Specification as above. £18 18 0. Carr. 10/-.

SAVE NEARLY £5!

Premier Stereo System with "NOVA" 10 watt Stereo Amplifier as above. 45 Gns. Carr. 35/-.

VERITAS V-149 MIXER

Battery operated 4-channel audio mixer providing four separate inputs. Size 6 x 3 x 2 in. suitable for crystal microphone, low impedance microphone with transformer, radio, tape, etc. Max. input 1.5v. Max. output 2.5v. Gain 6 dB. Standard jack plug socket inputs, phono inputs. Attractive teak wood grain finish case.



MONO MODEL 59/6 STEREO MODEL 69/6 P. & P. 2/6.

VERITAS V-313 TAPE HEAD DEFLUXER

A must for all tape users! Tape heads become permanently magnetized with constant use; this leads to background noise that prevents perfect recordings. Simply applied to recording head the V313 leaves head free of magnetism. Cleans any tape head in seconds.



34/6 P. & P. 1/6.

JULIETTE NA.5018 5 BAND 18 TRANSISTOR MAINS BATTERY RADIO

Covers AM 540-1600Kc/s. Marine 1.6-4.6Mc/s. FM 88-108Mc/s. VHF 108-134Mc/s. PB 148-174Mc/s. Ferrite bar aerial for AM MB. Telescopic aerial for FM/VHF PB. 4" P.M. Speaker and BFO switch. Operates on AC 250v. or D.C. by four 1.5v. batteries. Size: 9 1/2" x 5 1/2" x 3 1/2".



PREMIER 39 GNS. P. & P. 10/-.

MULTI TESTERS



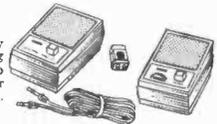
"TEST 7". A really versatile instrument that makes a handy pocket size tool. Measures AC or DC voltage in three ranges of 0-15-150-1000 volts. Resistance 0-100,000 ohms. Current 0-150 mA D.C. Size only: 3 1/2" x 2 1/4" x 1 1/4" Complete with P. & P. battery test leads 59/6 2/6. and instructions.



POCKET SIZE MULTI-TESTER With wide angle, jewelled meter movement, ceramic long-life, low-loss switching, tough impact resisting case. Sensitivity 20,000 ohms/volt D.C. 10,000 ohms/volt A.C. 19 Ranges: 0-5-25-50-250-500-2500 volts DC. 0-10-50-100-500-1000 volts AC. 50µA-2.5 mA-250 mA DC. 0-8000 ohms-6 megohms. 10µA µf-0.001 mfd-1 mfd. -20 to +22dB. Complete battery, test lead and instructions. £4.19.6 P. & P. 3/6.

TWO STATION TRANSISTOR INTERCOMS.

Complete with battery and 50ft. connecting wire. Compact size. Two way call system. Ideal for home, office, factory, etc. 65/- P. & P. 4/-.



FOUR STATION INTERCOM. Master unit and 3 slaves. Ideal for office and home. Complete with battery and connecting wire £7.19.6. P. & P. 5/6.

"PREMIER" TAPE CASSETTES



C60 (60 min.) 7/6
THREE FOR 21/-
C90 (90 min.) 12/6
THREE FOR 36/-
C120 (120 min.) 17/6
THREE FOR 51/-
P. & P. 1/-.



CASSETTE HEAD CLEANER
Removes unwanted deposits from delicate tape heads. Fits all cassette recorders. 11/6 P. & P. 1/-.



"VERITONE" RECORDING TAPE

SPECIALLY MANUFACTURED IN U.S.A. FROM EXTRA STRONG PRE-STRETCHED MATERIAL. THE QUALITY IS UNEQUALLED. TENSILIBED to ensure the most permanent base. Highly resistant to breakage, moisture, heat, cold or humidity. High polished splice free finish. Smooth output throughout the entire audio range. Double wrapped—attractively boxed.

LP3	3"	250'	P.V.C.	5/6	LP6	5 1/2"	1200'	P.V.C.	12/6
DT3	3"	450'	POLYESTER	7/6	DT6	5 1/2"	1800'	POLYESTER	22/6
DT3	3 1/2"	600'	POLYESTER	11/6	T18	8 1/2"	2400'	POLYESTER	37/6
SP5	5"	600'	P.V.C.	8/6	SP7	7"	1200'	P.V.C.	12/6
LP5	5"	900'	P.V.C.	10/-	DT7	7"	2400'	POLYESTER	25/-
DT5	5"	1200'	POLYESTER	15/-	T17	7"	3600'	POLYESTER	50/-

TAPE SPOOLS 3" 1/-, 5", 5 1/2", 7" 1/8, TAPE CASES 5", 7" 2/6.
Post and Packing 3" 1/-, 5", 5 1/2" 1/6, 7" 2/- (3 reels and over Post Free).

PREMIER RADIO

23, TOTTENHAM COURT ROAD, LONDON, W.1 Tel: 01-636 3451

OXFORD ST.

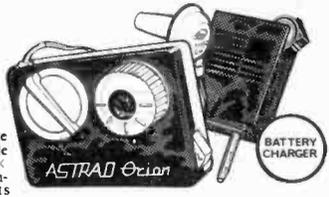


Lasky's

SCOOP! THE WORLD'S SMALLEST 6 TRANSISTOR TWO WAVEBAND RADIO RECEIVER

Over 10,000 sold

The Astrad ORION



Made to the highest space age standards this remarkable micro-set measures only 1 1/2 x 1 3/10 x 1 1/2 in. yet it contains 6 transistors and other components combined in a photo etched circuit only 2 x 1/4 in.; tuning capacitor, ferrite rod aerial, battery, wave band selection switch, etc. Output to a high impedance crystal earpiece, giving ample volume (automatically adjusted) and clear tone. Brief tech. spec: Waveband coverage—Medium wave 525 to 160kc/s, Long wave 150kc/s to 408 kc/s. Sensitivity: 35mV max. Selectivity—10dB (at 30kc/s de-tuning). Power source: 1 x 1.4V Mercury battery. The Orion is supplied fully built and tested complete with battery, left and right fitting earphone supports and attractive black and ivory plastic carrying case—the Orion is an ideal gift for all, providing a constant source of enjoyment without disturbing others.

LASKY'S PRICE ONLY 39/6 Post 2/6 Extra rechargeable battery 3/6

*NOTE: The battery we supply with the Orion is a rechargeable type. Charger units are available enabling you to recharge the battery from AC Mains 220/240V supply.
PRICE 19/6 extra Post Free with radio—otherwise 2/-

RECORD PLAYERS

- AUTOCHANGERS**
- SL 72B £25 0 0
 - AT 60 Mk II £13 5 0
 - 2025 TC complete with stereo cart. £8 17 6
 - 3000 complete with 9TA HC stereo cart. £9 19 6
 - SL 65B £15 19 6
 - 1025 complete with stereo cart. £6 19 6
 - SL 95B £40 0 0
 - SL 75B £32 0 0
- SINGLE PLAYERS**
- AP 75 £18 10 0
 - AP 75 with AD 76K mag. cart. £21 10 0
 - SP 25 Mk II £11 19 6
 - 401 Transcription Unit. £28 0 0
 - 12P25 Mk. II complete AD76K stereo cart. £15 10 0



BASES AND COVERS FOR GARRARD UNITS
 Type WB1 and WB5 for models AT60 Mk II, 2025TC, 3000, SL65B, SL55, 1025, SP25 Mk II. Price WB1 £13 16 6, WB5 £5 12 6. Type WB4 for models SL72B, SL75B, SL95B Price £5 12 6. Perspex covers: SPC1 for WB1 £3 14 1, SPC4 for WB4 and WB5 (allows unit to be played with the cover in place—Price £4 8 0.

GARRARD PACKAGE DEALS

- AP 75 complete with AD 76K Stereo mag. cart., teak plinth and perspex cover (illustrated). **£30.0.0** Post 10/-
 - SP 25 Mk II complete with AD 76K cartridge teak plinth and perspex cover. **£19.0.0** Post 7/6
 - 1025 complete with J2105 stereo crystal cart., teak plinth and perspex cover. **£11.19.6** Post 7/6
- Post on Garrard units: 6/- extra—except AP 75, SL 75B, SL 95B and 401 7/6 extra. Post on bases and covers 5/- extra.

AUDIO DEVELOPMENT LOW COST - HIGH QUALITY MAGNETIC CARTRIDGES

- AD-76K**
- Frequency response: 20-20,000Hz. Output: 5mV. Stylus: Diamond LP. Mono. Compatible. Channel balance: 1dB. Channel separation: 20dB. Compliance: 12 x 10⁻⁶ cm/dyne. Tracking force: 2 gms.
- £4.10.0** Replacement stylus type JS.P1. 38/6
- AD-96K**
- Frequency response: 20-20,000Hz. Output: 5mV. Stylus: Diamond LP 0.7 mil. mono compatible. Channel separation: 20dB. Compliance: 10 x 10⁻⁶ cm/dyne. Tracking force: 2 gms. 0.5 gms. ±
- £5.18.6** Replacement stylus type Y.960S. 51/6 Both Post Free.



TMK METERS

These meters incorporate the very latest developments in design and set a new standard in quality and accuracy. The new shape permits a more compact cabinet yet the meter size is actually increased! All have strong impact resistant cabinets with carrying handles and are complete with test leads, batteries and full instructions.

Model PL-436

20,000 O.P.V. Multitester for the amateur or professional. Features mirror scale and wood grain finish front panel. SPEC: DC/V ranges: 0-6, 3, 12, 30, 120/600V at 20K/O.P.V. AC/V ranges: 3, 30, 120, 600V at 8K/O.P.V. DC current: 50µA, 0.6, 60, 600mA. Resistance: 10K, 100K, 1M and 10M ohms end scale (65, 650, 6.5K and 65K ohms centre scale). Decibels: -20 to +57dB in four ranges. Operates on 2 x 1.5V U7 type batteries. Size: 5 1/4 x 4 1/2 x 2 1/2 in.

LASKY'S PRICE £6.19.6 Post 5/-

Model 5025

50,000 O.P.V. Multitester suitable for all professional and educational uses. Features a fantastic 57 measurement range cover (±2% accuracy on full scale DC). High speed range selection, polarity reversal switch and overload meter protection circuit. SPEC: DC/V ranges: 0-125 to 1000V in 12 ranges (0-25 to 500V at 50K/O.P.V.). AC/V ranges 1-5V to 1000V in 10 ranges (1.5 to 500V at 5K/O.P.V.). DC current: 25µA, 10A. Ohms: 0 to 10M ohms. Decibels: -20 to +81.5dB in 10 ranges. Operates on 2 x 1.5V U7 type batteries. Size: 6 1/2 x 5 1/2 x 2 1/2 in.

£12.10.0 Post 5/- Also available in kit form price £10.10.0.

100,000 O.P.V. "LAB" Model

A highly accurate yet rugged Multitester using a 10µA meter hand calibrated to a DC accuracy of ±3% of full scale. Special features—ultra large meter scale 6 1/2 x 3 1/2 in. incorporating an entirely new type of range selection panel which gives instant range identification without taking your eyes from the meter. An audible buzzer is provided for easy short testing. SPEC: DC/V ranges: 0-5, 2.5, 0, 50, 250, 500, 1000V at 100K/O.P.V. AC/V ranges: 3, 10, 50, 250, 500, 1000V at 5K/O.P.V. DC current: 0-10, 100µA, 0-10, 100mA, 0-2.5, 10A. Resistance: 0-1K, 10K, 100K, 10M, 100M/ohms. Decibels: -10 to +49.4dB. Continuity test: Audible buzzer. Operates on 1 x 1.5V U2 and 1 x 15V B. 154 type batteries. Cabinet size 7 1/4 x 6 1/2 x 3 1/2 in. Weight 4lb.

LASKY'S PRICE £19.10.0 Post 5/-

TTC Model C-1000

A really tiny 1,000 O.P.V. pocket multi-tester with "big" meter performance. Precision 2 jewel meter movement, ±3% accuracy on full scale of DC ranges, 4% on AC ranges. 2 1/2 in. square meter. SPECIFICATIONS: AC/V ranges: 0-10, 50, 250, 1,000 V at 1K/O.P.V. AC/V ranges: 0-10, 50, 250, 1,000V at 1K/O.P.V. DC current: 0-1-100mA. Resistance: 0-150K/ohms (3,000 ohms centre scale). Decibels: -10 to +22dB. Operated on one penlight cell. Two colour buff/green case—size only 3 1/2 x 2 1/2 x 1 in. Click stop range selection switch. Ohms zero adjustment. Complete with test leads, battery and inst.

LASKY'S PRICE ONLY 39/6 Post 2/6

TTC Model C-1051

A completely new design 20,000 O.P.V. pocket multimeter with mirror scale and built in thermal protection circuit. Exceptionally large easy to read meter with D'Arsonval movement. Colour coded scales. Single positive click-in, recessed selection switch for all ranges. Ohms zero adjustment. Range spec. AC volts: 0-6-30-300-1200V at 10K/ohms/V. DC volts: 0-3-15-150-300-1.2KV at 20K/ohms/V. Resistance: 0-60K, 6m. DC current: 0-60µA-300mA. Decibels: -20dB to +17dB. Extremely high standard of accuracy on ranges. Uses one 1 1/2 penlight battery. Strong impact resistant plastic cabinet—size only 4 1/2 x 3 1/2 x 1 1/2 in. Two colour buff/green, finish. Complete with test leads and battery.

LASKY'S PRICE 75/- Post 2/6

Lasky's

AUDIO TECHNICA SPECIAL OFFER

A-35X

Stereo magnetic cartridge with elliptical diamond stylus, Frequency response 20-25KHz—2dB. Channel separation 30dB. List Price £24 4s 9d



LASKY'S PRICE £17.10.0 Post Free

Also available AT-35 stereo magnetic cartridges with either .5 or .7 mil diamond stylus assemblies. List Price £18 10s 0d

LASKY'S PRICE £13.10.0 Post Free

AT 33 Stereo Magnetic Cartridge with .7 mil diamond stylus. List Price £10 14s 3d.

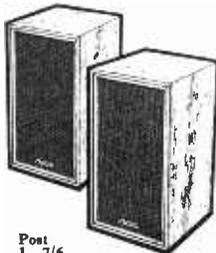
LASKY'S PRICE £7.19.6

EXCLUSIVE

FOSTER "Criterion" MkII

HIGH FIDELITY 2 SPEAKER TWO WAY BOOK-SHELF SPEAKER SYSTEM

Another high quality bookshelf system from Foster. The "Criterion" MkII is a sealed infinite baffle type enclosure using 5 1/2 in. bass/mid-range woofer with rolled cloth edge and a 2 1/2 in. HF cone type tweeter. The compact cabinet is constructed of 1/2 in. laminate with handsome oiled walnut veneer finish and black woven acoustic gauze front panel with satin chrome edge insert. SPEC: Frequency range 90-20,000Hz. Power Handling 10 watts. Impedance 8 ohms. HF crossover. Screw Tag connections at rear. Size 12 1/2 x 7 1/2 x 6 1/2 in. The performance of the "Criterion" is superior to many larger and more expensive units and at Lasky's exclusive price offers absolutely unbeatable value.



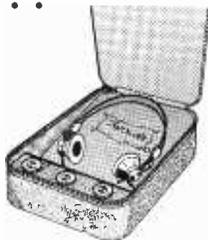
Post
1—7/6
2—10/.

LASKY'S PRICE £9.10.0 or **2 for £17.10.0**

SPECIAL BARGAIN !!

S. G. BROWN "DIPLOMAT" STEREO HEADPHONE AUDITORIUM

Comprising light weight headset and control unit in smart zip-topped case. Control facilities include independent left/right volume controls, channel mixing for perfect stereo balance or mono operation, switched impedance selection for either 15 or 600 ohms input. Complete with all cables and instructions in fitted case — available in either ivory or piskin. List price £12 10s 6d



LASKY'S PRICE £7.19.6 POST 3/6

AKG MODEL K20

Frequency response 30-20,000Hz. impedance 75 ohms (600 ohms each earpiece). Sprung cushion padded earpads for maximum comfort. Pale grey finish. with adjustable headband. List Price £6 5s 0d

LASKY'S SPECIAL PRICE 79/6 POST 3/6

AUDIO TRONICS '70

The 1970 edition of Lasky's famous Audio-Tronics catalogue is now available—FREE on request. The 28 tabloid pages—many in full colour are packed with 1000's of items from the largest stocks in Great Britain of everything for the Radio and Hi-Fi enthusiasts. Electronic Hobbyist, Servicemen and Communications Ham. Over half the pages are devoted exclusively to every aspect of Hi-Fi (including Lasky's budget Stereo Systems and Package Deals). Tape recording and Audio accessories plus Lasky's amazing money saving vouchers worth over £25 0s 0. All the goods shown are available from any of our branches or by Mail Order to any address in the U.K. or Overseas —bringing the benefits of shopping at Lasky's to you in the comfort of your home.



Send: Your name, address and 2/0d for the post only and inclusion of your name on our regular mailing list

THIS MONTH'S VOUCHERS ARE WORTH £1 AND TEN SHILLINGS. DONT MISS THEM SEND FOR YOUR AUDIO TRONICS CATALOGUE NOW.

NEW INTERNATIONAL TAPE

FAMOUS AMERICAN MADE BRAND TAPE at RECORD LOW PRICES

3in. Message tape, 150ft. ...	2 6	5 1/2in. Long play, 1200ft Mylar	15 0
3in. Message tape, 225ft. ...	3 9	5 1/2in. Triple play, 2400ft	35 0
3in. Message tape, 300ft. ...	7 6	7in. Standard play, 1200ft	
3 1/2in. Triple play, 600ft Mylar	10 0	Acetate	12 6
5in. Double play, 1200ft ...	15 0	7in. Standard play, 1200ft.	
5in. Long play, 900ft Acetate	10 0	Mylar	12 6
5in. Standard play 600ft ...	8 6	7in. Long play, 1800ft Mylar	19 6
5 1/2in. Double play, 1800ft M'lar	22 6	7in. D'ble play, 2400ft Mylar	25 0
5 1/2in. Long play 1200ft Acetate	15 0	7in. Long play 1800ft Acetate	15 0
5 1/2in. Standard play 900ft PVC	12 6	7in. Triple play 3600ft Mylar	50 0

P. & P. 1/ extra per reel, 4 reels and over Post Free. Special quotes for quantities

BUDGET CASSETTES from U.S.A.

C60 7/6 each post 1/-	Fives 35/- post 2/-	Tens 65/- post 3/-
C90 12/6 each post 1/-	57/6 post 2/-	115/- post 3/-
C120 17/6 each post 1/-	85/- post 2/-	165/- post 3/-

METROSOUND CASSETTE HEAD CLEANER

This ingenious device enables the delicate recording heads and drive system of your Cassette Recorder to be cleaned without damage. Just slip in the cassette like any other cassette and run through once. Only takes moments and removes all dirt and oxide deposits in seconds.

LASKY'S PRICE 10/8 POST 1/- EACH

LASKY'S ENCAPSULATED SOLID STATE MODULES

Size of each module only 4 x 1 1/2 x 1 1/2 in. Ready for immediate use—just connect to power source usually 9V battery, input and output. Encapsulated modules are shockproof and almost indestructible. Complete with full ins. Post 1/6 each.

- E-1311 Phono Pre-amp Module—max. output 3V, RMS, input 50mV, input imp. 100kΩ, gain 28dB, RIAA compensation 29/6
- E-1312 Tape Head Pre-amp Module—max. output 3V, RMS, input 50mV, input imp. 100kΩ, gain 25dB, NARTB compensation 29/6
- E1313-Microphone Pre-amp Module—max. output 4V, RMS, input 50mV input imp. 100kΩ, gain 28dB, response 10.5kc/s. 29/6
- E-1314 Power Amplifier Module—max. output 300mW, input imp. 1kΩ, gain 20dB, response 50-10kc/s, distortion 3% at 20mW. 29/6
- E-1315 Electronic Organ (tone oscillator) Module—frequency 200-1,000 c/s, output 80mW. For use with keyboard, variable resistors and 8Ω speaker. 25/-
- E-1316 Morse Code Practice Oscillator Module—frequency 400c/s, output 80mW. For use with morse key and speaker. 25/-
- E-1317 Modulated Wireless Signal Transmitter for use in test bench fault finding—frequency 400c/s-30Mc/s, tone freq. 400c/s. For use with any AM receiver. 25/-
- E-1318 Lamp Flasher Module—flashes two miniature lamps alternately. For use with 6V, 100/200mA bulbs and 6V power supply. 25/-

Lasky's Radio Limited

Branches

207 EDGWARE ROAD, LONDON, W.2 Tel. 01-723 3271

33 TOTTENHAM CT. RD., LONDON, W.1 Tel. 01-536 2505

Open all day, 9 a.m.—6 p.m. Monday to Saturday

152/3 FLEET STREET, LONDON, E.C.4 Tel. 01-353 2333

Open all day Thursday, early closing 1 p.m. Saturday

High Fidelity Audio Centres

42-45 TOTTENHAM CT. RD., LONDON, W.1 Tel. 01-580 2573

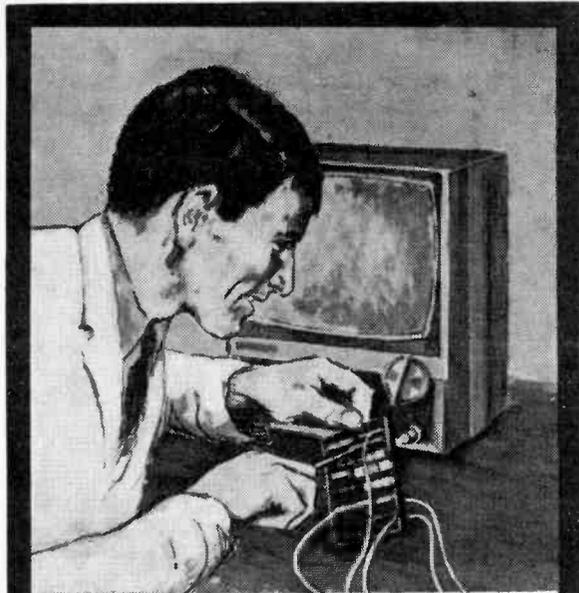
Open all day, 9 a.m.—6 p.m. Monday to Saturday

118 EDGWARE ROAD, LONDON, W.2 Tel. 01-723 9789

Open all day Saturday, early closing 1 p.m. Thursday

ALL MAIL ORDERS AND CORRESPONDENCE TO: 3-15 CAVELL STREET, TOWER HAMLETS, LONDON, E.1





Train for tomorrow's world in Radio and Television at The Pembridge College of Electronics.

The next full time 16 month College Diploma Course which gives a thorough fundamental training for radio and television engineers, starts on 15th April 1970.

The Course includes theoretical and practical instruction on Colour Television receivers and is recognised by the Radio Trades Examination Board for the Radio and Television Servicing Certificate examinations. College Diplomas are awarded to successful students.

The way to get ahead in this fast growing industry—an industry that gives you many far-reaching opportunities—is to enrol now with the world famous Pembridge College. Minimum entrance requirements: 'O' Level, Senior Cambridge or equivalent in Mathematics and English.

To: The Pembridge College of Electronics
(Dept. PW12), 34a Hereford Road, London, W.2

Please send, without obligation, details of the Full-time Course in Radio and Television.

NAME

ADDRESS



for fast, easy, reliable soldering

Contains 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux required.

SAVBIT ALLOY ALSO REDUCES COPPER BIT WEAR.

Economically packed for general electrical and electronic soldering. 75ft. 18 gauge on plastic reel. Recommended retail price 15/-



THIN GAUGE SOLDER, ESSENTIAL FOR

soldering small components and thin wires. High tin content, low melting point, 60/40 alloy, 170ft. 22 gauge on plastic reel. Recommended retail price 15/-



A RANGE OF SOLDERS IN HANDY DISPENSERS.

REF. ALLOY SWG

4A	60/40	18	3/-*
Size 5 (ill- ustra- ted)	Savbit	18	3/-*
15	60/40	22	4/-*

*Recommended Price



INVALUABLE FOR STRIPPING FLEX. THE NEW AUTOMATIC OPENING BIB WIRE STRIPPER AND CUTTER,

easily adjustable for all standard diameters. Plastic covered handles can also be used as wire cutter. Recommended retail price 8/6



From Electrical and Hardware shops. If unobtainable, write to:
Multicore Solders Ltd., Hemel Hempstead, Herts.

SEND NOW for your

1970

ENLARGED ILLUSTRATED CATALOGUE

FREE from

W.E.C. LTD. (MW)

74 THE STREET, ASHTEAD, SURREY



AMAZING MINI-DRILL



FOR PRECISION
**MODEL
WORK**



+ 6 TOOLS

Indispensable for precision drilling, grinding, polishing, etching, gouging, shaping. Precision power for the enthusiast. Shockproof. Completely portable power from 4½ volt external battery. So much more scope with MINI-DRILL. Super Kit (extra power, interchangeable chuck) 79/6, p.p. 2/6. De Luxe Professional Kit with 17 tools 130/- p.p. 4/6. Money ref. g'tee.

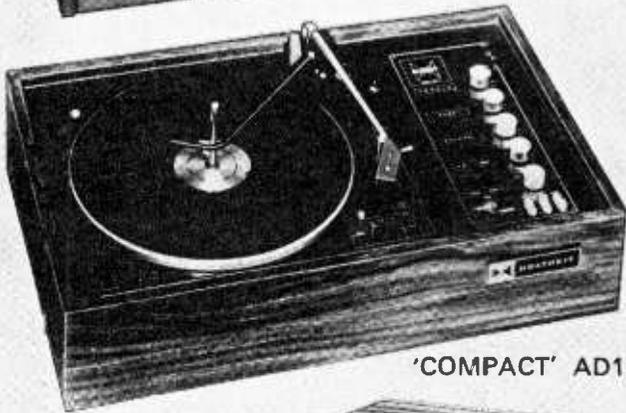
MERLIN SUPPLY CO.

Dept. PW3D, Nailsea, Bristol BS19 2LP

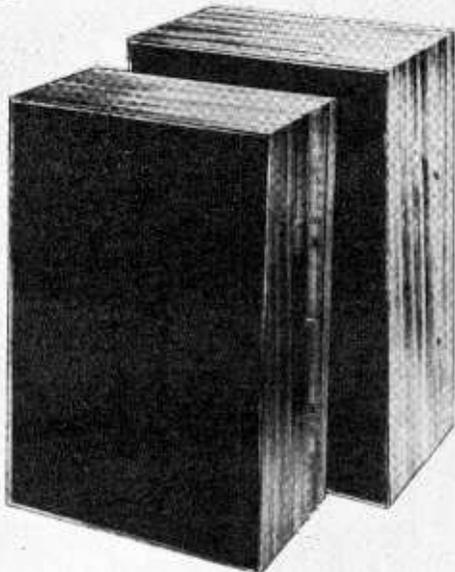
Heathkit for the new "Compact" Sound of the 70's



'COMPACT' AD27



'COMPACT' AD17



AMBASSADOR SPEAKERS

The fabulous stereo "Compacts" Models AD-17 and AD-27 are setting the pace in hi-fi for the 1970's. They offer outstanding value and performance. The AD-17 comprises a BSR MA-65 turntable/Shure M44-MB magnetic cartridge and a 10 watt (RMS) per channel stereo amplifier all mounted on a Teak or Walnut plinth. **Kit Price £54. Carr. 13/-**

The AD-27 is similar but uses the MA-70 turntable and includes an FM stereo tuner. In this case the "plinth" is better described as a small cabinet. It has the additional features of a "Roller Shutter" lid and is available in Teak or Walnut. **Kit Price £82. Carr 13/-**

Heathkit offer many excellent loudspeaker systems the new "Ambassador" Hi-Fi loudspeaker is winning many friends. Its cabinet is supplied ready assembled and finished in selected Teak or Walnut veneers to harmonise with other current Heathkit hi-fi equipment. It uses three loudspeaker units a 12in. bass, 5in. mid range and a 1in. Dome Pressure Tweeter. **Kit Price £29.16.0 Carr. 15/-**

The complete Heathkit hi-fi range of stereo amplifiers, tuner/amplifiers, FM tuners, Stereo "Compacts", loudspeaker systems and ancilliary hi-fi equipment are all described and illustrated, many in full colour. In a wonderful free catalogue.

**Send for the
FREE Catalogue
and see for
yourself ...
Today !**

TO DAYSTROM LTD., GLOUCESTER, GL2-6EE

Please rush me details of the latest Heathkit Hi-Fi Models

NAME.....
ADDRESS.....
51/3A



DAYSTROM LTD
GLOUCESTER
GL2-6EE

CAR LIGHT FLASHERS



Heavy duty light flasher employs a condenser discharge principle operating on electro-mechanical relay. (As inset). Housed in strong plastic case. Flashing rate between 60-120 per minute. 12V D.C. operation. Maximum load 6 amps. Size 2-11/16in. dia. x 4in. Supplied brand new at a fraction of original cost. 6/6 each P. P. 2/6. (3 for 17/6 P. P. 4/6).

CLASS D WAVEMETERS



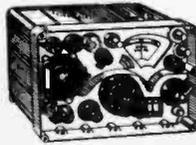
A crystal controlled heterodyne frequency meter covering 1.7-6 Mc/s. Operation on 6 volts D.C. Ideal for amateur use. Available in good used condition. \$5.19.8. Carr. 7/6. Or brand new with accessories. \$7.19.8. Carr. 7/6.

CLASS D WAVEMETERS No. 2

Crystal controlled. 1.2-19 Mc/s. Mains or 12V. D.C. operation. Complete with calibration charts. Excellent condition. \$12.10.0. Carr. 30/-.

R209 MK II

COMMUNICATION RECEIVER
11 valve high grade communication receiver suitable for tropical use. 1-20 Mc/s on 4 bands. AM/CW/FM operation. Incorporates precision vernier driver, B.F.O., aerial trimmer, internal speaker and 12V. D.C. internal power supply. 8 1/2" x 11 1/2" in excellent condition, fully tested and checked \$18.0.0. Carr. 20/-.



TYPE 13A DOUBLE BEAM OSCILLOSCOPES



An excellent general purpose D/B oscilloscope. T.B. 2 cps-750 Kc/s. Bandwidth 5-5 Mc/s. Sensitivity 33mV/cm. Operating voltage 0/110/200/240V. A.C. Supplied in excellent working condition. \$28.10.0. Or complete with all accessories, probe, leads, lid, etc. \$35. Carriage 30/-.



MARCONI

T/44/TF956

AF Absorption Wattmeter

1 μ/watt to 6 watts. \$20. Carr. 10/-.

GEARED MAINS MOTORS



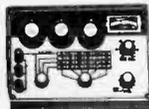
Paralux type 8D19 230/250V. A.C. Reversible. 30 r.p.m. 40 lb./ins. Complete with capacitor. Excellent condition. 99/6. Carr. 10/-.

TO-3 PORTABLE OSCILLOSCOPE



3in. tube. V. amp. Sensitivity 0.1v p-p/cm. Bandwidth 1.5 cps-1.5 MHz. Input Imp. 2 meg Ω 25pF. X amp. sensitivity 0.9v p-p/cm. Bandwidth 1.5 cps-800KHz. Input Imp. 2 meg Ω 20pF. Time base. 5 ranges 10 cps-300 KHz. Synchronisation. Internal/external. Illuminated scale 140 x 215 x 330 mm. Weight 15 1/2 lb. 220/240V. A.C. Supplied brand new with handbook. \$37.10.8 Carr. 10/-.

TRANSISTORISED L.C.R. A.C. MEASURING BRIDGE



A new portable bridge offering excellent range and accuracy at low cost. Ranges: R. 10-111 meg Ω 6 Ranges ±1%. L.I. μ H - 111 HENRYS 6 Ranges -2%. C. 10pF ±111mF. 6 Ranges ±2%. TURNS RATIO 1:11000. 6 Ranges ±1%. Bridge voltage at 1000 cps. Operated from 9 volts. 100μA. Meter indication. Attractive 2 tone metal case. Size 7 1/2 x 5 x 2in. \$20. P. & P. 5/-.

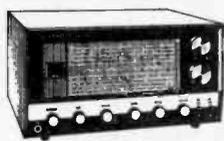
UNR-30 4-BAND COMMUNICATION RECEIVER

Covering 550 Kc/s-30 Mc/s. Incorporates BFO. Built in speaker and phone jack. Metal cabinet. Operation 220/240V. A.C. Supplied brand new, guaranteed with instructions. Carr. 7/6 **13 gns.**



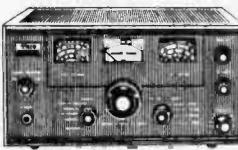
TRIO JR.310 New Amateur Band 10-80

Metre Receiver in stock. \$27.10.0.



LAFAYETTE SOLID STATE HA600 RECEIVER

5 BAND AM/CW/SSB AMATEUR AND SHORT WAVE 150 Kc/s-400 Kc/s and 550 Kc/s-30 Mc/s FET front end ● 2 mechanical filters ● Huge dial ● Product detector ● Variable BFO ● Noise limiter ● 8 meter ● 24in Bandspeed ● 230V. A.C./12V. D.C. neg. earth operation ● RF gain control. Size 15in. x 9 1/2in. x 8 1/2in. Weight 18 lbs. EXCEPTIONAL VALUE. \$45. Carr. 10/- S.A.E. for full details.



TRIO COMMUNICATION RECEIVER MODEL 9R-59DE

4 band receiver covering 550 Kc/s to 30 Mc/s continuous and electrical bandspeed on 10, 15, 20, 40 and 80 metres. 8 valve plus 7 diode circuit, 4/8 ohm output and phone jack. 98B-CW ● ANL ● Variable BFO ● 8 meter ● Sep. bandspeed dial ● IF 465 Kc/s ● Audio output 1.5 W. ● Variable RF and AF gain controls. 115/250V. A.C. Mains. Beautifully designed. Size: 7 x 15 x 10in. With instruction manual and service data. \$42. carriage paid. TRIO COMMUNICATION TYPE HEADPHONES. Normally \$5.19.6. OUR PRICE \$3.15.0 if purchased with above receiver.

TRIO JR. 500SE 10-80 Metre

Receiver £69.10.0

TRIO TS 510 AMATEUR TRANS-CEIVER with speaker and mains P.S.U.

£212. IN STOCK!



LAFAYETTE HA-800 SOLID STATE AMATEUR COMMUNICATION RECEIVER
Six bands 3-5.4, 7-7.3, 14-14.35, 21-21.45, 28-29.7, 50-54 Mc/s. Dual conversion on all bands. 2 x 455 Kc/s mechanical filters. FET front end. product detector, variable BFO, 100Kc/s crystal calibrator. 'S' Meter. Huge slide rule dial. Operation 230V A.C. or 12V D.C. Size 15 x 9 1/2 x 8 1/2 in. Complete with instruction manual. \$67.10.0 Carr. Paid. 100Kc/s crystal 39/6 extra.



RCA COMMUNICATIONS RECEIVERS AR88D

Latest release by ministry BRAND NEW in original cases. 110-250V. A.C. operation. Frequency in 6 Bands. 535 Kc/s-32 Mc/s continuous. Output impedance 2-5-600 ohms. Incorporating crystal filter, noise limiter, variable BFO, variable selectivity, etc. Price \$27.10.0. Carr. \$2.



LAFAYETTE PF-60 SOLID STATE VHF FM RECEIVER

A completely new transistorised receiver covering 152-174 Mc/s. Fully tunable or crystal controlled (not supplied) for fixed frequency operation. Incorporates 4 INTEGRATED CIRCUITS. Built in speaker and illuminated dial. Squelch and aerial controls. Tape recorder output. 75 Ω serial input. Headphone jack. Operation 230V. A.C./12V. D.C. Neg. earth. \$37.10.0. Carr. 10/-.



TELETON MODEL CR-10T AM/FM STEREO TUNER AMPLIFIER

A new model from Teleton. 31 solid state devices. 4+4 watt output. Inputs for ceramic/crystal cartridge. Frequency range AM 540-1600KHz FM 88-108MHz. Automatic FM Stereo reception. Stereo indicator. Controls: Tuning, function selector. Tone and R & L volume controls. AFC switch. Stereo headphone socket. Size 13 1/2 x 3 1/2 x 9 1/2 approx. PRICE \$34.0.0. Carr. 7/6.

CLEAR PLASTIC PANEL METERS



First grade quality Moving Coil panel meters. Type MR 38P. 1 1/2" high. square fronts.

500-0-500 μA 27/6	50mA 27/6	150V. D.C. ... 27/6
1mA 27/6	100mA 27/6	300V. D.C. ... 27/6
10-10mA 27/6	150mA 27/6	500V. D.C. ... 27/6
2mA 27/6	200mA 27/6	750V. D.C. ... 27/6
5mA 27/6	300mA 27/6	15V. A.C. ... 27/6
10mA 27/6	500mA 27/6	50V. A.C. ... 27/6
50-0-50 μA 40/-	3V. D.C. ... 27/6	150V. A.C. ... 27/6
100-0-100 μA 37/6	1 amp 27/6	300V. A.C. ... 27/6
100 μA 37/6	2 amp 27/6	500V. A.C. ... 27/6
100-0-100 μA 35/-	5mA 27/6	8 meter IMA 32/-
200 μA 35/-	5 amp 27/6	100V. D.C. ... 27/6
500 μA 40/-	20mA 27/6	VU meter 42/-

FULL RANGE OF OTHER SIZES IN STOCK. SEND S.A.E. FOR LEAFLET

Variable Voltage TRANSFORMERS

Brand new, guaranteed and carriage paid. High quality construction. Input 230V. 50-60 cycles. Output full variable from 0-250 volts. Bulk quantities available. 1 amp.—\$5.10.0; 2.5 amp.—\$6.15.0; 5 amp.—\$8.15.0; 8 amp.—\$14.10.0; 10 amp.—\$18.10.0; 12 amp.—\$21.0.0; 20 amp.—\$37.0.0.

CRYSTAL CALIBRATORS NO. 10



Small portable crystal controlled wavemeter. Size 7 x 7 1/2 x 4in. Frequency range 500 Kc/s-10 Mc/s (up to 30 Mc/s on harmonics). Calibrated dial. Power requirements 300V. D.C. 15mA and 12V. D.C. 0.3A. Excellent condition. 98/6. Carr. 7/6.

SOLARTRON CD.711S.2 OSCILLOSCOPES

Double beam. D.C. to 9Mc/s. Perfect order. \$65. Carr. 50/-.

TE-40 HIGH SENSITIVITY A.C. VOLTMETER



10 meg. input 10 ranges: 0.1/0.003/1-3/31/310/30/100/300V. R.N.S. 4cps. 1-2 Mc/s. Decibels -40 to +80dB Supplied brand new complete with leads and instructions. Operation 230V. A.C. \$17.10.0. Carr. 5/-.

LELAND MODEL 27 BEAT FREQUENCY OSCILLATORS

Frequency 0-20 Kc/s. on 2 ranges. Output 500 Ω or 5k Ω. Operation 200/250V. A.C. Supplied in perfect order. \$12.10.0. Carr. 10/-.

TE-65 VALVE VOLTMETER

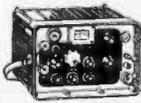


High quality instrument with 28 ranges. D.C. volts 1.5-1,500V. A.C. volts 1.5-1,500V. Resistance up to 1,000 megohms. 200/240V. A.C. operation. Complete with probe and instructions. \$17.10.0. P. & P. 6/- Additional probes available: R.F. 35/-, H.V. 42/6.

COSSOR 1049 DOUBLE BEAM OSCILLOSCOPES

D.C. coupled. Band width 1Kc/s. Perfect order. \$25. Carr. 30/-.

AM/FM SIGNAL GENERATORS



Oscillator Test No. 2. A high quality precision instrument made for the ministry by Airmecc. Frequency coverage 20-80 Mc/s. AM CW/FM. Incorporates precision dial, level meter, precision attenuator 1 μV-100mV. Operation from 12 volt D.C. or 0/110/200/250 volt A.C. Size 12 x 8 1/2 x 9in. Supplied in brand new condition complete with all connectors fully tested. \$45. Carr. 20/-.

EDDYSTONE VHF RECEIVERS Model 770R. 19-165 Mc/s. Excellent condition. \$198.

PLESSEY SL.4C3A 3 watt Integrated Amplifier Circuit 49/6 Post Paid.



TE-16A Transistorised Signal Generator. 5 ranges 400KHz-30mHz. An inexpensive instrument for the handyman. Operates on 9v battery. Wide easy to read scale. 800KHz modulation. 5 1/2 x 5 1/2 x 3 1/2 in. Complete with instructions and leads. \$7.19.6. P. & P. 4/-.

FIELD TELEPHONES TYPE L

Generator ringing, metal cases. Operates from two 1.5V batteries (not supplied). Excellent condition. \$4.10.0 per pair. Carr. 10/-.

AUTO TRANSFORMERS

0/115/230V. Step up or step down. Fully shrouded. 150 W. \$2.2.5. P. & P. 3/6. 300 W. \$2.19.6. P. & P. 4/6. 500 W. \$4.10.0. P. & P. 6/6. 1,000 W. \$8.10.0. P. & P. 7/6. 1,500 W. \$7.19.6. P. & P. 8/6. 2,000 W. \$15.10.0. P. & P. 20/-.

G. W. SMITH & CO. (RADIO) LTD. Also see oppo. page

ARF-100 COMBINED AF-RD SIGNAL GENERATOR



A.F. SINE WAVE
20-200,000 c/s.
Square wave 20-30,000 c/s. O.P. HIGH IMP. 21V. P/P 600Ω 3.8V. P/P T.F. 100 Kc/s-500 Mc/s. Variable B.F. 2.

attenuation int/ext. modulation. Incorporates dual purpose meter to monitor AF output and % mod. on R.F. 220/240V. A.C. £32.10.0. Carr. 7/6.

TE-20D RF SIGNAL GENERATOR



Accurate wide range signal generator covering 120 Kc/s-500 Mc/s on 6 bands. Directly calibrated Variable R.F. attenuator, audio output. Xtal socket for calibration. 220/240V. A.C. Brand new with instructions. £15. Carr. 7/6. Size 140x215x170 mm.

PEAK-SOUND PRODUCTS. Full range of Amplifiers, Kits, Speakers in stock.

TY75 AUDIO SIGNAL GENERATOR

Sine Wave 20c/s to 200 kc/s. Square Wave 20c/s to 30kc/s. High and low impedance output. Output variable up to 8 volts. 220/240 volts A.C. Size 210 x 150 x 120 mm. Brand new with instructions. £16. Carr. 7/6.



MARCONI TF148E DISTORTION FACTOR METERS. Excellent condition. Fully tested. £20. Carr. 15/-.

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

2 pF-2000 mFd
2 ohms 200 meg-ohms. Also checks impedance, ratio, insulation, 200/250V. A.C. Brand New £17.10.0 Carr. 7/6.



MODEL ZQM TRANSISTOR CHECKER

It has the fullest capacity for checking on A, B and Ico. Equally adaptable for checking diodes, etc. Spec. A: 0.7-0.9967. B: 5-200. Ico: 0-50 microamps 0-6mA. Resistance for diode 200Ω-1MΩ. Supplied complete with instructions, battery and lead. £5.19.6. P. & P. 2/6



ADVANCE TEST EQUIPMENT

Brand new and boxed in original sealed cartons

JIB. AUDIO SIGNAL GENERATOR. 15 c/s to 50 Kc/s. Sine wave. Output 600 ohms or 5 ohms. £30.0.0.

VM79. UHF MILLIVOLT METER. 100 Kc/s to 1,000 Mc/s. A.C. 10 mV to 3v. D.C. 10 mV to 3v. Current 0.01 uA to 0.3 mA. Resistance 1 ohm to 10 megohm. £125.0.0.

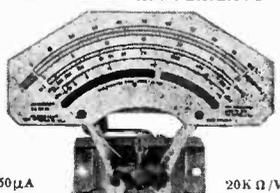
TT15. TRANSISTOR TESTER. Full range of facilities for testing PNP or NPN transistors in or out of circuit. £37.10.0. Carriage 10/- per item.

HOSIDEN DHD4S 2-WAY STEREO HEADSETS



Each headphone contains a 2in. woofer and a 1in. tweeter. Built in individual level controls. 8Ω imp. 25-18,000c/s with cable and stereo plug. £5.19.6. P. & P. 2/6.

AVOMETER MOVEMENTS



Spare movements for Model 8 or 9. (Fitted with Model 9 scale) or basis for any multimeter. Brand New & Boxed. 89/6. P. & P. 3/6.

AVO 48A. Perfect order with set of shunts and resistances. £12.10.0. P. & P. 7/6.

Latest Catalogue

The latest edition giving full details of a comprehensive range of HI F.I. EQUIPMENT, COMPONENTS, TEST EQUIPMENT AND COMMUNICATIONS EQUIPMENT. ... Nearly 2000 pages, fully illustrated and detailing thousands of items - many at bargain prices. FREE DISCOUNT COUPONS VALUE 10%.



SEND NOW - ONLY 7/6 P & P!

GARRARD

FULL CURRENT RANGE OFFERED BRAND NEW AND GUARANTEED AT FANTASTIC SAVINGS

- *2025 Stereo £7.19.6
- *2025T/C £7.19.6
- Mono/Stereo £8.17.6
- *3000 Stereo £19.19.6
- *SP25 MK II £11.19.6
- *SL55B £16.16.0
- A70 MK II £12.10.0
- AP75 £17.17.0
- 401 £28.7.6
- SL75 £28.10.0



Carriage/insurance 7/6 extra any model. WB4 Bases £3.19.6. Perspex covers £3.10.0. *Special offer base and cover available for these models at £4.15.0. Carr. 5/- Full range of Garrard accessories available.

LAFAYETTE LA-224T TRANSISTOR STEREO AMPLIFIER

19 transistors, 8 diodes, 1HF music power, 30W at 8Ω. Response 30-20,000 ± 2dB at 1W. Distortion 1% or less. Inputs 3mV and 250mV. Output 3-16Ω. Separate L and R volume control. Treble and bass control. Stereo phono jack. Brushed aluminium, gold anodised extruded front panel with complementary metal case. Size 104 x 3 9/16 x 7 13/16in. Operation 115/230V. A.C. £28. Carriage 7/6.



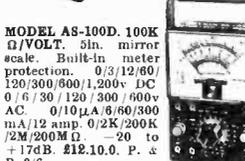
MULTIMETERS for EVERY purpose!

TE-51. NEW 20,000Ω/VOLT MULTIMETER with overload protection and mirror scale. 0/6/60/120/1,200v. A.C. 0/3/30/60/300/600/3,000v. D.C. 0/60/12/300mA. 15mA/12 amp. 0/2K/200K/2M/200MΩ. -20 to +17dB. £12.10.0. P. & P. 3/6.



TE-900 20,000Ω/VOLT GIANT MULTIMETER mirror scale and overload protection. 6in. full view meter. 2 colour scale. 0/2.5/10/250/1,000/5,000v. A.C. 0/25/12.5/10/50/250/1,000/5,000v. D.C. 0/50/10/110/100/500 mA/10 amp. D.C. 0.2K/200K/2M MEG. OHM. £15. P. & P. 3/6.

MODEL AS-100D. 100KΩ/VOLT 5in. mirror scale. Built-in meter protection. 0/3/12/60/120/300/600/1,200v. DC 0/6/30/120/300/600v. AC. 0/10/12/6/60/300 mA/12 amp. 0/2K/200K/2M/200MΩ. -20 to +17dB. £12.10.0. P. & P. 3/6.



MODEL TE-10A. 20kΩ/Volt 5/25/50/250/500/2,500v. D.C. 10/50/100/500/1,000v. A.C. 0/50/12/5mA/250mA D.C. 0/6K/6 meg. ohm. -20 to +20dB. 100. 100mFd. 0/100-0/1mFd. 69/6. P. & P. 2/6.

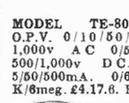
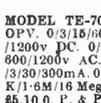


MODEL TE-90 50,000Ω/VOLT mirror scale overload protection 0/3/12/60/300/600/1200v. DC. 0/6/30/120/300/1200v. DC. -03/6/60/500mA. DC. 16K/160K/1/6/16meg Ω. -20 to +63dB. £7.10.0. P. & P. 3/6.



LAFAYETTE 57 Range Super 50kΩ/volt Multimeter. D.C. volts 12 mV -1000V. A.C. volts 1.5V -1000V. D.C. current 25µA-10 amp. Ohms 0-10 meg Ω dB -20 to +81 dB. Overload protection. £12.10.0. Carr. 3/6.

MODEL TE-70. 30,000Ω/VOLT 0/3/15/60/300/600/1200v. DC. 0/6/30/120/300/600/1200v. AC. 0/30/120/300/600/300mA. 0/16K/160 K/1-6M/16 Meg. Ω. £5.10.0. P. & P. 3/6.



MODEL TE-80. 20,000Ω/VOLT 0/10/50/100/500/1,000v. A.C. 0/5/25/50/250/500/1,000v. D.C. 0/50/10/50/500mA. 0/6K/60K/600 K/6Meg. £4.17.6. P. & P. 3/6.

MODEL FT-34. 1,000Ω/VOLT 0/10/50/100/500/1,000v. AC and DC. 0/1/100/500mA 10C. 0/100KΩ. 39/6. P. & P. 1/6.



MODEL TE-12. 20,000Ω/VOLT 0/0.6/6/30/120/600/1,200/3,000/6,000v. D.C. 0/6/30/120/600/1,200v. A.C. 0/60/12/6/60/600mA. 0/6K/60K/6Meg. 60 Meg. Ω. 50P/F. 0.2mFd. £5.18.6. P. & P. 3/6.

★ TRANSISTORISED FM TUNER ★



6 TRANSISTOR HIGH QUALITY TUNER, SIZE ONLY 6x4x4in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9V battery. Coverage 88-108Mc/s Ready built ready for use. Fantastic value for money. 88/7.6. P. & P. 2/6. Stereo multiplex adaptors 99/6.

TRANSISTORISED TWO-WAY TELEPHONE INTERCOM

Operative over amazingly long distances. Separate call and press to talk buttons. 2-wire connection. 1000's of applications. Beautifully finished in ebony. Supplied complete with batteries and wall brackets. £6.19.8. P. & P. 3/6.



SINCLAIR EQUIPMENT

Project 60 range of new models now in stock.

- Z30 Amplifier 89/6
- STEREO 60 Control Unit 89.19.6
- P25 Power Supply 64.19.6
- P26 Power Supply 67.19.6
- 16 Speakers 88.19.6
- All Post Paid SPECIAL PACKAGE OFFER!
- 2 x Z30 Amplifiers, Stereo 60 and P25 Power Supply £22.0.0 or with 2 x 16 Speakers £29.0.0

Micromatic Radio Kit 49/6
Micromatic Radio Built 59/6
SINCLAIR IC10 IN STOCK
2000 Amplifier £27.10.0 Carr. Pd.
Neoteric Amplifier £54.8.0 Carr. Pd.

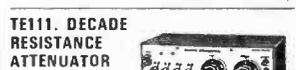
ECHO HS-605 STEREO HEADPHONES



Wonderfully comfortable. Light-weight adjustable vinyl headband. 6in. cable and stereo jack plug. 25-17,000 cps. 8 ohm imp. 87/6 P. & P. 2/6.

RACAL MA.168 TRANSISTORISED DIVERSITY SWITCH

Brand New Condition. £15. Carr. 10/-



TE111. DECADE RESISTANCE ATTENUATOR

Variable range 0-11dB. Connections, Unbalanced T and Bridge T. Impedance 600Ω range (0-1dB x 10 + 1dB x 10 + 10 + 20 + 30 + 40dB. Frequency: d.c. to 200kHz (-3dB). Accuracy: 0.05dB. + Indication dB x 0.01. Maximum input less than 4W (50V). Built in 600Ω load resistance with internal/external switch. Brand new £27.10.0. P. & P. 5/6.

RECORDING HEADS

GOSMORDED i-track heads. High imp. record/playback 85/- Low imp. erase 20/-
MARRIOTT i-track heads. High imp. record/playback 85/- Low imp. erase 20/-
Post extra.

AMERICAN TAPE

First grade quality American tapes. Brand new. Discount on quantities.

- 3in. 225ft. L.P. acetate 3/6
 - 3in. 800ft. T.P. mylar 10/-
 - 5in. 600ft. std. plastic 8/8
 - 5in. 900ft. L.P. acetate 10/-
 - 5in. 1,200ft. D.P. mylar 15/-
 - 6in. 1,200ft. L.P. acetate 12/6
 - 6in. 1,200ft. L.P. mylar 16/-
 - 6in. 1,800ft. D.P. mylar 22/6
 - 6in. 2,400ft. T.P. mylar 30/6
 - 7in. 1,200ft. std. acetate 12/6
 - 7in. 1,800ft. L.P. acetate 15/-
 - 7in. 1,800ft. L.P. mylar 20/-
 - 7in. 2,400ft. D.P. mylar 25/-
 - 7in. 3,600ft. T.P. mylar 46/-
- Postage 2/- Over £2 post paid.

MAXELL TAPE CASSETTES

CR0. 10/8; C90. 14/3; C120. 19/8. Post extra

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

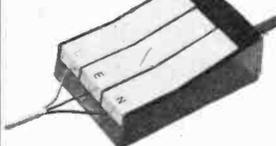
All Mail Orders to -
147, Church Street, London, W.2
Tel: 01-262 6562 (Trade supplied)

3, LISLE STREET, LONDON, W.C.2 Tel: 01-437 8204
34, LISLE STREET, LONDON, W.C.2 Tel: 01-437 9155
311, EDGWARE ROAD, LONDON, W.2 Tel: 01-262 0387
OPEN 9-6 MONDAY TO SATURDAY (EDGWARE ROAD 1/2 DAY THURSDAY)

LIND-AIR OPTRONICS LTD

See our vast range of Electronic Components and Accessories at our enlarged Component Centre 25 Tottenham Court Road

MAINS KEYNECTOR SAVES TIME — SAFELY !



One mains "Keynector" instantly and safely connects electrical appliances to mains supply without the use of a plug. A number of appliances may be used simultaneously up to the full 13 amp rating of this device. A red light glows when "live". The "Keynector" is fused and has its own robust switch which is interlocked to prevent connections when "live". Invaluable to handymen, servicemen, demonstrators, etc.

39/6 P. & P. 3/-

VHF AIRCRAFT BAND CONVERTER

When placed within 1in. of a MW band radio full coverage of VHF Aircraft Band 108-135 Mc/s can be obtained. All transistor. 9v battery operation. Fully tunable 188 in. x 7 section telescopic aerial. Size 4 x 2 1/2 x 1 1/2in. 79/6 P. & P. 3/6.



MODEL MAKER'S MOTOR

No. 15RN. Voltage 11.5v Current 400mA. Torque 12g-cm. Body size 1 1/2" long x 3/8" dia. Shaft 1/8" long x 1/16" dia. Ideal for small models and toys. 5/6 each. P. & P. 1/3. 3 for 15/- P. & P. 2/6.



DE-LUXE STEREO HEADPHONES

With soft rubber earpieces. Impedance 8-16 ohms. Frequency response 23-13,000 cps. With lead and stereo plug. Only 59/6 P. & P. 3/6.



Battery Eliminator Enables transistor equipment to be operated from AC mains. 6/9 1/2v output.

Selector switch and on/off switch. 100mA. Case size 4 x 2 1/2 x 2in. complete with mains lead, connecting leads and instructions 55/6. P. & P. 3/6

SINCLAIR IC-10 INTEGRATED CIRCUIT



10 watt Amplifier. Size only 1 x 0.4 x 0.2in. A true hi-fi amplifier complete with manual giving details of a wide range of applications and instructions. Guaranteed 5 years. ONLY 59/6. P. & P. 1/6.

SPECIAL TRANSFORMER FOR OPERATING SINCLAIR IC-10 from A.C. mains 120/250v. Output 13v. at 0.5 amp. 16/6 P. & P. 2/6.

HI-TONE RECORDING TAPE

BRITISH MADE. TOP QUALITY			
J1001 3"	Long Play PVC	225ft.	5/6 P. & P. 1/2.
J1002 3"	Triple Play Poly	600ft.	10/6 P. & P. 1/2.
J1003 5"	Long Play PVC	900ft.	10/- P. & P. 1/8.
J1004 5"	Double Play Poly	1200ft.	15/- P. & P. 1/8.
J1005 5 1/2"	Long Play PVC	1200ft.	12/6 P. & P. 2/-.
J1006 5 1/2"	Double Play Poly	1800ft.	22/6 P. & P. 2/-.
J1007 7"	Standard Play PVC	1200ft.	12/6 P. & P. 2/6.
J1008 7"	Long Play PVC	1800ft.	17/6 P. & P. 2/6.
J1009 7"	Double Play Poly	2400ft.	24/6 P. & P. 2/6.
J1010 7"	Triple Play Poly	3600ft.	50/- P. & P. 2/6.



Visit our Brand New enlarged Hi-Fi Demonstration Room, Tape, Record Bar and Scientific Show of Microscopes, Binoculars, Telescopes and Watches at 18/19 Tottenham Court Road

TRANSFORMERS

AUTO WOUND TRANSFORMERS

All Winding Voltage Ratings and Tapping 0-115-200-220-240v except MT113-0-115-210-240v.

MT113	20V	Size 2 1/2 x 1 1/2 x 1 1/2in.	Wgt 11oz	Price 12/6	P & P 2/6
MT164	75V	Size 2 1/2 x 2 x 2 1/2in.	Wgt 11b 14oz	Price 21/9	P & P 4/6
MT4	150V	Size 3 1/2 x 2 1/2 x 3in.	Wgt 31b	Price 33/-	P & P 6/6
MT65	200V	Size 3 1/2 x 4 1/2 x 4in.	Wgt 41b	Price 39/6	P & P 6/6
MT66	300V	Size 4 x 4 x 3 1/2in.	Wgt 61b 7oz	Price 59/4	P & P 9/-
MT110	400V	Size 4 1/2 x 4 1/2 x 4in.	Wgt 111b	Price 85/-	P & P 10/-
MT67	500V	Size 5 1/2 x 4 x 4 1/2in.	Wgt 121b 8oz	Price 89/-	P & P 10/6
MT83	750V	Size 4 1/2 x 5 1/2 x 5 1/2in.	Wgt 131b 4oz	Price 95/7	P & P 10/6
MT84	1000V	Size 4 1/2 x 5 1/2 x 5 1/2in.	Wgt 161b	Price 142/2	Carr. ex.
MT93	1500V	Size 5 1/2 x 5 1/2 x 6 1/2in.	Wgt 281b 9oz	Price 170/6	Carr. ex.
MT94	1750V	Size 6 1/2 x 6 1/2 x 6 1/2in.	Wgt 311b	Price 195/-	Carr. ex.
MT95	2000V	Size 7 1/2 x 5 1/2 x 8 1/2in.	Wgt 401b	Price 211/2	Carr. ex.
MT73	3000V	Size 6 1/2 x 7 1/2 x 8 1/2in.	Wgt 451b 8oz	Price 300/-	Carr. ex.

LOW VOLTAGE 12 VOLT RANGE

Primary 200-250v—Secondary 12v

MT111	0.5 Amp	Size 3 x 2 1/2 x 1 1/2in.	Wgt 12oz	Price 15/3	P & P 2/6
MT71	2 Amp	Size 2 1/2 x 2 1/2 x 2 1/2in.	Wgt 11b	Price 19/-	P & P 3/9
MT69	4 Amp	Size 3 1/2 x 2 1/2 x 2 1/2in.	Wgt 21b 4oz	Price 28/-	P & P 6/6
MT70	6 Amp	Size 4 x 3 x 3 1/2in.	Wgt 31b 12oz	Price 39/-	P & P 6/6
MT12	10 Amp	Size 4 1/2 x 4 x 4in.	Wgt 61b 3oz	Price 51/-	P & P 9/6
MT15	20 Amp	Size 4 1/2 x 4 1/2 x 4in.	Wgt 111b 3oz	Price 95/-	P & P 9/6
MT187	30 Amp	Size 5 1/2 x 4 1/2 x 4 1/2in.	Wgt 161b 12oz	Price 180/-	P & P 13/6

LOW VOLTAGE 24 VOLT RANGE

Primary 200/250v. Secondary 24v

MT58	1 Amp	Size 3 1/2 x 2 1/2 x 2 1/2in.	Wgt 11b 7oz	Price 23/9	P & P 4/6
MT114	3 Amp	Size 2 1/2 x 2 1/2 x 3in.	Wgt 31b 6oz	Price 38/-	P & P 6/6
MT72	5 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 51b 12oz	Price 53/10	P & P 6/6
MT17	8 Amp	Size 4 1/2 x 3 1/2 x 4in.	Wgt 71b 8oz	Price 72/7	P & P 9/6
MT115	10 Amp	Size 4 1/2 x 4 1/2 x 4in.	Wgt 111b 13oz	Price 95/-	P & P 11/6

LOW VOLTAGE 30 VOLT RANGE

Primary 200/250v—Secondary Tapped 12-15-20-30-40

MT112	0.5 Amp	Size 3 1/2 x 2 1/2 x 1 1/2in.	Wgt 11b 4oz	Price 17/4	P & P 3/9
MT79	3 Amp	Size 2 1/2 x 2 1/2 x 2 1/2in.	Wgt 21b	Price 23/-	P & P 6/6
MT20	3 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 41b 6oz	Price 46/2	P & P 6/6
MT51	5 Amp	Size 4 1/2 x 3 1/2 x 4in.	Wgt 61b 8oz	Price 60/9	P & P 9/6
MT88	8 Amp	Size 5 1/2 x 3 1/2 x 4in.	Wgt 91b 6oz	Price 92/4	P & P 11/6
MT89	10 Amp	Size 5 1/2 x 4 x 4 1/2in.	Wgt 121b 2oz	Price 103/6	P & P 11/6

LOW VOLTAGE 50 VOLT RANGE

Primary 200-250v—SECONDARY TAPPED 19-25-33-40-50v

MT102	0.5 Amp	Size 2 1/2 x 2 1/2 x 2 1/2in.	Wgt 11b 11oz	Price 21/3	P & P 6/6
MT104	2 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 51b	Price 45/8	P & P 6/6
MT106	4 Amp	Size 4 1/2 x 4 x 4in.	Wgt 91b 4oz	Price 77/-	P & P 9/6
MT118	8 Amp	Size 5 1/2 x 5 1/2 x 4 1/2in.	Wgt 181b 9oz	Price 132/-	P & P 13/6
MT119	10 Amp	Size 6 1/2 x 4 1/2 x 6 1/2in.	Wgt 191b 12oz	Price 165/-	P & P 15/6

LOW VOLTAGE 60 VOLT RANGE

Primary 200/250v. Secondary 24-30-40-48-60

MT124	0.5 Amp	Size 3 1/2 x 2 1/2 x 2 1/2in.	Wgt 21b 4oz	Price 24/-	P & P 6/6
MT127	2 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 51b 6oz	Price 52/10	P & P 6/6
MT123	4 Amp	Size 4 1/2 x 3 1/2 x 4 1/2in.	Wgt 101b 6oz	Price 99/-	P & P 11/6
MT122	10 Amp	Size 6 1/2 x 5 x 6 1/2in.	Wgt 231b 2oz	Price 152/-	Carr. ex.

MAINS H.T. RANGE

Model	Voltage	Rating	Size	Price	P & P
MT1A	250-0-250v	80MA 6-3v 3-5A 5/6-3v 1A	3 1/2 x 3 x 3 1/2	33/-	6/6
MT6A	250-0-250v	100MA 6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	38/3	6/6
MT110	250-0-250v	120MA 6-3v 3-5A 5/6-3v 1A	4 x 4 x 3 1/2	44/9	6/6
MT11A	300-0-300v	100MA 6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	37/9	6/6
MT12A	300-0-300v	120MA 6-3v 4A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	46/2	9/6
MT33A	300-0-300v	150MA 6-3v 4A 5/6-3v 1A	4 x 5 x 3 1/2	59/4	9/6
MT2A	350-0-350v	80MA 6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	38/6	6/6
MT7	350-0-350v	100MA 6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	42/4	6/6
MT8	350-0-350v	120MA 6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 1/2	50/-	6/6

BATTERY CHARGER TYPES

Primary Voltage 200-250v. Secondary 6-12v. (Rectifier not included)

MT45	1.5 Amp	Size 2 1/2 x 2 1/2 x 2 1/2in.	Wgt 11b 9oz	Price 21/9	P & P 4/6
MT46	2 Amp	Size 3 1/2 x 2 1/2 x 2 1/2in.	Wgt 21b 4oz	Price 25/4	P & P 6/6
MT47	3 Amp	Size 4 x 3 x 3 1/2in.	Wgt 31b 8oz	Price 28/4	P & P 6/6
MT5	4 Amp	Size 4 x 2 1/2 x 3 1/2in.	Wgt 31b 11oz	Price 33/-	P & P 6/6
MT78	5 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 51b 4oz	Price 42/-	P & P 6/6
MT86	6 Amp	Size 4 x 3 1/2 x 3 1/2in.	Wgt 51b 12oz	Price 48/-	P & P 6/6
MT48	7 Amp	Size 4 x 4 x 3 1/2in.	Wgt 61b	Price 56/7	P & P 9/6
MT146	8 Amp	Size 3 1/2 x 4 x 4in.	Wgt 61b 4oz	Price 75/-	P & P 9/6
MT49	9 Amp	Size 4 1/2 x 3 1/2 x 4in.	Wgt 71b 8oz	Price 99/-	P & P 9/6
MT147	10 Amp	Size 4 1/2 x 4 x 4in.	Wgt 91b 3oz	Price 108/-	P & P 9/6
MT50	12.5 Amp	Size 5 1/2 x 4 1/2 x 4 1/2in.	Wgt 111b 14oz	Price 125/-	P & P 11/6

Amperages are D.C. when used with nominal selenium bridge rectifiers.

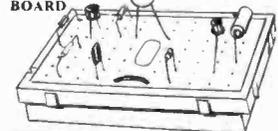
MAINS ISOLATING RANGE ALSO AVAILABLE

TTC.C1001 MULTITESTER

leather case. Overload protection. 20,000 opv. AC volts 10, 50, 250 1,000v. DC volts 5-25, 125, 500, 2500v. D.C. Current 0-2.5mA. 0-250mA. Resistance 0-60K, 0-6 Meg-ohm. Decibels -20 to +22dB. Size of meter 4 1/2 x 3 1/2 x 1in. 85/- P. & P. 3/6.

SHIRA 62D MULTITESTER 20,000 op.v. DC voltage: 5-25-50-250-500-2.5K (20,000 ohms per volt). AC Voltage: 10-50-100-500-1000 volts (10,000 ohms per volt). DC Current: 0-50 mA. 0-2.5 mA. 0-250 mA. Resistance: 0-6K, 0-6Mg (300 ohm and 30K at centre scale.) Capacitance: 10f. to .001 mfd, 0.01 µf to 1µf. Decibels: -20 to +22dB Size 4 1/2 x 3 1/2 x 1in. 71/- P. & P. 3/6

S-DeC BREAD BOARD



British Made Solderless breadboard panels, for fast reliable component connections. Single DeCs. One S-DeC with Control Panel, Jig and Accessories for solderless connections. Controls etc. with booklet "Projects on S-DeC" giving construction details for a variety of circuits. 29/6. P. & P. 2/6. 4-DeC KIT, Four S-DeCs with two Control Panels, Jigs and Accessories and the booklet "Projects on S-DeC" all contained in a strong attractive plastic case. Ideal for the professional user. 85/17.6 P. & P. 1/6

GARRARD DECKS



1025 less Cart	£6. 9/6
1025 with Sonotone 9TAHC Stereo/Mono Cart	£8. 9/6
3000 with Sonotone 9TAHC Stereo/Mono Cart	£9. 19/6
3000 with Sonotone 9TAHCD Stereo/Mono Cart	£10. 19/6
SP25 Mk II	£11. 19/6
SP25 Mk II with Sonotone 9TAHC Stereo/Mono Cart	£13. 19/6
SL65B less Cart	£15. 19/6
Bases for above	£2. 19/6
AP75 less Cart	£18. 10/0
SL75B less Cart	£27. 6/0
Bases for above	£4. 19/6

CARTRIDGE BARGAIN! Sonotone 9TAHCD Stereo/Mono Cartridge. Recommended price 4 gns. Our Price 55/- P. & P. 2/6

SPECIAL OFFER! SP25 Mk II with base and Sonotone 9TAHCD Stereo/Mono Cartridge £15. 10/0. P. & P. 15/-

P. & P. Decks 12/6 Bases 4/6 P. & P. Deck & Base 15/-

MINIATURE SOLDERING IRON



British made and designed for use with transistor circuitry but ideal for many other uses. AC 240v. 18 watt. Length 7 1/2in. 1/2 slide on bit. Price 32/6 P. & P. 2/-



LIND-AIR OPTRONICS LTD

18/19, 25 & 53 TOTTENHAM CT. ROAD, LONDON W.1

Telephone: 01-580 2255/4532/7679

Shops open 9-6 pm. Monday to Saturday. Thursday until 7 pm.

ALL MAIL ORDERS To Dept. PW370, 54a Tottenham Court Road, London, W1.

Complete stereo system – £29-10

The new Duo general-purpose 2-way speaker system is beautifully finished in polished teak veneer, with matching vynair grille. It is ideal for wall or shelf mounting either upright or horizontally.

Type 1 SPECIFICATION:-

Impedance 10 ohms. It incorporates Goodmans high flux 6" x 4" speaker and 2½" tweeter. Teak finish 12" x 6½" x 5½". 4 guineas each. 7/6d. p. & p.
Type 2 as type 1. Size 17½" x 10½" x 6½". Incorporating 10½" x 6½" bass unit and 2½" tweeter. 3 ohms impedance 5½ guineas plus 7/6 p. & p.

Garrard Changers from £7.19.6d. p. & p. 7/6d.
 Cover and Teak finish Plinth £4.15.0d. 7/6d. p. & p.

The items illustrated can be purchased together for £29-10.

The Duetto is a good quality amplifier, attractively styled and finished. It gives superb reproduction previously associated with amplifiers costing far more.

SPECIFICATION:-

R.M.S. power output: 3 watts per channel into 10 ohms speakers.
INPUT SENSITIVITY: Suitable for medium or high output crystal cartridges and tuners. Cross-talk better than 30dB at 1Kc/s.
CONTROLS: 4-position selector switch (2 pos. mono and 2 pos. stereo) dual ganged volume control.
STONE CONTROL: Treble lift and cut. Separate on/off switch. A preset balance control.

Duetto

Integrated Transistor Stereo Amplifier

£9-10
 plus 7/6d.
 p. & p.



The above 5 items can be purchased together for £29.10 + £1.10.0 p. & p.

The Classic

£9 plus 7/6 p. & p.

Controls: Selector switch Tape speed equalisation switch (3½ and 7½ i.p.s.). Volume. Treble. Bass. 2 position scratch filter and 2 position rumble filter.

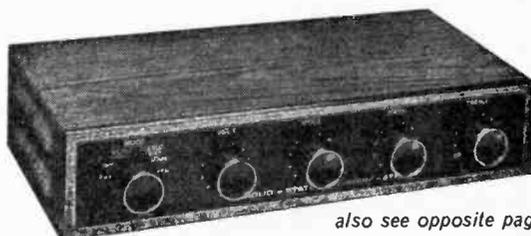
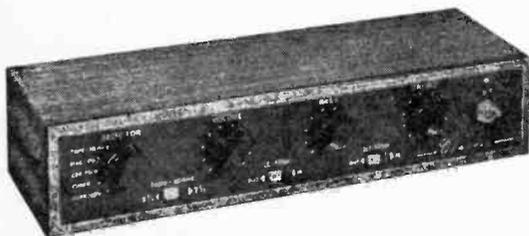
Specification: Sensitivities for 10 watt output at 1KHz into 3 ohms. *Tape head:* 3mV (at 3½ i.p.s.). *Mag. P.U.:* 2mV. *Cer. P.U.:* 80 mV. *Tuner:* 100mV. *Aux.:* 100mV. *Tape/Rec. output:* Equalisation for each input is correct to within ±2dB (R.I.A.A.) from 20Hz to 20KHz. *Tone control range:* Bass ±13dB at 60Hz. Treble ±14dB at 15KHz. *Total distortion:* (for 10 watt output) <1-5%. *Signal noise:* <-60dB. A.C. mains 200-250v. Built and tested. Size 12½in. long, 4½in. deep, 2½in. high. Teak finished case.

The Viscount

£14.5 plus 7/6 p. & p.

Integrated High Fidelity Transistor Stereo Amplifier. Specification—Output: 10 watts per channel into 3 to 4 ohms speakers (20 watts monaural). Input: 6 position rotary selector switch (3 pos. mono and 3 pos. stereo). P.U., Tuner, Tape and Tape Rec. out. Sensitivities: All inputs 100mV into 1-8M ohm. Frequency Response: 40Hz-20KHz ±2dB. Tone Controls: Separate bass and treble controls; treble, 13dB lift and cut (at 15KHz); Bass, 15dB lift and 25dB cut (at 60Hz). Volume Controls: Separate for each channel. A.C. Mains Input: 200-240V. 50-60Hz. Size, 12½" x 6" x 2½" in teak finished case. Built and tested.

VISCOUNT MARK II for use with magnetic pick-ups specification as above. Fully equalised for magnetic pick-ups. Suitable for cartridges with minimum output of 4mV/cm/sec. at 1kc. Input Impedance 47k. £15.15 plus 7/6 p. & p.



also see opposite page



SPECIAL OFFER!

Complete stereo system comprising BALFOUR 4-speed autoplayer with stereo head, 2 Duo speaker systems, size 12in. x 6½in. x 5½in. Plinth (less cover) and the DUETTO stereo amplifier. All above items

£20 plus 20/- p. & p.

NEW COMPLETE HI-FI STEREO SYSTEM - £39

comprising SP 25 Garrard Mk II with diamond cartridge, Viscount Mk I amplifier, two type 2 speakers, plinth and cover

£39 plus £2 p. & p.



The ELEGANT SEVEN Mk. III (350mW Output)

7 transistor fully tunable M.W.-L.W. superhet portable. Set of parts. Complete with all components, including ready etched and drilled printed circuit board—back printed for foolproof construction.

MAINS POWER PACK KIT: 9/6 extra.

Price £4.9.6 plus 7/6 P. & P.

Circuit 2/6
FREE WITH PARTS.

The DORSET (800mW Output)

7-transistor fully tunable M.W.-L.W. superhet portable—with baby alarm facility. Set of parts. The latest modernised and pre-alignment techniques makes this simple to build. Sizes: 12 x 8 x 3in.

Price £5.5.0 plus 7/6 P. & P.

MAINS POWER PACK KIT: 9/6 extra



Circuit 2/6
FREE WITH PARTS.



EXTRACTOR FAN

A.C. mains 230/250v. complete with pull switch. Size: 6 x 6 x 4in.

Price 27/6 plus 7/6 P. & P.

X101 10W SOLID-STATE HI-FI AMP WITH INTEGRAL PRE-AMP

Specifications: Power Output (into 3 ohms speaker) 10 watts. Sensitivity (for rated output): 1mV into 3K ohms (0.33 microamp).

Total Distortion at 1KHz at 5 watts, 0.35%, at rated output 1.5%.

Frequency Response: Minus 3dB points 20Hz and 40KHz.

Speaker: 3-4 ohms (3-15 ohms may be used).

Supply voltage: 24V. DC. at 800mA (6-24V. may be used).

Price 69/6 plus 2/6 P. & P.

Control assembly: including resistors and capacitors. 1. Volume: PRICE 5/-. 2. Treble: PRICE 5/-. 3. Comprehensive bass and treble: PRICE 10/-. The above 3 items can be purchased for use with the X101.

Power Supplies for the X101:
P101 M (for mono) 35/- plus 4/6 p. & p.
P101 S (for stereo) 42/6 plus 4/6 p. & p.



CAR TRANSISTOR IGNITION SYSTEM

by famous manufacturer

For 6 volt or 12 volt positive earth systems. Comprising: special high voltage working hermetically sealed silicon transistor mounted in finned heat-sink, high output ignition coil, ballast resistor and hardware (screws, s. washers, etc.).

Price £4.19.6 plus 5/- P. & P.

50 WATT AMPLIFIER

A.C. Mains 200-250V



Price £28.10

plus 20/- p. & p.

An extremely reliable general purpose valve amplifier. Its rugged construction yet space age styling and design makes it by far the best value for money. TECHNICAL SPECIFICATIONS 3 electronically mixed channels, with 2 inputs per channel, enables the use of 6 separate instruments at the same time. The volume controls for each channel are located directly above the corresponding input sockets. SENSITIVITIES AND INPUT IMPEDANCES. Channels 1 & 2 4mV at 470K. These 2 channels (4 inputs) are suitable for microphone or guitars. Channels 3 & 4 300mV at 1m. Suitable for most high output instruments (gram, tuner, organ, etc.). Input sensitivity relative to 10w output. TONE CONTROLS ARE COMMON TO ALL INPUTS. Bass Boost +12dB at 60Hz. Bass Cut -13dB at 60 Hz. Treble Boost +11dB at 15 KHz. Treble Cut -12dB at 15 KHz. With bass and treble controls central -3dB points are 30 Hz and 20 KHz. POWER OUTPUT: For speech and music 50 watts rms. 100 watts peak. For sustained music 45 watts rms. 90 watts peak. For sine wave 38.5 watts rms. Nearly 80 watts peak. Total distortion at rated output 3.2% at 1KHz. Total distortion at 20 watts 0.15% at 1KHz. Output to match into 8 or 15 ohms speaker system. NEGATIVE FEEDBACK 20dB at 1KHz. SIGNAL TO NOISE RATIO 60dB. MAINS VOLTAGES adjustable from 200-250V. A.C. 50-60 Hz. A protective fuse is located at the rear of unit. Output impedance 3, 8 and 15 ohms.

B.S.R. TD-2 TAPE DECK

Takes 5 1/2 in. spools, fitted with B.S.R. 1/2 Track Heads. Size 13 1/2 in. long by 8 1/2 in. wide.

Price £8.19.6 plus 7/6 P. & P.

The RELIANT

SOLID STATE
GENERAL
PURPOSE
AMPLIFIER



SPECIFICATIONS

Output—10 watts

Inputs—1. -xial mic 10mV Tone Controls—

2. -gram/radio 250mV

Output Impedance—3 to 4 ohms

Treble control range ±12dB at 10 KHz.

Bass control range ±13dB at 100Hz

Frequency Response—(with tone controls central) Minus 3dB points at 20Hz and 40KHz. Signal to Noise Ratio—better than -60dB. Transistors—4 silicon Planar type and 3 Germanium type. Mains input—220/250V. A.C. Size of chassis—10 1/2" x 4 1/2" x 2 1/2". For use with Sid. or L.P. records, musical instruments, all makes of pick-ups and mikes. Separate bass and treble lift control. Two inputs with control from gram. and mike. Built and tested.

RELIANT Mk. I

As above less teak case

£5.15 plus 7/6 P. & P.

RELIANT Mk. II

In teak finished case.

£6.16 plus 7/6 P. & P.

RECORD PLAYER SNIP

A.C. Mains 240V

The "Princess", 4-speed automatic record changer and player engineered with the utmost precision for beauty, long life, and trouble free service. Will take up to ten records which may be mixed 7" to 10" or 12". Patent stylus brush cleans stylus after each playing and at shut off, the pick-up locks itself into its recess, a most useful feature with portable equipment—other features include pick-up height adjustment and stylus pressure adjustment. This truly is a fine instrument which you can purchase this month only £5.19.6 complete with cartridge and ready to play. Post and ins. 7/6 extra.

ONLY £5.19.6 plus 7/6 P. & P.



POCKET MULTI-METER



Size 3 1/2 x 2 1/4 x 1 1/2 in. Meter size 2 1/2 x 1 1/2 in. Sensitivity 1,000 O.P.V. on both A.C. and D.C. volts 0-5, 0-150, 0-1,000 D.C. current 0-150mA Resistance 0-100KΩ Complete with test prods, battery and full instructions.

42/6 plus 3/6 P. & P.

FREE GIFT for limited period only. 30 watt Electric Soldering Iron value 15/- to every purchaser of the Pocket Multi-Meter

STEREO PRE-AMPLIFIER

Inputs—6 position rotary switch (3 position mono, 3 position stereo). Tuner 150mV into 680K. Magnetic pick-up fully equalised and suitable for magnetic cartridges with minimising output of 4mV/cm/sec. Load 47K. Ceramic pickup 150mV into 680K. Sensitivities taken for 200mV output. Controls—separate volume controls for each channel. Twin ganged bass, 12dB lift and 15dB cut at 60c/s. Twin ganged treble, 10dB lift and 15dB cut at 10Kc/s. Voltage required 23-30V DC at 5mA. Size 1 1/2 x 3 1/4 x 2 1/2 in. In teak finished case, complete with front panel and knobs, Built and tested.

£7.7.0 plus 5/- P. & P.

THREE-IN-ONE HI-FI 10 WATT SPEAKER

A complete Loud Speaker system on one frame, combining three matched ceramic magnet speakers with a low loss crossover network. Peak handling power 10 watts. Impedance 15 ohms. Flux density 11,000 gauss. Resonance 40-60 c/s. Frequency range 50c/s to 20Kc/s. Size 1 1/2 x 8 1/2 x 4 1/2 in. By famous manufacturer.

List price £7 OUR PRICE 74/6 plus 5/- P. & P.

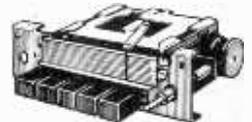
Similar speaker to the above without tweeters in 3 and 15 ohms 44/6 plus 5/- p. & p.

PYE CAR RADIO

Push Button Tuning Heart

This PRESTOLOCK 5 station Push-Button Tuner Heart with Manual Over-ride is an ideal basis for a quality AM car radio. Size 6 3/4" x 4" x 2".

As illustrated but without knobs.
25/- plus 3/- P. & P.



QUALITY MAINS TRANSFORMER

Input 250 volts. OUTPUT (All RMS values) 4 windings of 11.5 volts connected in series total 46 volts at 4.5 amps (conservatively rated). The following combinations may be used. 1. 23-0-23 volts. 2. 46 volts. Both of these above voltages are commonly used in medium to high powered transistor amplifiers, power supplies, etc.

Price 35/- plus 7/6 P. & P.



TERMS C.W.O.
All enquiries S.A.E.

Goods not despatched outside UK

RADIO & T.V. COMPONENTS (ACTON) LTD

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

Also at 323 Edgware Road, London W.2.

ALL ORDERS BY POST TO OUR ACTON ADDRESS

RADIO & TV COMPONENTS
R TV
(ACTON) LIMITED

HENRY'S RADIO LTD.

ELECTRONIC COMPONENTS AND EQUIPMENT
303 EDGWARE ROAD, LONDON W.2. 01 723 100R.9
Open Monday to Saturday 9am to 6pm (Thurs 1pm)
Open all day Saturday.



*EXPERIMENTORS MODULE

Brand new STC time delay electronic units. Relay output. Adjustable 3-15 secs. 9-12 volt operated. Supplied complete with uses and circuits STC Module Price 35/- or 3 for 90/-.



*MULTIMETER

Return of a popular model. 2000ohms/V 0/10/50/500/1000V a.c./d.c. 0/50μA. 0/10/250mA d.c. 0/10/100kΩ/1MΩ resistance. dB and capacitance scales. Size 5 x 3 1/2" Robust and easy to use. Complete with leads, batteries and instructions THL33a. Price 82/6 p.p. 2/6. Leather case—Price 22/6.



*GRID DIP METER

All transistor grid dip meter, absorption and osc. detector. Frequency range 440 kc/s to 280Mc/s in 6 coils. Uses transistor plus diode with 500μA meter. Internal battery. TE 15 Price £11.10.0 p.p. 3/6.



*MULTI-METER 20KΩ/V



Popular model but with extra scale range 20,000 ohms per volt. 0/5/25/50/250/500/2500V d.c. 0/10/50/100/500/1000V a.c. 0/50μA, 0/2 1/2/250mA. Resistance 0-6KΩ and 6MΩ Also dB scales and capacitance. 200H, Price 77/6 p.p. 2/- Leather case, Price 15/-.

FREE 16 PAGE BROCHURE COVERING LOW COST TEST EQUIPMENT FULLY DETAILED AND ILLUSTRATED. OVER 50 UNITS DETAILED ASK FOR PUBLICATION 'T' - REMEMBER IT'S FREE!

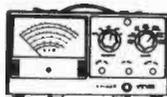
*SINE/SQUARE WAVE AUDIO GENERATOR

Provides audio output on 4 bands. Sine wave 20c/s to 200kc/s, output up to 7V; square wave 60c/s to 30kc/s, 7V p-p. Distortion under 2%. Output impedance 1kΩ. Variable output amplitude control. Supplied with leads and instructions. A.C. mains operated. TE22, Price £16.10.0. Carriage, etc., 10/-.



*LOW COST VACUUM TUBE VALVE VOLTMETER

New Model Multi-Range and easy to use. DC and A.C. Volts 0/1 1/2/5/15/50/100/500/1500. AC p-p 0/4/2/14/42/140/420/1400/4200. Resistance 0.2 ohm to 1000 Megohm—7 ranges. dBm scales—20 to +25 dBm. Input impedance: DC 11 Meg. AC ±5 Meg. Response: ±1dB 20c/s to 5 Mc/s. Complete with probe and handbook. Size 10 1/2" x 5 1/2" x 4 1/2". VT650 Price £16.10.0 p.p. 7/6.



*FIELD STRENGTH METERS



5-ranges 1-250 Mc/s. Fitted 200μA meter. Earphone output. Calibrated tuning scales. FL30HA Price 72/6 p.p. 2/- Also non calibrated type peaking F/S Meter FSI Price 45/- p.p. 2/6

*TRANSISTOR CHECKER

Complete capacity for checking all transistors npn and pnp for alpha, beta and leakage. Also diodes complete with leads and instructions. ZQM-2, Price £5.19.6 p.p. 3/6.



BUILD YOURSELF A QUALITY RADIO



New printed circuit design with full power output. Fully tuneable on both mw/lw. bands. 7 Mullard transistors. Fitted 5" speaker. Room Filling Power. Easy to build with terrific results. Two colour leathercloth cabinet with silvered front. All local and continental stations. Complete detailed instructions. TOTAL COST £6.19.6 p.p. 4/6. Ask for Leaflet No. 1.

*SCOOP! STAAR RECORD PLAYER

Deck plays 33, 45, 78, R.P.M. records. 9 volt operated, with mono cartridge. BRAND NEW... as illustrated.



Price 59/6 p.p. 3/6. Send for leaflet No. 2

MULLARD 1 WATT AMPLIFIER Portable Transistor Unit—ideal for Intercoms, Baby Alarms, Telephone, Record Players or Guitar Practice. 9 Volt 5 transistors with volume control, output 3 ohms. Ideal for use with STAAR RECORD DECK. Price 45/-, p.p. 2/6.

*SIGNAL INJECTOR AND TRACER

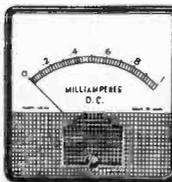
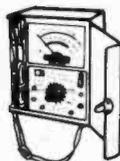


New model for checking all audio and RF up to VHF. Simple to use. Battery operated. Output approx. 1kc/s, 1.4V pp. Harmonics up to VHF. SE250B Price 35/- p.p. 1/6. * Matching Signal Tracer. SE500 Price 27/6 p.p. 1/-.

ALL PARTS IN STOCK TO BUILD THE INTEGRATED CIRCUIT DESIGN'S APPEARING IN PRACTICAL WIRELESS AND ELECTRONICS ASK FOR QUOTATIONS—SEE LATEST CATALOGUE EDITIONS.

*50,000 OHMS PER VOLT MULTIMETER

Recommended quality instrument with mirror scale and overload protection. 0/0.3/1/2/6/12/30/60/120/600V d.c. 50kΩ/V; 0/6/30/120/300/600/1200V a.c. 10kΩ/V; 0/30μA 6/60/300mA, 0/12A; resistance 0/10kΩ/1/10/100MΩ. Meter movement 20μA, Polarly reversing switch. Complete with batteries, leads and instructions. AF105, Price £8.10.0 p.p. 2/6. Leather case 28/6.



*QUALITY PANEL METERS (D.C. RANGES)

38 Series. Face size 42 x 42mm (1 1/2" x 1 1/2"). 20μA, 37/6; 10μA, 35/- 200μA, 32/6; 500μA, 27/6; 1mA, 5mA, 10mA, 50mA, 100mA, 500mA, 25/- each; 10V, 20V, 50V, 100V, 300V, and 500V, 25/- each; 1A and 5A, 25/- each. "S" meter, 1mA, 29/6; VU meter, 37/6. 65 Series. Face size 86 x 78mm (3 1/4" x 3 1/4"). 50μA, 62/6; 100μA, 52/6; 200μA, 47/6; 500μA, 45/-; 1mA, 5mA, 10mA, 500mA, 37/6 each. "S" meter, 1mA, 42/6. Other ranges and sizes in stock. Leaflet No. 33.

*10 in 1 TEST UNIT

A NEW DESIGN TESTS MOST CIRCUITS Model SE400 Price £9.10.0



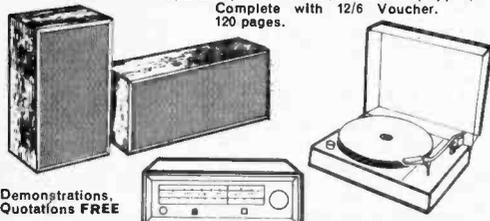
*AC/DC Volts (4K/Volt) 0/15/50/150/500. *Resistance 0/10K/100K/1 Meg. *Five values resistance and capacitance substitution. *RF F/S Meter 1 to 140 Mc/s *DC Ammeter 0/500mA. *455/700kc/s RF Generator *400c/s Audio Generator. Size 7 1/2" x 3 1/2" x 3 1/2"

COMPONENTS UK'S LARGEST STOCKISTS ASK FOR QUOTES—SEE LATEST CATALOGUE

HENRY'S FAMOUS CATALOGUES—SEE BACK COVER FOR DETAILS

HI-FI equipment to suit EVERY POCKET

HI FI AUDIO EQUIPMENT CATALOGUE 5/- pp. 1/- Complete with 12/6 Voucher. 120 pages.

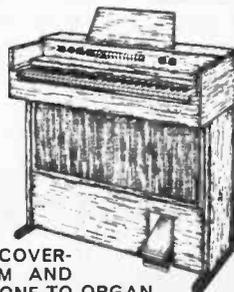


Demonstrations. Quotations FREE

VISIT OUR HI-FI CENTRE AT 309 EDGWARE ROAD. for all leading makes of AMPLIFIERS, TUNERS, DECKS, SPEAKERS, MICROPHONES, TEST EQUIPMENT. ALL WITH DISCOUNTS—IT WILL PAY YOU TO PAY US A VISIT. AUDIO SYSTEMS £40-£300 TO SUIT. SEND FOR BROCHURE 16/17.

ELECTRONIC ORGANS

- *MODERN ALL BRITISH TRANSISTORISED DESIGNS AVAILABLE AS KITS OR READY BUILT.
- *TEAK VENEERED CABINETS FOR ALL MODELS.
- *49 NOTE, 61 NOTE SINGLE MANUAL DESIGNS ALSO TWO MANUAL 49 NOTE.
- *KITS AVAILABLE IN SECTIONS AS REQUIRED.
- *HP and CREDIT SALE FACILITIES. WHEN IN LONDON CALL IN AND TRY FOR YOURSELF.



FREE 16 PAGE ORGAN BROCHURE COVERING ORGANS IN KIT FORM AND READY BUILT—WRITE OR PHONE TO ORGAN DEPT. ASK FOR PETER ELVINS.

BRAND NEW FULLY GUARANTEED TRANSISTORS & DEVICES

1N4001	2/-	2N4291	10/-	B3M	15/6	CR51/30	8/-	OA9	3/-
1N4002	2/3	2N4292	12/-	BA110	5/-	CR51/35	8/6	OA10	4/-
1N4003	2/6	40367	12/-	BY51	2/-	CR51/40	9/6	OA17	2/-
1N4004	3/-	40362	13/6	BC107	2/-	CR51/45	6/-	OA70	2/-
1N4005	3/6	25001	18/-	BC108	2/9	CR51/50	6/-	OA71	2/-
1N4006	4/-	25002	18/-	BC109	3/-	CR51/55	6/-	OA73	2/-
1N4007	4/-	25003	9/6	BC113	3/-	CR51/60	6/-	OA74	2/-
1N4009	1/6	25004	9/6	BC116	8/-	CR51/65	6/-	OA79	2/-
1N4148	1/9	25005	15/-	BC118	7/6	CR5400/40	10/6	OA81	2/-
1N4785	10/-	25017	25/-	BC134	7/6	CR5025AF	4/-	OA85	2/-
2G210	12/6	25012A	22/6	BC135	4/-	CR52/25	15/-	OA86	4/-
2G240	49/6	25013	20/-	BC136	7/-	D006	3/9	OA90	2/-
2G301	4/-	25015	25/-	BC137	8/-	DD058	4/-	OA91	1/6
2G302	4/6	25017	15/-	BC138	8/-	DD190	12/6	OA95	1/6
2G303	5/-	25018	17/6	BCY30	5/6	DD242	7/6	OA200	1/9
2G306	5/6	25020	50/-	BCY31	2/6	DD262A	3/9	OA202	12/-
2G308	7/6	25024	50/-	BCY32	10/-	DK110	1/6	OA210	6/-
2G309	6/-	25025	60/-	BCY33	5/-	DT3200	7/6	OA211	9/6
2G319A	4/-	25026	100/-	BCY34	4/-	FT212	3/6	OA2200	11/-
2G371	4/6	25034	12/6	BCY38	7/-	FST1/1	3/6	OA2201	10/-
2G374	5/6	25036	25/-	BCY39	8/6	FST2/0	3/6	OA2202	8/6
2G381	5/-	25102	18/-	BCY40	4/-	FST2/1	3/6	OA2203	8/6
2G382	6/-	25103	12/6	BCY42	5/-	FST3/0	3/6	OA2204	8/6
2G378A	4/6	25104	12/6	BCY43	5/-	FST3/1	4/-	OA2205	8/6
2G383	5/-	25111	10/-	BCY44	5/-	FST3/2	4/-	OA2206	8/6
2G304	4/6	25301	6/-	BCZ11	7/6	FST3/05 AF	3/6	OA2207	8/6
2G305	5/-	25302	7/6	BC147	3/9	GET102	4/6	OA2208	6/6
2N404	4/6	25303	10/-	BC148	2/6	GET103	4/6	OA2209	6/6
2N456	15/-	25304	12/6	BC149	4/-	GET105	8/6	OA2210	6/6
2N458	20/-	25305	15/-	BF152	6/-	GET106	10/6	OA2211	6/6
2N503	5/6	25310	12/6	BF152	6/6	GET110	12/6	OA2212	6/6
2N509	12/6	25311	2/-	BF154	8/6	GET113	3/6	OA2213	6/6
2N601	3/6	25322	7/6	BF194	3/6	GET114	4/-	OA2217	9/6
2N696	4/6	25323	6/6	BF195	3/6	GET115	9/6	OA2223	9/6
2N697	5/-	25324	12/6	BTY79/100R	15/-	GET116	10/6	OA2229	9/6
2N698	8/6	25501	8/6	BT102/500R	15/-	GET120	5/-	OA2231	9/6
2N706	1/6	25502	8/6	BD119	12/6	GET872	6/-	OA2238	9/6
2N708A	2/6	25503	9/6	HD124	12/6	GET876	6/-	OA2240	9/6
2N707	12/6	25512	9/6	5D780	5/-	GET882	6/-	OA2233	7/6
2N708	7/6	25702	11/-	BF115	5/-	GET883	5/-	OA2224	7/6
2N711	7/6	25702	11/-	BF115	5/-	GET885	5/-	OA2225	7/6
2N711A	7/6	25724	50/-	BF154	8/6	GET887	4/-	OA2228	7/6
2N721	11/-	25731	8/6	BF154	8/6	GET889	4/-	OA2234	7/6
2N743	4/-	25732	4/6	BF154	8/6	GET890	4/-	OA2242	4/6
2N744	4/-	25733	9/6	BF163	8/6	GET896	4/6	OA2244	4/6
2N753	5/-	25743	50/-	BF167	5/-	GET897	4/6	OA2245	4/6
2N865	30/6	25854	50/-	BF173	5/-	GET898	4/6	OA2247	4/6
2N914	4/6	AA129	4/-	BF180	7/6	GEX71	2/6	OA2247	4/6
2N916	4/6	AA178	8/6	BF181	7/6	JK10A	15/-	OA2272	4/6
2N918	7/6	AA179	7/6	BF182	6/6	JK10B	12/6	OA2273	4/6
2N919	4/-	AA172	5/-	BF188	5/-	JK11B	9/6	OA2291	7/6
2N920	5/-	AA212	4/-	BFY17	8/6	JK20A	15/-	OA2292	7/6
2N922	8/6	AA213	4/-	BFY18	8/6	JK60A	19/6	OC16	19/6
2N930	7/6	AA217	2/-	BFY19	5/-	JK6001B	15/-	OC19	7/6
2N1090	6/-	AC126	5/-	BFY20	12/6	MAT100	5/-	OC20	19/6
2N1091	6/-	AC127	5/-	BFY21	12/6	MAT101	5/-	OC21	19/6
2N1131	6/-	AC127	12/6	BFY51	4/-	MAT120	5/-	OC23	12/6
2N1132	8/-	AC128	5/-	BFY52	5/-	MAT121	6/-	OC24	12/6
2N929	4/6	AC134	3/-	BFY53	4/-	MAT124	6/-	OC25	12/6
2N1303	4/6	AC154	3/-	BFY64	8/6	NK772	5/-	OC26	5/6
2N1304	5/-	AC169	3/-	HLV10	20/-	NK128	6/-	OC28	12/6
2N1305	5/-	AC171	3/-	HLV11	22/6	NK142	6/-	OC29	12/6
2N1306	5/-	AC187	5/-	BPY10	19/6	NK1211	5/-	OC35	10/-
2N1307	5/-	AC188	6/-	BSX20	4/-	NK1212	4/-	OC36	12/6
2N1308	5/-	AC189	4/-	BSX21	4/-	NK1213	4/-	OC41	5/-
2N1309	5/-	ACY18	4/-	BSX76	4/-	NK1214	4/-	OC42	6/-
2N1420	18/6	ACY19	5/-	BSY27	4/-	NK1216	5/-	OC43	8/-
2N1483	10/6	ACY20	5/-	BSY28	5/-	NK1217	5/-	OC44	4/-
2N1613	5/-	ACY21	4/6	BSY29	5/-	NK1218	5/-	OC44M	4/-
2N2147	17/6	ACY22	3/6	BSY30	5/-	NK1221	5/6	OC45	3/6
2N2160	15/-	ACY28	3/6	BSY51	5/-	NK1222	4/6	OC45M	3/6
2N2160	15/-	ACY34	4/-	BSY53	5/-	NK1223	6/-	OC46	5/6
2N2287	28/-	ACY36	5/-	BSY64	5/-	NK1224	4/6	OC57	12/-
2N2297	9/6	ACY39	5/-	BSY65	5/-	NK1226	10/6	OC58	13/-
2N2446	7/6	ACY40	3/-	BSY66	5/-	NK1226	10/6	OC59	9/6
2N2646	10/6	AD140	11/-	BSY67	5/-	NK1227	5/6	OC70	3/-
2N2704	10/-	AD149	12/6	BSY91A	3/6	NK1228	6/-	OC71	3/-
2N2904	9/6	AO161	7/6	BSY95	3/-	NK1251	5/-	OC72	3/-
2N2905	18/6	AD162	7/6	BTY42	18/6	NK1261	5/-	OC73	6/-
2N2925	4/-	AD170	7/6	BTY79/100R	15/-	NK1265	9/6	OC74	6/-
2N2926	2/6	AD211	24/6	BTY84	12/6	NK1271	5/-	OC75	6/-
2N3011	7/6	AD212	29/6	BTY88	15/6	NK1272	5/-	OC76	5/-
2N3053	4/6	AEY11	5/-	BUV10	12/6	NK1273	4/-	OC78	7/6
2N3054	12/6	AEY12	12/6	BUV11	18/6	NK1275	5/-	OC78D	2/6
2N3055	15/-	AF102	15/-	BUV10	12/6	NK1276	5/-	OC79	5/-
2N3133	6/-	AF110	6/6	BY100	3/6	NK1277	5/-	OC81	8/6
2N3136	6/-	AF115	6/-	BY103	4/-	NK1278	5/-	OC81D	4/6
2N3142	7/6	AF116	6/6	BY114	5/-	NK1279A	4/-	OC81M	2/-
2N3232	15/-	AF117	5/-	BY126	5/-	NK1301	6/-	OC81M	2/-
2N3233	15/-	AF118	12/6	RYX12600	5/3	NK1304	7/6	OC82	7/6
2N3235	30/-	AF124	6/-	BYZ10	10/-	NK1352	8/6	OC82	7/6
2N3236	10/-	AF125	6/-	BYZ11	9/-	NK1403	9/6	OC82	7/6
2N3528	9/6	AF126	4/-	HVZ12	8/-	NK1404	9/6	OC82D	3/6
2N3702	3/6	AF127	4/-	BYZ13	5/-	NK1449	8/6	OC83	5/-
2N3703	3/6	AF139	6/6	BYZ15	3/6	NK1451	8/6	OC84	5/-
2N3704	4/-	AF178	9/6	BYZ16	12/6	NK1452	7/6	OC122	10/6
2N3705	3/6	AF181	8/6	BZY88C3V3	4/-	NK1453	6/-	OC123	10/6
2N3707	4/-	AF186	9/-	BZY88C4V7	4/-	NK1512	5/-	OC130	5/-
2N3709	3/6	AFZ39	8/-	BZY88C5V6	4/-	NK1675	5/-	OC140	7/6
2N3710	3/-	AFY19	22/6	BZY88C5V1	4/-	NK1677	5/-	OC141	15/-
2N4291	3/-	AFZ11	8/-	BZY88C6V8	4/-	NK1678	6/-	OC160	5/-
2N3135	6/-	AFZ12	10/-	BZY88C7V5	4/-	NK1713	6/-	OC160	5/-
2N3794	2/6	ASY26	5/6	BZY88C8V2	4/-	NK1773	8/-	OC171	6/-
2N4292	3/-	ASY27	7/6	BZY88C9V1	4/-	NK1777	8/-	OC200	5/-
2N3711	3/6	ASY28	6/6	BZY88C9V1	4/-	NK1833	4/-	OC201	5/-
2N3730	10/-	ASY29	6/-	BZY88C9V2	4/-	NK12329	7/6	OC202	12/6
2N3731	12/6	ASY36	5/-	BZY94C10	4/-	NK13329	4/6	OC203	7/6
2N3819	8/-	ASY40	6/-	BZY94C11	4/-	NK13519	10/-	OC204	8/-
2N3820	19/6	ASY51	8/-	BZY94C12	4/-	NK13521	10/-	OC205	12/6
2N3823	17/6	ASY67	9/6	BZY94C13	4/-	NK13522	8/6	OC206	15/-
2N4058	5/6	ASY83	5/-	BZY94C16	4/-	MPF103	6/-	OC207	15/-
2N4061	4/-	ASY86	6/-	CP404	12/6	MPF104	7/6	OC211	19/6
2N4286	3/-	ASZ21	8/6	CR51/05	5/-	CR51/05	5/-	ORP12	9/6
2N4381	3/-	ASZ23	20/-	CR51/10	6/-	OA5	3/6	ORP60	8/-
2N4289	3/6	AU110	19/6	CR51/20	7/6	OA7	4/-		
2N4290	3/-	AU101	30/-						

Send for Free Copy of 1970 Transistor List (36) Today!

INTEGRATED CIRCUITS

BP1010	25/-	PA424	39/6
CA3014	29/6	PA436	79/6
CA3018	22/6	PA246	52/6
CA3020	29/6	MC1304	55/-
CA3028A	23/6	TAD100	45/-
CA3036	18/6	TA263	15/-
IC10	59/6	SL403	49/6
PA230	23/6	UL900	10/6
PA234	20/-	UL910	10/6
PA237	37/6	UL914	12/6

DISCOUNTS:

10% on 6+ . 15% 12+ any one type

QUANTITY PRICES 100+

Phone 01-723-0401 Ex. 4.

Post/Packing add 2/6 on your order.

HENRY'S RADIO

Mail Order Dept. Components, Organ Dept.
303 EDGWARE ROAD, LONDON W.2
Telephone 01-723 1008 9

OPEN MON-SAT 9am-6pm THURS 9am-1pm

F.A.L. Phase 32

You must hear this superb unit



15 + 15 WATT HIGH FIDELITY OUTPUT

SOLID STATE STEREO AMPLIFIER

Recommended Retail Price ONLY 36 Gns.

- ★ Excellent performance
- ★ High grade components and transistors
- ★ Impressive

R.S.C. SENSATIONAL HIGH FIDELITY STEREO 'PACKAGE' OFFERS

★ Super 30 Amplifier (30 watt) in veneered housing
★ Goldring Transcription Turntable on Plinth
★ Shure or Goldring Magnetic Pick-up Cartridge
★ Pair of Stanway II Loudspeaker Units

Special total price. Four fully wired units ready to "plug-in". Carr. 30/-
TERMS AVAILABLE ALL PACKAGE OFFERS

Matching as recommended for optimum performance. Send for coloured brochure showing other money-saving offers.

Package prices apply providing all individual units are purchased from any branch within 3 months. See leaflet.

★ Super 30 amplifier (30 watt) in veneered housing
★ Garrard SP25 Mk II Turntable on Plinth
★ Goldring CS90 Ceramic P.U. Cartridge with diamond stylus
★ Pal. Stanway II Speaker Units

Four fully wired units ready to "plug-in". Special total price **76 Gns.** Carr. 30/-

AUDIOTRINE HIGH FIDELITY LOUDSPEAKERS



Heavy construction. Latest high efficiency ceramic magnets. Treated Cone surround for low fundamental resonance. "D" indicates Tweeter Cone providing extended frequency range up to 15,000 c.p.s. Impedance 3 or 15 ohms. Please state choice. Exceptional performance at low cost.

Prices include carriage.
HF100D 10" 15W £5.15.0
HF10L 5" 10W 5/9 HF120 12" 15W 8/9
HF801D 8" 8W 5/9 HF120D 12" 15W 8/9
HF811D 8" 10W 4 gns. HF126 12" 15W £5.5.0
HF102D 10" 10W 65/- HF126D 12" 15W £5.15.0

HIGH FIDELITY LOUDSPEAKER UNITS
Cabinets latest style Satin Teak or Afrormosia veneer. Acoustically lined or filled acoustic damping. Ported where appropriate, credit terms available.

DORCHESTER Size 16 x 11 x 9in. Addr. Range 45-15,000 c.p.s. Rating 8-10 watts. Fitted High flux 13x8in. Dual Cone speaker. Imp. 3 or 15 ohms. **£8.19.9**



STANWAY II Size 20x10x9 1/2in. Carr. 7/6
10 watts. Inc. Fane 13x8in. speaker with highly flexible cone surround. long throw voice coil and 11,000 line magnet. High flux tweeter. Handsome Scandinavian deslan cabinet. Range 35-20,000 c.p.s. Imp. 15 ohms. Gives smooth realistic sound output. **16 Gns.**

R.S.C. TA6 6 Watt HIGH FIDELITY SOLID STATE AMPLIFIER



200-250v. A.C. mains operated. Frequency Response 30-20,000 c.p.s. -2dB. Harmonic Distortion 0.3% at 1,000 c.p.s. Separate Bass and Treble

'lift' and 'cut' controls. 3 input sockets for Mike, Gram, Radio or Tape. Input selector switch. Output for 15-15 ohm spkrs. Max. sensitivity 5mV. Output rating I.H.F.M. Fully enclosed enamelled case. 9x24x5in. Attractive brushed silver finish fascia plate 10 1/2 x 3 1/2in. and matching knobs. COMPLETE KIT OF PARTS WITH FULL WIRING DIAGRAMS AND INSTRUCTIONS. Or FACTORY BUILT with 12 months' guarantee. **£8.19.9**



EXTREMELY ATTRACTIVE PLINTHS finished in Teak or Afrormosia veneer. Trans. plastic cover.

RECORD PLAYING UNITS

Money saving units. Mounted on Plinth. Supplied with transparent plastic cover Ready to plug into Amplifier or Tape recorder.

RP2C Garrard SP25 Mk II (with heavy turntable) fitted Goldring CS90 high compliance ceramic Stereo/Mono cartridge with diamond stylus. **23 Gns.** Inc. Carr.

RP5C Garrard 2025 Auto Unit fitted Garrard GCS 23 Stereo Cartridge with diamond tip. inc. carr. **15 Gns.** Other types available with Magnetic cartridges and with alternative design plinths.

R.S.C. PLINTHS



for Record Playing units, cut for Garrard 1025, 2025, 3000, AT60, SP25 etc.

Available with trans. plastic cover. Inc. Carr. **6 Gns.**

INTEREST CHARGES REFUNDED

On Credit Sales settled in 3 months.

R.S.C. TA12 MKII 13 WATT STEREO AMPLIFIER

FULLY TRANSISTORISED, SOLID STATE CONSTRUCTION HIGH FIDELITY OUTPUT OF 6.5 WATTS PER CHANNEL

Designed for optimum performance with any crystal or ceramic Gram P.U. cartridge, Radio tuner, Tape recorder, 'Mike' etc. ★ 3 separate switched input sockets on each channel ★ Separate Bass and Treble controls ★ Slide Switch for mono use ★ Speaker output 3-15 ohms ★ For 200-250v. A.C. mains ★ Frequency Response 30-20,000 c.p.s. -2dB ★ Harmonic Distortion 0.3% at 1000 c.p.s. Hum and Noise -70dB ★ Sensitivities (1) 300mV (2) 50mV (3) 100mV (4) 2mV. Output rating I.H.F.M. ★ Handsome brushed silver finish Facia and Knobs. Complete kit of parts with full wiring diagrams & instructions. Factory built with 12 months' guarantee. 17 gns. or Deposit £5.2.6 and 9 monthly payments 34/- (Total £20.8.6). Or in Teak or Afrormosia veneer 20 1/2 Gns. Dep. £5.10.6 and 9 monthly payments £21.7 (Total £24.4.9).



AUDIOTRINE HI-FI SPEAKER SYSTEMS

Consisting of matched 12in. 11,000 line 15 Watt 15 ohm high quality speaker, cross-over unit and tweeter. Smooth response and extended frequency range ensure surprisingly realistic reproduction.

Or Senior 15 Watt inc. HF126 15,000 line Speaker £6.15.0. Carr. 6/6 **£5.15.0** Carr. 5/9



LINEAR L10 HIGH FIDELITY LOW AMPLIFIER

with separate Pre-amp. Magnet P.U. matching. To clear **10 Gns.**

HI-FI SPEAKER ENCLOSURES Teak or Afrormosia veneer

finish. Modern design. Acoustically lined. All sizes approximate. Prices Inc. carr. **£4.14.6**

JEB Size 16 x 11 x 9in. Pressurised. Gives pleasing results with any 8in. Hi-Fi speaker. **£5.15.0**

SE8 For optimum performance with any 8in. Hi-Fi speaker. Size 22 x 15 x 9in. Ported. **£5.10**

SE10 For outstanding results with 12in. with 10in. Hi-Fi speaker and Tweeter. **£6.19.9**



THE 'YORK' HIGH FIDELITY 3 SPEAKER SYSTEM

★ Moderate size, only 25 x 14 x 10in. Complete Kit **20 Gns.**
★ Response 30-20,000 c.p.s. Impedance 15 ohms
★ Performance comparable with units costing Carr. 12/6 considerably more. Consists of (1) 12in. 15 watt Bass unit with cast chassis. Roll rubber cone surround for ultra low resonance, and ceramic magnet. (2) 3-way quarter section series cross-over system. (3) 8 x 5in. high flux middle range speaker. (4) High efficiency tweeter. (5) Appropriately quantity acoustic damping material. (6) Teak veneered cabinet. (7) tweeter and full instructions. Terms: Dep. £5.10.6 and 9 monthly payments 39/- (Total £23.1.0).



DEMONSTRATIONS AT ALL BRANCHES

R.S.C. TFMI SOLID STATE VHF/FM RADIO TUNER

★ High-sensitivity. ★ 200-250v. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Output for feeding Stereo Multiplexer. ★ Tuner head using silicon Planar Transistors. ★ Designed for standard 80 ohm co-axial input.



Visually matching our Super 15 and 30 amplifiers and of the same high standard of performance and reliability. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Factory built 18 gns. Or in Teak finished cabinet as illustrated 21 gns. Terms: Deposit £6.1.0 and 9 monthly payments 2 gns. Total £24.19.0. Stereo version, inc. carr. 23/1 gns.

R.S.C. BATTERY/MAINS CONVERSION UNITS

Type BM1 An all-day battery eliminator. Size 5 1/2 x 4 1/2 x 2in. approx.

Completely replaces batteries supplying 1.5v. and 90v. where A.C. mains 200/250v. 50c/s is available. Complete kit with diagram 52/6 or assembled 3 Gns.

R.S.C. SUPER 15 HIGH FIDELITY SOLID STATE AMPLIFIER

Approx. as Super 30 but single channel. Complete kit with full constructional details and point to point wiring diagrams. Carr. 12/6 or factory built 15 1/2 Gns. Carr. 12/6. Terms: Deposit 4 Gns. and 9 monthly payments 31/1 (Total £18.3.9) or in Teak or Afrormosia veneered housing. **19 Gns.**



R.S.C. SUPER 30 MKII HIGH FIDELITY STEREO AMPLIFIER

High Grade Components Specifications comparable with units costing considerably more.

TRANSISTORS 9 high quality types in each channel.

OUTPUT 10 Watts R.M.S. continuous into 15Ω (per channel). 15 Watts R.M.S. continuous into 3Ω.

INPUT SENSITIVITIES Mag. P.U. 4 mV. Ceramic P.U. 35 mV. Tape Amp. 400 mV. Aux. 100 mV. Mic. 5 mV. Tape Head 2.5 mV.

FREQUENCY RESPONSE ±2 dB. 10-20,000 c.p.s.

TREBLE CONTROL +17 dB to -14 dB at 10 Kc/s.

BASS CONTROL +17 dB to -15 dB at 50 c/s.

HUM LEVEL -80 dB.



Employing Twin Printed Circuits. 200/250v. A.C. mains operation. HARMONIC DISTORTION 0.1% at 10 watts, 1,000 c.p.s. CROSS TALK 52 dB at 1,000 c.p.s. CONTROLS 5 Position Input Selector, Bass, Treble, Vol., Bal., Stereo/Mono Switch, Tape Monitor Switch, Mains Switch. INPUT SOCKETS (1) P.U. (2) Tape Amp. (3) Radio, (4) Mic. or Tape Head. Operation of Input Selector assures appropriate equalisation.



MAIL ORDERS TO: 102 Hencrover Lane, Bramley, Leeds 13. No C.O.D. under £1. Terms C.W.O. or C.O.D. Postage 4/6 extra under £2. 5/9 extra under £5. Trade supplied. S.A.E. with enquiries. Branches open all day SATS. MAIL ORDERS MUST NOT BE SENT TO SHOPS

- BRADFORD 10 North Parade. (Half-day Wed.) Tel. 25349
- BLACKPOOL (Agents) O. & C. Electronics, 227 Church Street
- BIRMINGHAM 30/31 Gt. Western Arcade 021-236-1279 (Half-day Wed.)
- DERBY 26 Osaston Rd., The Spot (Half-day Wed.) Tel. 41361
- DARLINGTON 18 Priestgate (Half-day Wed.) Tel. 68043
- EDINBURGH 133 Leith St. (Half-day Wed.) Tel. Waverley 5766
- GLASGOW 326 Argyle St. (Half-day Tues.) Tel. CITY 4158
- HULL 91 Paragon Street (Half-day Thursday) Tel. 20505

- 32 High Street (Half-day Thurs.) Tel. 56420 LEICESTER
- 5-7 County (Mecca) Arcade, Briggate (Half-day Wed.) Tel. 28252 LEEDS
- 73 Dale St. (Half-day Wed.) Tel. CENTral 3573 LIVERPOOL
- 238 Edgware Road, W2 (Half-day Thurs.) Tel. PAD 1629 LONDON
- 60A Oldham Street (Half-day Wed.) Tel. CENTral 2778 MANCHESTER
- 106 Newport Rd. (Half-day Wed.) Tel. 47096 MIDDLESBROUGH
- 41 Blakett Street (Opp. Fenwick's Store) (Half-day Wed.) Tel. 21469 NEWCASTLE UPON TYNE
- 13 Exchange Street (Castle Market Bldgs.) (Half-day Thursday) Tel. 20716 SHEFFIELD

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



Highly sensitive. Push-Pull high output, with Pre-amp. Tone Control Stages. Performance figures of factory built unit: Hum level -70dB. Frequency response $\pm 3dB$ 30-20,000c/s. Sectionally wound output transformer. All high grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 36mV. Suitable for high impedance microphones. Crystal or Ceramic P.U.'s. Designed for Clubs, Schools, Theatres, Dance Halls or Outdoor Functions, etc. For use with Electronic Organ, Guitar, String Bass, etc. Gram, Radio or Tape. Reserve L.T. and H.T. for Radio Tuner. Two inputs with associated volume controls so that two separate inputs such as Gram and "Mike" can be mixed. 200-250v. 50c/s A.C. mains. For 3 and 15 ohm speakers. Complete kit of parts with point-to-point wiring 15 Gns. Carr. diagrams and instructions. 12/6
Twin-handled perforated cover 27/6. Supplied factory built with EL34 output valves. 12 months' guarantee for 18 Gns. TERMS: Deposit $\pounds 6.30$ and 9 monthly payments of 34/- (Total $\pounds 21.90$). Send S.A.E. for leaflet.

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



PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP. Two input sockets with mixing facilities High sensitivity. 5 valves Sectionally wound output transformer. IND. base and treble controls. Frequency response $\pm 3dB$ 30-20,000 c/s. Hum level -60dB. Sensitivity 40 millivolts. For Crystal or Ceramic P.U.'s. High Impedance "mikes". For Musical Instruments etc. Std. AC mains. For 3 & 15 ohm spkrs. SAE for leaflet. Complete kit. Full instructions and point-to-point wiring diagrams. Carr. 11/6 (for factory built 12 Gns). Twin handled metal cover 27/6. TERMS ON ASSEMBLED UNITS. Deposit 9/6 and 9 monthly payments of 23/- (Total $\pounds 15.66$)
RSC A11 TRANSISTORISED VERSION of above complete kit 9 Gns. (Assembled 13 Gns.)

30 WATT HI-FI AMPLIFIER

for Guitar, Vocal or Instrumental Group. A 2 or 4 input. 2 vol. control HI-FI unit with Separate Bass and Treble controls. B.V.A. valves. Peak output rating. Strong Rexine covered cabinet with handles. Attractive black/gold perspex fascia. Neon indicator. For 200-250v. A.C. mains. For 3 or 15 ohm speakers. Send S.A.E. for leaflet. Deposit 5 gns. and 9 19 Gns. Carr. monthly payments of 39/8 (Total 22 gns.)



FANE ULTRA HIGH POWER LOUDSPEAKERS

All power ratings are R.M.S. continuous. 2 years' guarantee. High Flux ceramic magnets. Heavy cast chassis. All prices carr. free



'POP' 100
18" 100 Watt
14,500 gauss
21 GNS.

'POP' 60
15" 60 Watt
14,000 gauss
12 GNS.

'POP' 50
12" 50 Watt
14,000 gauss
10 GNS.

FANE
'POP' 30C
12" 25 Watt
Dual cone
 $\pounds 5-19-9$

SELENIUM RECTIFIERS (Bridged) F.W. All 6/12v. D.C. output. Max. A.C. Input 18v. 1a. 4/3. 2a. 6/11. 3a. 9/9. 4a. 12/9. Ga. 15/9.

R.S.C. COLUMN SPEAKERS

Covered in two-tone Rexine/Vynair, ideal for vocalists and Public Address, 15 ohm matching. CS7 15 watts inc. five 7 x 4in. speakers $\pounds 7.19.11$.
TYPE C48S 25/30 WATTS. Fitted four 8in. high flux 8 watt speakers. Overall size approx $42 \times 10 \times 5in$.
16 Gns. Carr. 10/-
Or deposit 67/- and 9 monthly payments 34/9 (Total $\pounds 18.19.9$).
TYPE C412S, 50 WATTS. Fitted four 12in. 11,000 line 15 watt speakers. Overall size $56 \times 14 \times 9in$. approx.
26 Gns. Carr. 15/-
Or Deposit $\pounds 5.17.6$ and 9 monthly payments of 54/6 (Total $\pounds 30.70$).

HIGH QUALITY LOUDSPEAKERS

In Teak or Afrormosia veneered Cabinets
L13 13" x 8" 10 £4-19-9 Carr. 7/6
W13 13" 10,000 lines 3 or 15 ohms
L12 12" 20 Watt 10,000 lines 15 ohms. Carr. 8/9 $\pounds 8-19-9$

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

An exceptionally high quality all-purpose unit for lead, rhythm, bass guitar, vocalists, gram, radio, tape. Peak O-P rating.
* Two extra heavy duty 12in. Loudspeakers.
* Four Jack inputs and two Volume Controls for simultaneous use of up to four pick-ups or "mikes". Bass and Treble controls.
55 Gns. Carr. 30/- or dep. $\pounds 13.4.9$ and 9 monthly payments of $\pounds 5.11.9$ (Total 60/- gns.).
Send S.A.E. for leaflet. G100 100 watt peak output with Pr. speaker columns and 1 Bass Unit (Six 12" and Two 15" Speakers). 99/- gns.

R.S.C. MAINS TRANSFORMERS

FULLY GUARANTEED. Interleaved and Impregnated. Primaries 200-250v. 50c/s. Screened
MIDGET CLAMPED TYPE $2\frac{1}{2} \times 2\frac{1}{2} \times 2\frac{1}{2}in$.
250-0-250v. 60mA 6-3v. 2a. 0-5-6-3v. 2a. 17/11
250-0-250v. 60mA 6-3v. 2a. 0-5-6-3v. 2a. 18/11

FULLY SHROUDED UPRIGHT MOUNTING
250-0-250v. 60mA 6-3v. 2a. 0-5-6-3v. 2a. 24/9
250-0-250v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 39/9
300-0-300v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 39/9
300-0-300v. 130mA 6-3v. 4a. c.t. 1. 6-3v. 1a.

For Mullard 510 Amplifier
350-0-350v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 47/11
350-0-350v. 150mA 6-3v. 4a. 0-5-6-3v. 3a. 47/9
425-0-425v. 200mA 6-3v. 4a. c.t. 1. 5v. 3a. 89/9
425-0-425v. 200mA 6-3v. 4a. c.t. 1. 5v. 3a. 93/9
450-0-450v. 250mA 6-3v. 4a. c.t. 1. 5v. 3a. 99/9

TOP SHROUDED DROP-THRU TYPE
250-0-250v. 70mA 6-3v. 2a. 0-5-6-3v. 2a. 23/9
250-0-250v. 100mA 6-3v. 3-5a. 27/9
250-0-250v. 100mA 6-3v. 2a. 6-3v. 1a. 28/9
350-0-350v. 80mA 6-3v. 2a. 0-5-6-3v. 2a. 29/11
250-0-250v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 39/9
300-0-300v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 39/9
300-0-300v. 130mA 6-3v. 4a. 0-5-6-3v. 3a.

Suitable for Mullard 510 Amplifier
350-0-350v. 100mA 6-3v. 4a. 0-5-6-3v. 3a. 46/9
350-0-350v. 150mA 6-3v. 4a. 0-5-6-3v. 3a. 46/11

FILAMENT or TRANSISTOR POWER PACK Types
6-3v. 1.5a. 8/9; 6-3v. 2a. 9/9; 6-3v. 3a. 13/9; 6-3v. 6a. 22/9; 12v. 1a. 9/11; 12v. 3a. or 24v. 1.5a. 23/9; 0-9-18v. 1.2a. 19/11; 0-12-25-42v. 2a. 31/9.

CHARGER TRANSFORMERS 0-9-15v. 1.2a. 18/9; 2.2a. 19/11; 3a. 21/11; 5a. 25/11; 6a. 29/9; 8a. 36/9.

ATFO (Step Up/step DOWN) TRANSFORMERS
0-110/120v. 200-230-250v. 50-80 watts 19/9
150 watts. 33/6; 250 watts 49/9; 500 watts 105/-

OUTPUT TRANSFORMERS
Standard Pentode 5,000 Ω or 7,000 Ω to 3 Ω 8/9
Push-Pull 8 watts EL84 to 3 Ω or 15 Ω ... 14/9
Push-Pull 10 watts 6V6 ECL86 to 3.5, 5, 8 or 15 Ω ... 24/9
Push-Pull EL84 to 3 or 15 Ω 10-12 watts ... 23/9
Push-Pull Ultra Linear for Mullard 510, etc. 39/9
Push-Pull 15-18 watts, sectionally wound 6L6, KT66, etc., for 3 or 15 Ω ... 35/9
Push-Pull 20 watt high quality sectionally wound EL34, 6L6, KT66 etc. to 3 or 15 Ω 59/9

SMOOTHING CHOKES
150mA. 7-10H. 250 Ω 12/9; 100mA. 10H. 200 Ω 10/9; 80mA. 10H. 350 Ω 8/9; 60mA. 10H. 400 Ω 4/11.



YOURS FREE FOR 7 DAYS

The 'New Picture-Book' way of learning BASIC ELECTRICITY (5 VOL.) ELECTRONICS (6 VOL.)

You'll find it easy to learn with this outstandingly successful NEW PICTORIAL METHOD—the essential facts are explained in the simplest language, one at a time, and each is illustrated by an accurate, cartoon-type drawing. The books are based on

the latest research into simplified learning techniques. This has proved that the PICTORIAL APPROACH to learning is the quickest and soundest way of gaining mastery over these subjects.

TO TRY IT, IS TO PROVE IT

This carefully planned series of manuals has proved a valuable course in training technicians in Electricity, Electronics, Radio and Telecommunications.

WHAT READERS SAY

'... carefully written ...'
'... I am very satisfied with these carefully written and well expressed manuals ... A.W., Shunklin.'
'... valuable assistance ...'
'... Your valuable assistance has enabled me to find a good position as a Radio and TV Engineer ... D.S., Bristol.'
'... they are invaluable ...'
'... I find that as a base for a course in Electronics they are invaluable and I have yet to find anything even to approach the same standard ... H.N., Rotherham.'

A TECH-PRESS PUBLICATION

To The SELRAY BOOK CO., 60 HAYES HILL, HAYES, BROMLEY, KENT BR2 7HP

Please send me WITHOUT OBLIGATION TO PURCHASE, one of the above sets on 7 DAYS FREE TRIAL, I will either return set, carriage paid, in good condition within 7 days or send the following amounts. BASIC ELECTRICITY 75/- Cash Price, or Down Payment of 20/- followed by 3 fortnightly payments of 20/- each. BASIC ELECTRONICS 90/- Cash Price, or Down Payment of 20/- followed by 4 fortnightly payments of 20/- each. This offer applies to UNITED KINGDOM ONLY. Overseas customers cash with order, prices as above.

Tick Set required (Only one set allowed on free trial)

BASIC ELECTRICITY BASIC ELECTRONICS
Prices include Postage and Packing.

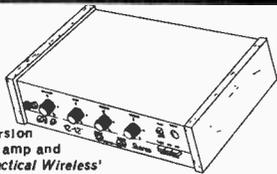
Signature _____ (If under 21 signature required of parent or guardian)

NAME _____
BLOCK LETTERS _____
FULL POSTAL ADDRESS _____

POST NOW FOR THIS OFFER!!

BETTER Bargains Service FROM TRS

BUILD THIS FINE VERSION OF THE PW.12-12 WITH A TRS KIT



T.R.S. have produced their own kit version of this outstanding combined stereo amp and pre-amp. It conforms precisely to *Practical Wireless'* excellent circuit but is styled for a flatter, more conventional cabinet which will be available shortly. Kit includes two-tone front panel and control knobs, components and transistors.

Inputs—Mag. P.U. (R.I.A.A.) 2.5mV into 88 Kohms; Ceramic P.U. and Radio; Response 20Hz to 30KHz \pm 1dB. Output—12 watts per channel. R.M.S. into 15 ohms.

Kit complete, less cabinet **£24.10.0** (Carr. 7/6) *Power Amplifier & Pre-amp Kits available separately. S.A.E. brings list.*

AMPLIFIERS

Styled and kitted by T.R.S., using quality components, including valves or transistors as necessary and excellent instructions. Backed by T.R.S. service.

MULLARD 5-10. Basic kit (requires pre-amp). Input Sensitivity—40mV; Response 20Hz-15KHz \pm 1dB; Output 10 watts R.M.S. at 3 or 15 ohms. KIT **£10.10.0**. BUILT **£13.0.0** (Carr. either, 7/6).

MULLARD 2 VALVE PRE-AMP. Switching for 5 inputs; bass/treble/volume controls, etc. Sensitivity at Input—4mV max. into 80K-1 Megohm; Response 20-25,000Hz \pm 1dB. KIT **£6.19.0**. BUILT **£9.10.0** (Carr. either 5/6).

MULLARD 10-10 STEREO AMPLIFIER. Input sensitivity—210mV per channel; Response 12Hz-35KHz \pm 3dB; 10 watts R.M.S. output per channel into 3 or 15 ohms. KIT **£18.10.0**. BUILT **£22.10.0** (Carr. either 12/6).

Basic Kit (no panel or controls) **£17.0.0**. Built **£21.0.0**. Pre-amp must be used here.

MULLARD 2+2 STEREO PRE-AMP with same characteristics per channel as mono pre-amp (+ balance). BUILT **£13.19.6** (Carr. 7/6).

T.R.S. 4+4 ECONOMY STEREO. Modular assembly. With cabinet power supply and Din plugs. 4 watts per ch. into 8-15 Ω **£12.10.0** (Carr. 7/6).

50 & 100 WATT R.M.S. VALVE AMPLIFIERS for mic., P.A. and Instruments, etc. 8/15 Ω output. Available shortly.

TUNERS

T.R.S. 6 VALVE AM/FM. Self-powered, large scale; push-buttons. Magic eye. Med. Wave and F.M. Diode output per tape. COMPLETE KIT **£12.10.0** (Carr. 7/6).

T.R.S. FM TUNER. Transistors, Inter-station suppression, A.F.C. etc. Modular assembly. Modules, chassis, drive etc. come to **£15.15.0** (Carr. 7/6) Cabinet to match T.R.S. 4+4 **£1.17.6** (Carr. 2/6)

Power supply **£2.5.0** (Carr. 3/-)
Decoder for Stereo **£10.10.0** (Carr. 2/6)

GRAMO UNITS & PLINTHS

GARRARD SP.25 MK. II. Manual: Arm and 10 1/2 in. die-cast/1 table, cueing device, etc. less cartridge. Brand new in maker's carton **£12.7.6**.

GARRARD LM.2025. With Sonotone 9TA/HC Stereo Cartridge and lift control **£10.19.6** (Carr. 7/6)

Garrard WB.1 Plinth **£3.7.6** (Carr. 5/-)

Garrard CLEARVIEW Cover SCP.1 **£3.5.0** (Carr. 4/6)

Garrard ScandInavian Type Plinth **£5.5.0** (Carr. 5/-)

ALWAYS IN STOCK

Resistors in all values; wire-wound resistors; volume controls log or linear, 10K-2meg. Mono 3/6 (with switch 5/-). Stereo 8/6 (with switch, certain values 10/6). Log/antilog balance controls 9/6, capacitors and electrolytics; Vinyl speaker covering 48in.—22 1/2 yd; Bondacoust 18in. x 1in. thick 7/-; Veroboard; Kit-Clt; valves; transistors; Sinclair products, etc., etc. S.A.E. with enquiries please.

TRS

**RADIO COMPONENTS
70 BRIGSTOCK ROAD,
THORNTON HEATH,
SURREY**

Open Sats. **1 min. Thornton Heath** Phone
Close early Weds. **Stn. (Southern)** **01-684 2188**

TRANSISTORS etc.

AC107	3/-	OC35	9/-
AC126	2/-	OC44	2/-
AF115	3/-	OC45	2/-
AF116	3/-	OC70	2/3
AF117	2/9	OC71	2/-
BFY12	4/6	OC72	2/2
BFY51	4/-	OC73	2/9
GET113	2/6	OC75	2/2
OA5	1/6	OC81	2/-
OA9	1/8	OC81D	2/-
OA47	1/9	OC82D	2/3
OA81	1/6	OC140	5/-
OA85	1/6	OC169	3/6
OC23	6/6	OC170	2/6
OC25	6/-	OC171	2/2
OC26	7/6	OC202	4/6
OC28	8/6	TK22C	1/6

SILICON DIODE RECTIFIERS

BY100	800 piv	2/10
500A	250 piv	1/9
Avalanche 1A	1200 piv	4/-
Six Amp Series		
BVZ13	300 piv	3/6
BVZ1	600 piv	4/6
BVZ11	900 piv	5/-
BVZ10	1200 piv	5/6
Mullard Stack FW		
Bridge		
12A	100 piv	39/6 (3/-)

Midget Electrolytic

At 6d. each	
0.8uF	25 volt
4uF	150 volt
640uF	2.5 volt
At 9d. each	
2uF	350 volt
4uF	12 volt
8uF	12 volt
16uF	16 volt
30uF	10 volt
100uF	6 volt
125uF	4 volt

CRYSTAL DIODES

Crystal Diodes—6 for 2/6

THYRISTORS

5 amp series	
100 piv	7/6
200 piv	9/-
300 piv	10/6
400 piv	12/-
800 piv	25/-
10 amp series	
50 piv	10/-
100 piv	12/-

At 1/- each

16uF	250 volt
100uF	12 volt
100uF	10 volt
200uF	10 volt
320uF	10 volt

Additional Transistors

Additional Transistors—AF147 and AF150, 24V. Larger envelope. 4 leads. collect current 100mA gain AF149—4/6 each. AF149—4/6 each.

Also 8uF 350V 1/2, 25uF 25V 1/3 and 50uF 50V 1/9. Other electrolytics in current list. Postage, Packing and Insurance all above 1/- up to 11, 12 and over charges paid.

2 GANG VAR. CONDENSER: Mod. air-spaced, .0005 sec. 5/- (1/-). 3 GANG, 7/6 (1/6).

STUB MITR. TRANSFORMERS: Output (3 for OC72 etc.) 2/6. Up to 500VA. MULTIMETER: 20,000 DIV C.A. 10,000 DIV A.C. 5/25 (50/500) 1K volts D.C. 10/1050/100/500/1K volts A.C. 10/50uA/2.5mA/250mA D.C. 10/6K 1/6 max 10/10uF—001mfd. 10/20 to 220uF. Complete with test leads and instructions. Over-load protected 1970 model with every refinement. £4.10.0 (2/6). JUNIOR MODEL at 4/76 (2/6). 1000V/V described in free list.

SOLDERING IRON. Slim Mod. British High speed, 81in., all parts replaceable. fully guaranteed for professional, radio and general D.I.Y. use, 19/6 (1/6).

DIAMOND STYLI

Replacements for BSR TC8LP, TC83P, TC8LP and TC8LP/STEELE COLLARD "O"; ROMETT B340ETI

GARRARD GC2LP and GC8LP; ACOS GP65/67; all at 7/6 each (1/-). ACOS GP73 and GP91; BSR ST4 and ST9; SONOTONE 8TA, 9TA and 9TACH; PHILIPS AG3306, 3060 (3063, 3066, 3301, 3302, 3304) state whether 2in. or 1in. all at 13/6 (1/-)

STYLUS: all the above 7/6 types only, all 3005 GP37 at 3/3 each (1/-). ACOS GP91 at 7/6 (1/-). No other types at present, and no 78 rpm available in any type.

PICK-UP CARTRIDGES

All fitted Styli and Standard fittings. Mono

which also plays Stereo records monaurally with min. wear. GP91/SC, 21/-.

10/15: Stereo GP93, 24/6. Ceramic Stereo, top quality for expensive outfits. GP94, 38/6 (all 1/-).

PP3 ELIMINATOR (A.C.) 17/6 (1/6). TWO STATION TRANS. INTER-COM. Excellent baby alarm. Instant, easy fitting with leads, plugs and battery. All you require 5/2 (3/6).

TRANSISTORISED AMPLIFIERS.

3 watt, 9V operation. 45/6 (1/6): 7 1/2 watt, 24V operation. 67/6 (2/6).

Extra High Torque MINI-MOTOR, 4 1/2 to 12V, 1 1/2 x 1/2 in. 5/- (1/-), 9,000 r.p.m. SUBSTITUTION BOXES. Capacitance 25/6 (1/6). Resistance 32/6 (1/6). Both full range and complete. Full details in list.

TEST PRODS: Flexible, unbreakable 24in. Red and Black leads, thin 4 1/2 in. prods. 1 1/2 in. plugs 4/9 (1/-). Croc. Clips: Plated with screw, or with red/black handles, 6d. each, 5/- doz. (1/-).

RECORDING TAPE

Finest quality British Wyal. STANDARD: 5in. 600ft. 7/3. 5 1/2 in. 850ft. 8/9. 1200ft. 11/3. LONG PLAY 5in. 900ft. 10/-, 5 1/2 in. 1200ft. 11/3. 7in. 1800ft. 18/- (1/3 recel). Still the finest quality and value obtainable.

MICROPHONES—CRYSTAL. MIC91, Desk, 16/3; MIC45, curved hand grip 17/6; Slick "60" 20/3; Slick "39" 2/6 (1/6 each type). Cream plastic hand type 7/6; or with "strut" stand, switch and 2 leads with 2.5 and 3.5 plugs 12/6 (1/3). Lapel (or hand) with clip 6/6 (1/-). Machined metal tapered stick type with neck cord and adaptor to fit standard floor stands, 25/- (1/6). DYNAMIC: Cream hand/table 15/6 (1/6). MS10 50K 12, 3 1/2 x 3in. with base, Adaptor 37/6 (2/6). MS11, similar, but fixed on flexible Swan neck to switch-fixed base 42/6 (2/6). DYNADOM uni-directional ball-type all metal, for hand or stand use at low price of £3.13.6 (1/6).

CARDIOID DYNAMIC OMNI-DIRECTIONAL: Two highly successful mikes "SQUARE" 208, £5.10.0. "BALL" type, 209, with built-in vol. control, switch 50K/60 ohms 1m, £5.17.6 (either type 1m). Full details in list.

MICROPHONE INSERTS: Diameter 1.75in. or 0.9in., either size 5/6 (1/6).

SPEAKERS: 12in. round, fitted Tweeter, 6W, 3 or 15 Ω (state which), 37/6 (5/6); or for stereo, 80/- per pair (charges paid): 24in. 3 1/2 6/6 (1/-); 6 x 4 heavy duty 3 1/2 14/6 (3/6) or for stereo, 34/6 (1/6). Limited quantity powerful 2 1/2 in. PM transistor replacement speaker, high ohms, excellent 5/9 (1/6). HEADPHONES High Res. 2000 Ω ca. earpiece 18/6 (1/6); Stereo Dyn 8-16 Ω 63/- (3/-). EARPIECES with lead and min. jack plug, magnetic 1/9. Crystal 4/9 (up to 3 for 1/- on either). State if 5mm or 3.5mm. plus required. (Crystal 3.5mm, only.)

AERIALS, Car Types: Telescopic, windproof, locks retracted, 2 keys and all fittings, 22/6 (2/6). Motor driven, 12V, 5 section, complete 7/10.0 (5/-).

FOR ALL PORTABLES and F.M. SETS, 7-Section 5A-32in., no swivel, screw hole in base, 6/6, 10-section 6 1/2-47in., no swivel, screw hole in base, 12/6.

DISAPPEARING 8 section, swivel fixing assembly, 6 1/2-31in. 10/-, New 6 section 5 1/2-25 1/2 in., screw hole in base, no swivel 4/- (1/- all sizes).

SWITCHES: Standard toggle, metal, 250V 2A. One hole fixing: SPST 2/3, SPDT 2/9, DPST 3/-, DPDT 3/3. Slide type, Sub-min. DPDT 1/6 each. Small DPDT 3 way, centre "off" 1/9. Reed magnetic on/off 1/9 (up to three, 1/-, 1d. each all additional). Rotary Switches etc. in list.

VIBRATORS: Famous makes only, 12 volt 4 pin non-synch. 4/6, 12 volt 7 pin switch, 12/6 (1/- each either type). No other types available.

MAINS NEO TESTER: Fly leads 2/-, Pocket screwdriver type 3/6. PLUGS: Std. Jack, plastic body 2/3. Screened 3/-, VALVE HOLDERS: B7G or B9A, Moulded 6d. (all above, 1/- up to three). CONNECTING WIRE: 5 coils assid. coils, each 5 yds. Solid Core 2/6. Flexible 3/-, Super thin for transistor wiring etc. 3/- (1/- all types per 5 coils). PICK-UP WIRE: Twin Super thin Flex, Screened, Sheathed, 1 1/2 yds. 6d. up to 6 yds., over 6 yds. post free. TWIN COIL CABLE: 1 1/2 yd. SINGLE MIKE CABLE: 7d. yd. Both flexible, screened and sheathed. (Up to 3 yds. 8d., each additional yard 1d. extra.)

R.F. FIELD INDICATOR, 5-band with antenna, monitoring crystal earpiece, visible indicator etc. 48/6 (1/6). Details in list.

RETRACTABLE FLEXIBLE LEADS. Space saving "Curly", many uses in car and home: with phono plug each end, 6/-, 4/6; 12/-, 7/9; With phono plug one end, phono socket at other, 6/-, 5/-, 12/-, 8/6 (1/- each all types).

CAR RADIO: Splitting new All-in-one dash-mounting radio using Mullard transistors and circuit. M. and L. wave. Separate speaker and baffle. Absolutely complete, for + or - chassis, £11.11.0 (6/6). A huge success since introduction.

CURRENT LIST: Sent with all orders or free for s.a.e. details of cable, croc. clips and leads, Continental din plugs for Grundig, Telefunken equipment, etc., dials, plugs and sockets, panel meters, record player and tape recording accessories, BATTERY CHARGERS: test equipment, terminals, tape recorder, special transistors, portable sets, more switches and other components, tools, Veroboard etc., etc. This advertisement cancels all previous ones and lists supplied prior to Jan. 31st, 1970.

FELSTEAD ELECTRONICS

(PW28) LONGLEY LANE, GATLEY, CHEADLE, CHESHIRE, SK8 4EE

TERMS: Cash with order only. No C.O.D. or caller service. Post, packing and insurance charges are shown in brackets after all items. Regret orders under 5/- plus carriage cannot be accepted, and a minimum charge of 1/- is now made. Charges apply to G.B. and Eire only. Overseas orders welcomed by air or surface mail at cost. Sent at buyer's risk, unregistered and uninsured unless specified and min. insurance/rep. fee of 3/2 sent.

S.A.E. please for all enquiries, otherwise regret cannot be replied to.

SPECIAL MONEY SAVING DISCOUNTS

on the Best Hi-Fidelity Equipment on the Market Today

	Rec. Retail Price	Discount Price		Rec. Retail Price	Discount Price
AMPLIFIERS					
ARENA F210 2x10 watts Stereo Amplifier teak case	£34 13 0	£29 10 0	WHARFEDALE UNIT 3 Speaker Kit	£10 17 6	£9 5 0
PHILIPS RH580 stereo amplifier magnetic input	£26 0 0	£21 5 0	PLAYING DECKS		
DULCIJ 207M as above but accepts magnetic cartridge	£30 0 0	£21 15 0	GARRARD 401	£31 14 2	£27 0 0
GOODMANS Maxamp teak or walnut	£54 0 0	£42 15 0	GARRARD AP75	£23 16 7	£17 15 0
LEAK Stereo 30 plus chassis model	£53 0 0	£43 10 0	GARRARD SP25 Mark II	£15 11 11	£11 5 0
LEAK Stereo 30 plus teak cased	£59 10 0	£48 12 6	GARRARD SRP22	£6 12 10	£5 10 0
LEAK Stereo 70 chassis model	£63 0 0	£50 15 0	GARRARD SL95	£45 9 1	£34 10 0
LEAK Stereo 70 plus teak cased	£69 10 0	£55 15 0	GARRARD SL75	£35 12 5	£30 10 0
NIKKO TRM 120	£46 10 0	£39 10 0	GARRARD SL65	£18 8 4	£14 17 0
NIKKO 40B	£95 0 0	£84 10 0	GARRARD SL55	£13 17 9	£11 12 6
ROGERS RAVENSBOURNE teak cased	£64 0 0	£54 10 0	GARRARD 60 Mark II	£17 5 10	£14 19 6
ROGERS RAVENSBROOK chassis model Limited Quantity	£46 10 0	£39 10 0	GARRARD 3500	£12 4 10	£10 19 6
ROGERS RAVENSBROOK in teak case	£62 17 7	£56 10 0	GARRARD 2025 T/C	£11 3 11	£10 10 0
SANSUI AU 222	£80 9 7	£69 10 0	GARRARD 1025	£10 6 2	£9 10 0
SANSUI AU 555	£54 12 0	£45 0 0	GOLDRING GL68	£22 7 2	£17 15 0
TRUVOX TSA200 teak cased	£37 10 0	£34 10 0	GOLDRING GL75	£35 15 5	£28 15 0
ROGERS Cadet Mark III teak cased	£98 0 0	£85 0 0	GOLDRING GL75P	£46 18 8	£37 10 0
QUAD 33 Control Unit and 303 Power Amplifier	£28 7 6	£22 10 0	THORENS TD150	£29 8 1	£26 10 0
TELETON 203E			THORENS TD150A	£35 14 6	£31 10 0
			THORENS TD150AB	£39 16 9	£35 10 0
			THORENS TD125	£63 4 9	£54 5 0
FM TUNERS			Plinths, tops and accessories of above available at 10% discount on retail price.		
ARENA F211 with Decoder	£39 18 0	£34 15 0	STEREO CARTRIDGES		
DULCI FMT7 Mono tuner	£22 1 0	£18 10 0	AUDIO TECHNICA AT66	£6 6 0	£5 10 0
DULCI FMT7S Stereo tuner	£29 8 0	£23 10 0	SHURE M3DM	£7 8 3	£6 2 6
GOODMANS Stereomax teak stereo tuner	£82 10 5	£70 10 0	SHURE 31E	£12 19 5	£11 10 0
LEAK Stereo Troughline tuner chassis mounting	£51 10 6	£39 10 0	SHURE 32E	£12 0 11	£10 15 0
LEAK Stereo Troughline	£59 13 10	£48 10 0	SHURE 55E	£16 13 6	£13 19 0
QUAD Stereo Tuner	£51 0 0	£45 15 0	SHURE 44E	£14 16 6	£12 19 6
TRUVOX FM200 less Decoder	£37 12 11	£32 10 0	SHURE M75E	£25 18 10	£23 5 0
			SHURE V15 Mk II	£40 15 3	£35 0 0
TUNER AMPLIFIERS			GOLDRING CS90	£5 4 0	£4 2 6
ARENA TI500 teak only	£64 1 0	£57 10 0 (add 7 gns. for decoder)	GOLDRING 809	£13 0 0	£11 12 6
			STEREO TAPE DECKS AND RECORDERS		
ARMSTRONG 525	£87 16 9	£74 10 0	AKAI Model 4000D 3-head stereo tape deck	£87 10 0	£74 10 0
ARMSTRONG 526	£98 15 0	£85 15 0	AIWA TP 1011 professional stereo 3 head tape deck	£164 6 0	£139 10 0
ARMSTRONG 127	£43 19 6	£37 10 0	SANYO MR910 4 track stereo tape recorder	£83 10 0	£74 10 0
B & O Beomaster 1000	£101 15 0	£94 10 0	SANYO MR929 4 track stereo tape recorder, 2 detachable speakers	£100 16 0	£89 10 0
GOODMANS 3000	£77 14 7	£67 10 0 (with decoder)	SANYO MR801 stereo tape deck	£79 0 0	£67 10 0
			REVOX model 1104 4-track tape deck	£187 19 0	£169 10 0
NIKKO FAM 12F	£68 8 3	£59 10 0	GRUNDIG TK247 de-luxe stereo tape recorder	£139 18 9	£102 10 0
NIKKO ST 701	£136 3 11	£120 0 0	MONAURAL MAINS TAPE RECORDERS		
SANSUI 350	£129 1 10	£114 10 0	GRUNDIG TK120 continental twin-track tape recorder	£39 5 0	£29 10 0
SANSUI 2000	£162 3 0	£147 10 0	GRUNDIG TK144 4-track tape recorder	£47 13 1	£41 10 0
SANYO DC60 2x30 watts rms	£99 0 0	£89 10 0 (with decoder)	GRUNDIG TK149 Automatic 4-track tape recorder	£55 18 10	£49 10 0
			PHILIPS 4307 4-track tape recorder	£48 11 0	£41 10 0
TELETON F2000 2x5 watts rms	£51 19 0	£43 10 0 (with decoder)	PHILIPS 4308 2-speed 4-track tape recorder	£60 0 10	£51 10 0
TELETON R8000 Tuner/Amplifier with 2 speaker enclosures	£70 19 0	£49 10 0 (with decoder)	COMPLETE HI-FI SYSTEMS		
			PHILIPS GF818 Philips autochange Player, integrated 2x4 watts amplifier, 2 separate speakers, all in teak finish	£51 9 0	£45 0 0
SPEAKERS			RADON 404 SYSTEM Garrard SP25, separate 2x8 watt amplifier, 2 bookshelf type speakers teak or blond oak	£57 4 0	£49 10 0
(Prices quoted for single speaker unless otherwise specified)			WINDSOR 1500 Garrard 2025 T/C, integrated 2x4 watt amplifier, 2 separate speakers, all finished in teak	£57 15 0	£49 19 6
ARENA HT14 bookshelf type in teak	£14 3 0	£12 10 0	TOSHIBA SOPHIA Transcription turntable, magnetic cartridge, integrated tuner amplifier, with stereo decoder, fitted hinged perspex top, 2 separate speakers, walnut finish	£82 19 0	£75 0 0
ARENA HT16 teak or rosewood	£19 19 0	£17 10 0	SANYO DC534E Transcription turntable, magnetic cartridge, integrated tuner/amplifier, 2x12 watts rms, decoder, fitted hinged perspex top	£132 10 0	£119 10 0
CELESTION Ditton 10	£21 13 1	£17 15 0	Matching SANYO SX/X speakers per pair	£37 16 0	£32 10 0
CELESTION Ditton 15	£31 3 7	£26 5 0			
GOODMANS Maxim	£20 15 6	£16 15 0			
GOODMANS Marimba	£24 0 5	£19 15 0			
GOODMANS Mezzo II	£30 18 0	£25 10 0			
GOODMANS Magnum K	£40 2 0	£29 15 0			
Leak Sandwich	£43 10 0	£37 10 0			
LEAK Mini Sandwich	£29 15 0	£25 5 0			
LOWTHER Accousta PM6	£45 10 0	£40 10 0			
LOWTHER Accousta PM7	£55 10 0	£50 10 0			
KEF Cresta	£22 3 7	£18 10 0			
KEF Celeste	£25 0 0	£25 0 0			
KEF Concord	£43 10 0	£37 10 0			
KEF Concerto	£53 10 0	£45 0 0			
QUAD Electrostatic	£66 0 0	£59 10 0			
WHARFEDALE Denton per pair	£33 12 0	£29 10 0			
WHARFEDALE Super Linton per pair	£42 0 0	£37 10 0			
WHARFEDALE Dovedale III	£39 10 0	£32 19 6			

All goods are in manufacturer's sealed cartons and are insured against loss or damage in transit
Guaranteed "by return" service.

Add 7/6 to all orders for p. & p. Send cash/cheque with order. Personal Callers Welcome—Business Hours.

SMITH'S RADIO SERVICE (Wolverhampton) LTD.

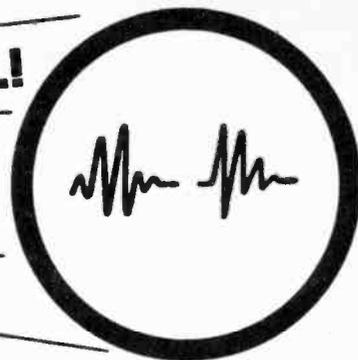
Mail Order Department, 26 Victoria Street, Wolverhampton, Staffs. Tel: Wolv. 29246

LOOK!

PRACTICAL!

VISUAL!

EXCITING!



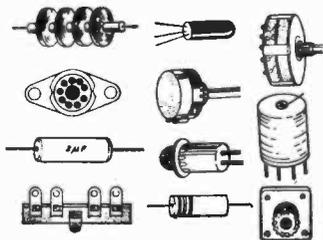
a new 4-way method of mastering

ELECTRONICS

by doing — and — seeing . . .

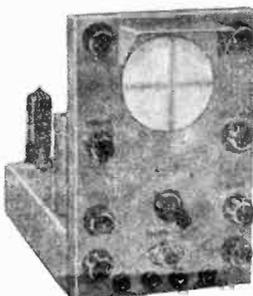
1 ▶ OWN and HANDLE a

complete range of present-day **ELECTRONIC PARTS** and **COMPONENTS**



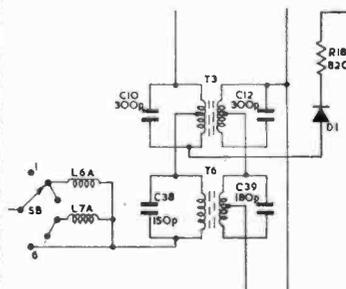
2 ▶ BUILD and USE

a modern and professional **CATHODE RAY OSCILLOSCOPE**



3 ▶ READ and DRAW and

UNDERSTAND **CIRCUIT DIAGRAMS**



4 ▶ CARRY OUT OVER **40** EXPERIMENTS ON BASIC ELECTRONIC CIRCUITS AND SEE HOW THEY WORK . . . INCLUDING . . .

- VALVE EXPERIMENTS
- PHOTO ELECTRIC CIRCUIT
- A.C. EXPERIMENTS
- TRANSISTOR EXPERIMENTS
- COMPUTER CIRCUIT
- D.C. EXPERIMENTS
- AMPLIFIERS
- BASIC RADIO RECEIVER
- SIMPLE COUNTER
- OSCILLATORS
- ELECTRONIC SWITCH
- TIME DELAY CIRCUIT
- SIGNAL TRACER
- SIMPLE TRANSMITTER
- SERVICING PROCEDURES

This new style course will enable anyone to really understand electronics by a modern, practical and visual method—no maths, and a minimum of theory—no previous knowledge required. It will also enable anyone to understand how to test, service and maintain all types of Electronic equipment, Radio and TV receivers, etc.

FREE POST NOW
for
BROCHURE

or write if you prefer not to cut page

To: **BRITISH NATIONAL RADIO SCHOOL, READING, BERKS.** Please send your free Brochure, without obligation, to: *we do not employ representatives*

NAME.....BLOCK CAPS

ADDRESS.....PLEASE PW1

PRACTICAL WIRELESS

VOL 45 NO 11

Issue 757

MARCH 1970

TOPIC OF THE MONTH

Is the RAE just?

THE object of an examination is to test the ability and proficiency of a candidate in a particular subject. But although the attainment of a pass certificate or diploma endows the holder with appropriate status, there is no doubt that in certain cases this is largely a reflected glory. Due to personal factors such as temperament and academic factors such as choice and phrasing of questions, it is still possible for one candidate to pass and another of greater talent to fail.

When one comes to examinations that are not purely academic, the situation is more complex and can be even more unsatisfactory. Two such examinations that touch our particular field, in which theory and practice intermingle, are the RTEB exam for service engineers and the RAE for aspiring amateur radio operators. Both, in our view, fall short of the ideal mainly because of the complicating factor of practical ability.

One of the commonest and most persistent criticisms of the Radio Amateurs Examination is that the format is heavily weighted in favour of the younger candidate who, because of greater learning ability, is best able to tackle the theoretical nature of the questions. Candidates in older age-groups have often forgotten the magic formulae learned years ago but nevertheless may be perfectly capable of building, operating and maintaining an amateur radio station. (Incidentally, it seems ludicrous that candidates for exams are not allowed to use standard reference sources on the spot—as they are able to do in any later practical application of the type of work involved.)

Of course, it is virtually impossible to arrange oral or practical examinations across the country since the RAE is organised by the City and Guilds of London Institute, not the GPO (to use its old name!). The question paper is set by a Committee including representatives of the RSGB, the GPO and C & G, and to these bodies we strongly recommend that Part 2 of the RAE be divided into sections of (a) theory and (b) practice. Surely some way could be devised to ensure that future licence holders have been tested in some measure as to their *practical* ability to run a station, and are not passed purely as egg-heads with good memories.

The validity of the present RAE surely rests on two basic questions: (1) Is the primary object to screen out the incompetent? and (2) Does the present set-up ensure that those who pass can fulfil the requirements and responsibilities of running an amateur transmitting station?

W. N. STEVENS—*Editor*.

NEWS AND COMMENT

Leader	843
News and Comment	844, 845
Practically Wireless by <i>Henry</i>	857
On the Short Waves by <i>Malcolm</i>	
<i>Connah and David Gibson,</i>	
<i>G3JDG</i>	861, 862
MW Column by <i>C. Molloy</i>	864
Letters to the Editor	874
Club Spot	889

CONSTRUCTIONAL

FET's and their Uses	
by <i>T. Snowball</i>	846
Panoramic Receiver for 160 to 80	
Metres, Part 3 by <i>D. Bollen</i>	849
Bookshelf Speaker by <i>C. R. Bradley</i>	852
Extra Head for the BSR TD2	
by <i>A. Oliver</i>	858
Versatile Power Supply Stabiliser	
by <i>P. R. Broadbent</i>	863
General Coverage Receiver	
by <i>F. G. Rayer, G3OGR</i>	868
I.C. of the Month, Audio	
Amplifiers by <i>L. A. J. Ireland</i>	877
VOX Control Unit by <i>S. G. Wood,</i>	
<i>G5UJ</i>	882
Metal Locator by <i>Hal Moorshead</i>	885
Take 20, Novelty Light Flasher	
by <i>Julian Anderson</i>	893

OTHER FEATURES

P.W. Guide to Components,	
Part 15 by <i>M. K. Titman, B.Sc.</i>	865
Basic Semiconductor Technology	
Part 10 by <i>M. F. Docker, M.Sc.</i>	878

APRIL ISSUE WILL BE PUBLISHED ON
MARCH 6th

PRICE INCREASE

We regret that owing to mounting production costs it has been necessary to increase the price of Practical Wireless to 3s. 6d. as from the April issue.

©IPC Magazines Limited 1969. Copyright in all drawings, photographs and articles published in "Practical Wireless" is fully protected, and reproduction or imitations in whole or in part are expressly forbidden. All reasonable precautions are taken by "Practical Wireless" to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it, and we cannot accept legal responsibility for it. Prices are those current as we go to press. All correspondence intended for the Editor should be addressed to Fleetway House, Farringdon Street, London, E.C.4. Address correspondence regarding advertisements to Advertisement Manager, Fleetway House, Farringdon Street, London, E.C.4. Orders for back numbers should be addressed to IPC Magazines Ltd., Back Numbers Department, Carlton House, Gt. Queen Street, London W.C.2.

NEWS... NEWS... NEWS...

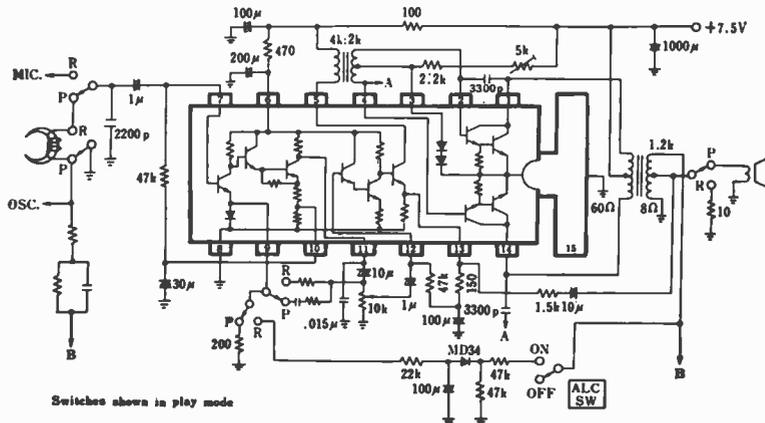
Integrated audio amplifier



A 1 watt audio amplifier integrated circuit that has been designed for use as a single a.f. amplifier or as a semiconductor bed of a tape recorder, is one device in a new range of linear integrated circuits available from UECL, Microelectronics Division.

This audio amplifier, M5101P, is designed for use on a V_{CC} up to 12 volts and with the addition of a fin will dissipate 1.8 watts. Distortion is typically 0.5% at 45% circuit efficiency.

The device consists of a pre-amplifier, driver and power amplifier and has input resistances of 30,000 ohms to both the



Switches shown in play mode

pre-amp and driver sections. The circuit consumes only 15mA under zero signal conditions. The whole device is packaged in plastic dual-in-line and will operate over the temperature range -10° to $+125^{\circ}$ C.

This integrated circuit, being d.c. coupled, may also be used

as a servo amplifier.

The M5101P is available ex-stock at a price of 25s. 5d. on a cash with order basis. Further details of this device may be obtained from *Ultra Electronic (Components) Limited*, 35-37 Park Royal Road, London, N.W.10. Tel: 01-965 5744.

Hear it at Graham's

One comparative newcomer to the Hi-Fi scene is GRAHAMS HI-FI CENTRE at 86-88 Pentonville Road, N.1 (837 4412). They have set up instantaneous comparison facilities.

Grahams have provided a comprehensive Hi-Fi auditorium which offers customers the opportunity of viewing a wide spectrum of the market. Their policy is first to ascertain the budget level of each customer and to stick to that as closely as possible. "Subject," they say, "to a discreet observation of the customer's reaction to the sound of equipment at his stated price level; if we feel that he is likely to 'outgrow' his set-up, to feel dissatisfied with it after a little while, then we explain that we would rather not make a sale at that time. If his ear is so acute, better that he should get the right advice and not buy, than buy the wrong thing. In practice, most people return for equipment that will give them lasting pleasure, perhaps buying it in stages."

Grahams' agencies include Akai, Armstrong, Arena, Bang & Olufsen, Bryan, Dual Dyna-

tron, Ferguson, Grundig, Rotel, Sony, Tandberg and Vander-molen, in addition to dealing in the normal range of high-quality equipment including Uher, Leak, Quad, Rogers, Thorens, Revox and Goldring.

Playback



'Playback' is the title of a 16-page mini-magazine available free of charge from stockists of Scotch magnetic tape.

The issue now available from electrical and hi-fi shops includes features on actor David Hemmings and his use of a tape recorder both on and off the film

set; tape recording in schools; and 'how-to-do-it' articles on recorder care and recording the spoken word. There is also some helpful advice on using a tape recorder to make your party go with a swing.

'Playback' is published quarterly by the 3M Company, manufacturer of Scotch magnetic tapes and cassettes.

Anglian rally

The date has been fixed for the above venture, 20th and 21st June, 1970, at the Suffolk Show Ground, Ipswich. Due to the success of the first one, it has been decided to hold a convention on Saturday afternoon, and a social and dance that evening. Sunday the Rally itself will take place. No guest speakers have as yet been appointed.

Another feature is that three awards will be made. (1) Any electronics equipment for groups up to 15 years; (2) Any electronic equipment for groups up to 19 years; (3) Any electronic equipment for any individual any age. For details, send a s.a.e. to *D.W.N.Thomas, G8BVE, 9 Burlington Road, Ipswich, Suffolk.*

NEWS... NEWS... NEWS...

Eddystone light shines on...

...two new receivers. They are the EC10 Mk. 2 and the EB35 Mk. 2. The EC10 Mk. 2 is a re-styled replacement for the earlier model EC10 incorporating a number of additional features, including an integral carrier level meter, fine tuning control and de-sensitising facilities. Coverage is 550kHz to 30MHz and a low-level output is provided for tape recording. Other features include: Solid state design, 1% calibration accuracy, standby switch, size of $12\frac{1}{2} \times 6\frac{1}{2} \times 8$ in. and there is a guaranteed 10 years availability of spares. Price is £69 10s.

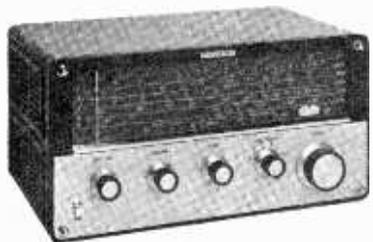
The EB35 Mk. 2 is a fully transistorised a.m./f.m. broadcast receiver designed for the person who requires something superior to the normal domestic set. It has a high sensitivity and wide frequency range (88-108MHz, 8.5-22MHz, 3.5-8.5MHz, 1.5-3.5MHz, 550-1500kHz and 150-350kHz). A version is available for stereo multiplex v.h.f. broadcasts.

An internal speaker is fitted and outputs are available for tape recorder and Hi-Fi speaker connection. The audio stages can be used independently for microphone, tape or record reproduction. Price is £82 4s 9d.

For further information, contact J. H. Roche at *Imhofs Ltd.*, 112-116 New Oxford Street, London, W.C.1. Tel.: 01-636 7878.

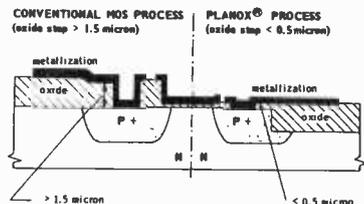


EC10 Mk2



EB35 Mk2

SGS steps forward



The SGS International Group of semiconductor companies have developed a new process called Planox that enables the oxide layers on the surface of a silicon wafer to be effectively flat so that reliability is greatly enhanced and manufacturing yields improved. Applicable to both bipolar and metal-oxide-silicon devices (M.O.S) the Planox process is of particular importance in the production of M.O.S. integrated circuits where oxide thickness varies greatly and metal inter-connection patterns are complex.

In a M.O.S. device the oxide layer grown on the gate regions has to be extremely thin in order to achieve low threshold voltage sensitivity while the oxide layer in the field region has to be thick to avoid spurious M.O.S. effects.

With conventional methods, the thick layer on the field region gives rise to high "steps" of oxide on the chip surface over which the metallization pattern has to be formed. Resultant sharp bends in metallization can lead to weak spots.

The Planox process eliminates this problem by removing sufficient underlying silicon to accommodate the oxide thickness so that the resultant surface is essentially flat. This is made possible by depositing a thin layer of silicon nitride on the silicon wafer. This prevents oxidation and enables selective etching with respect to silicon dioxide. The nitride film is then masked and etched to lay bare the regions where thick oxide is to be grown.

THE WRONG DATE

In the November 1969 issue of P.W. on page 474, under the heading "Free Radio and More for Television" the date for the licence rise should read 1st April 1971.

Rally diary notes

APRIL 19: North Midlands Mobile Rally. **MAY 10:** Ealing and District Amateur Radio Society Mobile Rally. **JUNE 21:** University College of Swansea Amateur Radio Club Annual Rally, Singleton Park, Swansea. **JUNE 28:** Longleat Safari Mobile Rally, Longleat House, Nr. Warminster. Organised by the City and Council of Bristol RSGB Group. **JULY 5:** South Shields Mobile Rally. **JULY 12:** Worcester and District Amateur Radio Club Rally.

They've got it taped!

"Tape Recorders: A-Z" is a book which covers every audio tape recorder in the VTR, professional, domestic and Hi-Fi fields, currently available on the UK market.

All machines listed carry detailed specs. and most entries carry a photograph. The Domestic and Hi-Fi section contains some 250 entries with prices ranging from £20 to £300.

Two sub-sections are included in the Professional, Scientific & Industrial Audio Tape Recorder section, one part dealing with the upper range in the "studio" class and the other with high-quality machines costing £1,000 or less.

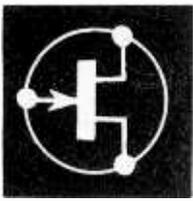
Car tape players are dealt with as are mixers, headphones, tape and accessories.

Tape Recorders: A-Z costs £1 (price includes post and packing) and is obtainable from the publishers: *A.P.A. Publishing (Catalogues) Ltd.*, 4th. Floor, Quality House, Quality Court, Chancery Lane, London, W.C.2.

Diode power

Philips Research Laboratories, Eindhoven, Holland announce for their silicon diodes in oscillators of the "Avalanche Transit Time" type, a continuous output of 1.75W at a frequency of 5GHz (6cms wavelength). For a wavelength of 3cms it is 0.5W at 10GHz.

The oscillators are used for supplying the microwave power in links operating in the centimetre wave range.



FET'S AND THEIR USES

T. SNOWBALL

PART 1

FIELD EFFECT TRANSISTORS, or f.e.t.'s for short, are becoming cheaply obtainable in very great variety but unfortunately their characteristics have even wider spreads than usual. In the cheaper varieties of f.e.t. the drain current for zero bias voltage can have a spread of up to 15:1, and the bias voltage for cut-off can have a similar spread. Usually the more costly f.e.t.'s of up to £4 each are no better performers than their cheaper brothers, the cost usually just providing a smaller spread of parameters, and metal instead of plastic encapsulation. A simple checker will quickly give you your particular f.e.t. characteristics and enable you to get the maximum performance from the cheap f.e.t.'s now available. It is possible, of course, to allow for spreads of characteristics when designing but of necessity you will only get the performance of the worst unit.

Only two measurements are required on the normal f.e.t. to give the characteristic shown in Fig. 1. Here the drain current (I_D) is plotted against the gate, source or bias voltage (V_{GS}). The two points of interest on this curve are I_{DSS} (The drain current for zero bias) and V_P (The gate source bias voltage for zero drain current).

Having defined I_{DSS} and V_P any other point on the curve is obtained from the equation:

$$I_D = I_{DSS} \left(1 - \frac{V_{GS}}{V_P}\right)^2 \dots\dots\dots(1)$$

This is an equation for a parabola with its vertex at V_P . The above form is the one to use to work out the drain current for a given value of bias.

Below is the formula to use when working out the bias for a given drain current:

$$V_{GS} = V_P \left(1 - \sqrt{\frac{I_D}{I_{DSS}}}\right) \dots\dots\dots(2)$$

The two points of interest, I_{DSS} and V_P , are easy to measure in a simple test circuit as in Fig. 2. The checker which forms the subject of this article has the same basic circuit but includes switching for N channel (+ve drain volts) and P channel (-ve drain volts) types. It will also check the newer types such as *insulated gate field effect transistors* (i.g.f.e.t.) or *metal oxide silicon transistors* (m.o.s.t.) as they are sometimes called, *dual gate f.e.t.* and f.e.t.'s with substrate connections. The i.g.f.e.t.'s sometimes need bias voltages with the same sign as the drain supply, and these types are called *enhancement* types as opposed to the more normal ones which are usually junction f.e.t.'s (j.f.e.t.) called *depletion* types.

Sometimes I_{DSS} and V_P are not given in the manufacturer's data, but only I_{DSS} and g_{m0} , where g_m is the transconductance in μmhos , or mutual conductance in mA/V (i.e., the change in I_D for a given change in V_{GS} , the slope of the characteristic at the point of use). Remembering back to school days this is obtained by differentiating equation (1) with respect to V_{GS} :

$$\frac{\Delta I_D}{\Delta V_{GS}} = g_m = \frac{2}{V_P} \times I_{DSS} \left(1 - \frac{V_{GS}}{V_P}\right) \dots\dots\dots(3)$$

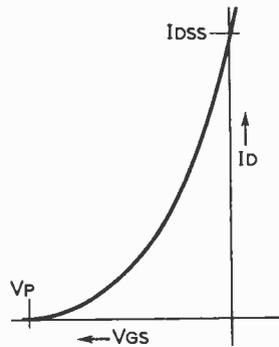


Fig. 1: Drain current versus Gate Source volts.

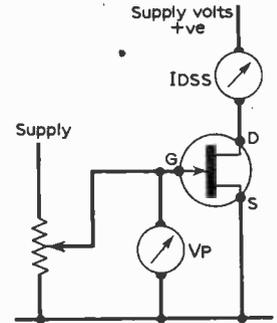


Fig. 2: Test circuit for V_P and I_{DSS}

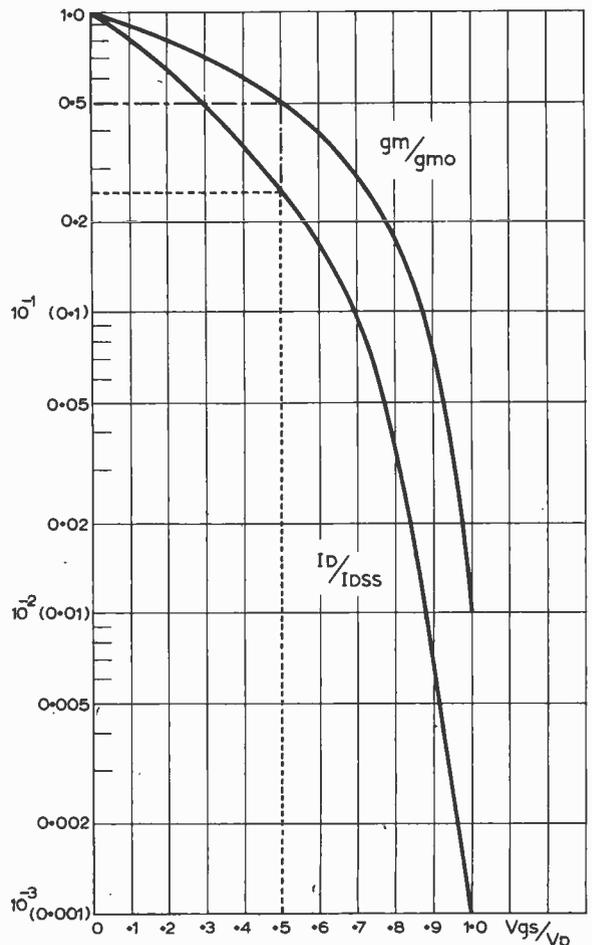


Fig. 3: Normalised curves for I_D and g_m versus V_{GS} .

however, if V_{GS} is made zero, then the g_m at zero bias:

$$g_{m0} = \frac{2I_{DSS}}{V_P} \dots\dots\dots(4)$$

So a simple relationship exists between g_{m0} and V_P

which means that conversion from one type of specification to the other is simple. If we wish to, we can work in g_m easily by using equation (4) to get g_{mo} from the checker measurements of I_{DSS} and V_P .

The mutual conductance at any other value of I_D is given by:

$$g_m = g_{mo} \sqrt{\frac{I_D}{I_{DSS}}} \dots\dots\dots (5)$$

or at any other value of V_{GS} from (3),

$$g_m = g_{mo} \left(1 - \frac{V_{GS}}{V_P}\right) \dots\dots\dots (6)$$

A simple graph which will do all the sums in equations (1), (2), (5) and (6) is shown in Fig. 3. This graph is normalised to value one, so as an example, if our measured f.e.t. had an I_{DSS} of 5mA and V_P of 5V we must multiply our answers by 5 when read from Fig. 3. Shown dotted is the point where I_D is $I_{DSS}/4 = 1.25mA$, shown as 0.25 on the graph, so going across horizontally to the I_D/I_{DSS} curve and then reading the intercept vertically below on the V_P scale we get the working point to be $0.5V_P$ or $2.5V$ bias. Coming back up the vertical line to intercept the g_m/g_{mo} curve and reading this off horizontally we get $g_m = 0.5g_{mo}$, g_{mo} is 2.0 from equation (4), so $g_m = 1mA/V$ at I_D of 1.25mA and V_{GS} of 2.5V.

Tester Description

The two gate potentiometers apply voltages of $\pm 15V$ through gate series resistors of $100k\Omega$ in order to limit the gate current to a safe value when the f.e.t.'s are forward biased. These pots are calibrated in 1V steps with the zero voltage point accurately marked.

In the drain circuit of the f.e.t. is a 1mA meter, which is used unshunted for V_P measurements and shunted to 20mA f.s.d. for I_{DSS} measurement. The diode D5 across the meter is a high conductance germanium type, which although it does not interfere with the scale calibration, will start to conduct if the current through the meter exceeds 1mA.

The other diodes D1—D4 are any silicon or germanium junction diodes, their function being to direct the current through the meter in the correct direction irrespective of whether an N or P channel f.e.t. is being tested.

The $0.001\mu F$ capacitors on the four terminals of the f.e.t. are to inhibit oscillation, due to the length of connections, while testing high frequency types.

Operation

In using the tester, I_{DSS} is found by setting the V_{GS} pot. to zero, and a direct reading of I_{DSS} is obtained on the 20mA scale of the meter.

In obtaining V_P , which has been specified as the gate source bias for zero I_D , the procedure is to switch to the 1mA scale and increase the bias until I_D has dropped to nearly zero.

The curve gets very flat near V_P and it is difficult to estimate exactly zero I_D so two ways are open. One is to measure V_P at 1 per cent of I_{DSS} , or the one chosen in this tester, is to measure V_P at a fixed low value of I_D , 0.1 mA is used here and is marked as V_P on the meter scale.

Having obtained I_{DSS} and V_P the formulae (1), (2), (5) and (6) or graph Fig. 3 will give all the information required to enable the use of the f.e.t. in any circuit.

Applications

Having tested and measured various f.e.t.'s here are a few ideas on how to use them.

The usual configurations are grounded source, which corresponds to the grounded emitter transistor case and the source follower which is similar to the emitter follower.

The equations for stage gain in the grounded source case are given for two conditions, with and without source feedback Figs. 5a and 5b.

In Fig. 5a the gain $A = g_m R_L \dots\dots\dots (7)$

In Fig. 5b the gain $A = \frac{g_m R_L}{1 + g_m R_S} \dots\dots\dots (8)$

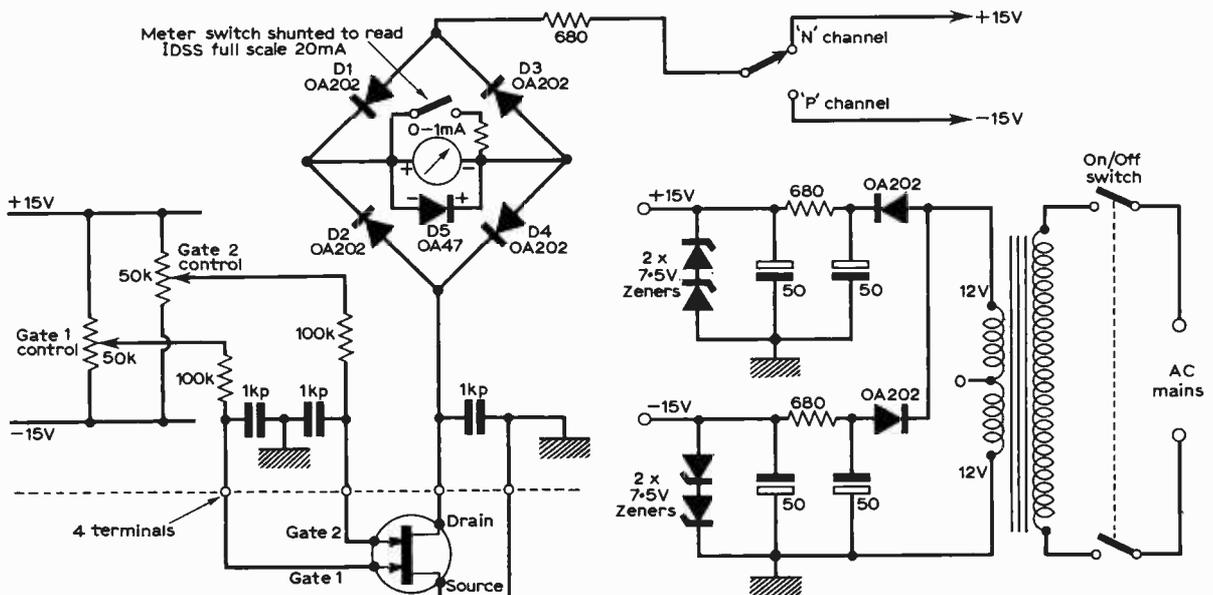
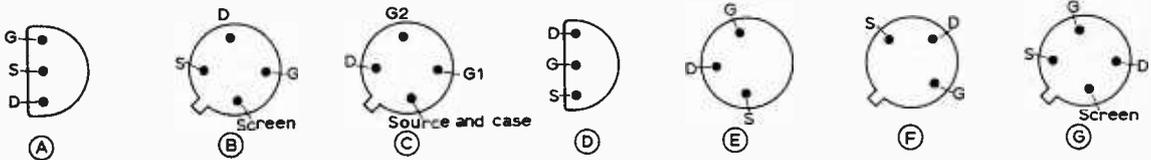


Fig. 4: Circuit of the f.e.t. tester.

F.E.T. DATA TABLE

Type No.	Manufacturer	N Channel or P Channel	V _p at I _d			I _{dss} (mA)			G _{mo} mA/V			V _{ds} (max.)	C _{in} (pF)			C Feedback (pF)			Base
			Min.	Typical	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.	
MPF103	MOTOROLA (plastic)	N	100μA	2.5mA	—	1	3	5	1	3	5	25V	—	4.5	7	—	1.5	3	A
MPF104		N	200μA	3.5mA	—	2	6	9	1.5	4	5.5	25V	—	4.5	7	—	1.5	3	A
MPF105		N	400μA	4.5mA	—	4	9	16	2	4.5	6	25V	—	4.5	7	—	1.5	3	A
UC734	UNION CARBIDE (plastic)	N	400μA	1mA	7.5mA	4	—	20	3.5	—	6.5	30V	—	—	4	—	—	0.8	B
3N140	R.C.A. (TO18, metal)	N	200μA	—	24mA	5	—	30	6	8	18	20V	2	4.5	6	0.01	0.02	0.03	C
3N141		N	200μA	—	24mA	5	—	30	6	8	18	20V	2	4.5	6	0.01	0.02	0.03	C
2N3819	TEXAS (plastic)	N	200μA	0.5mA	7.5mA	2	—	20	2	—	6.5	20V	—	—	8	—	—	4	D
2N3820		P	30μA	0.3mA	7.9mA	0.3	—	15	0.8	—	5		—	—	32	—	—	16	
TIS34	TEXAS (plastic) (similar to 2N3823)	N	400μA	1mA	7.5mA	4	—	20	3.5	—	65	30V	—	—	6	—	—	2	D
2N4302	AMELCO (plastic)	N	10μA	—	4mA	0.5	—	5.0	1	—	—	30V	—	—	6	—	—	—	E
2N4303		N	10μA	—	6mA	4.0	—	10	2	—	—	30V	—	—	6	—	—	3	E
2N4304		N	10μA	—	10mA	0.5	—	15	1	—	—	30V	—	—	6	—	—	—	E
MPF151	MOTOROLA (plastic)	P	—	—	—	1	—	5	1	—	4	40V	—	—	2	—	—	—	E
MPF152		P	—	—	—	2	—	9	1.5	—	5	40V	—	—	2	—	—	2	E
MPF153		P	—	—	—	4	—	16	2	—	6	40V	—	—	2	—	—	—	E
NKT0211	NEWMARKET (Audio frequency) (TO18, metal)	N	1μA	0.5mA	—	0.05	—	0.15	0.2	—	0.7	10V	—	23	—	—	—	—	F
NKT0212		N	1μA	0.7mA	—	0.1	—	0.3	0.4	—	1.1	10V	—	23	—	—	—	—	F
NKT0213		N	1μA	1mA	—	0.2	—	0.8	0.8	—	1.5	10V	—	23	—	—	—	—	F
NKT0214		N	1μA	1.5mA	—	0.5	—	1.5	0.9	—	2.2	10V	—	23	—	—	—	—	F
NKT0215		N	1μA	2.5mA	—	1.0	—	3.0	1.3	—	3.0	10V	—	23	—	—	—	—	F
NKT0216		N	1μA	3.5mA	—	2.0	—	6.0	1.8	—	4.2	10V	—	23	—	—	—	—	F
NKT0111	NEWMARKET (Radio frequency) (TO17, metal)	N	0.1μA	0.5mA	6mA	0.3	—	6.5	0.7	—	3.5	20V	—	—	3.5	—	—	—	G
NKT0112		N	0.1μA	0.65mA	4.5mA	0.45	—	5.0	0.8	—	3.2	20V	—	—	3.5	—	—	—	G



Base connections reference—see data table.

To take a practical case, if we had measured an f.e.t. with $I_{DSS} = 2\text{mA}$ and $V_p = 3\text{V}$ and wanted to run it from a 9V supply line at 0.5mA, from equation (2) the bias needed is:

$$3 \left(1 - \sqrt{\frac{0.5}{2}} \right) = 1.5\text{V}$$

So the source resistor is $IR = 3\text{k}\Omega$

If the drain resistor drops 4V its value is $8\text{k}\Omega$. The gain from (7) will be $A = g_m \times 8$.

The value of g_m can be got from (5) or (6) if we know g_{mo} which we get from (4).

$$g_{mo} = \frac{2 \times 2}{3} = 1.3\text{mA/V}$$

∴ at $I_D = 0.5\text{mA}$ from (5)

$$g_m = 1.3 \sqrt{\frac{0.5}{2}} = 0.65\text{mA/V}$$

So gain is $8 \times 0.65 = 5.2$ Fig. 5a. But for Fig. 5b:

$$A = \frac{0.65 \times 8}{1 + (0.65 \times 3)} = \frac{5.2}{2.95} = 1.75$$

The other characteristics of this configuration are that the input impedance can be very high (equal to the input resistor in fact, which for all normal circuits can be made about $2\text{M}\Omega$) and the output impedance is equal to the drain load.

If the source follower is used as in Fig. 6, the gain is

$$\frac{g_m R_s}{1 + g_m R_s} \dots\dots\dots(9)$$

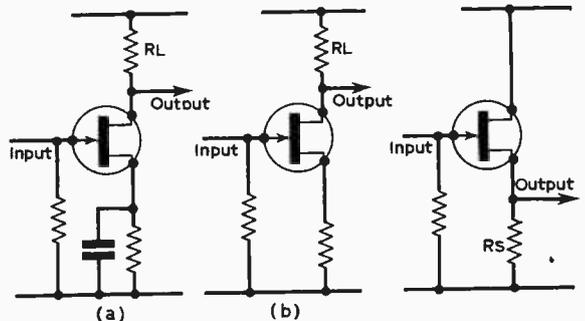


Fig. 5 (a) Grounded source amplifier, (b) with source feedback.

Fig. 6: Source follower.

$$\text{Output impedance} = \frac{R_s}{1 + g_m R_s} \dots\dots\dots(10)$$

which for the f.e.t. considered above at 0.5mA. I_D becomes, from (9).

$$\text{Gain} = \frac{0.65 \times 3}{1 + (0.65 \times 3)} = \frac{1.95}{2.95} = 0.66$$

This is thus similar to an emitter follower except perhaps lower gain (higher g_m f.e.t.'s improve this), the chief characteristic of this configuration is of course lower input capacitance and lower output impedance to help matching to other circuits.

From (10) the output impedance: =

$$\frac{3\text{k}\Omega}{1 + (0.65 \times 3)} = 1\text{k}\Omega$$

TO BE CONTINUED

A PANORAMIC RECEIVER for 160 to 80 METRES



BY D. BOLLEN

PART 3

In this final part the alignment of the receiver is described and examples of displays are shown.

ALIGNMENT

For best results circuit alignment should be carried out with a signal generator. Start by ensuring that the medium wave receiver or i.f. strip is working, and is tuned to a frequency of 1.6MHz. Connect a pair of high impedance headphones, or an audio amplifier and loudspeaker to the detector diode output via S1d (see Fig. 9a). The i.f. transformer cores on the i.f. strip or in the medium wave receiver need not be accurately aligned until later. Temporarily disconnect the three wire links between the diode tuner panel and VC1-VC3, and put S1 in the "listen" position. Connect the converter output lead to the i.f. strip or receiver.

Couple a signal generator to the converter aerial terminal in series with a 470Ω carbon resistor, and inject a modulated signal at 1.67MHz. Fully mesh the vanes of the tuning capacitor VC1-VC3, then adjust the core of T3 to receive the signal. If more than one response is obtained while trimming T3 core, reduce the signal generator output and select the loudest response core position. Next, set the signal generator to 5MHz, and fully open the tuning capacitor vanes. Adjust trimmer TC3 to receive the signal. Now connect a 2.5V d.c. meter in place of the headphones or audio amplifier and repeat the above procedures using an unmodulated signal, this time peaking the meter reading by adjustment of T3 and TC3.

Set the signal generator to 1.83MHz unmodulated and tune in the signal with the tuning capacitor; vanes set approximately 20° from fully meshed. Adjust T1 and T2 cores for maximum output as indicated by the voltmeter. If necessary, reduce signal generator output if the a.g.c. voltage shown by the meter is near maximum. Set the signal generator to 4.5MHz and tune in the signal with the tuning capacitor; vanes set approximately 15° from fully unmeshed. Adjust trimmers TC1 and TC2 for maximum output. If desired, an aerial can now be connected to the converter to check for reception of signals at headphone strength.

THE DIODE TUNER PANEL

The diode tuner panel is deliberately excluded from the early alignment procedures to avoid confusion and to simplify fault tracing. When the converter is working satisfactorily as an ordinary receiver, in conjunction with its i.f. strip, connect up the diode tuner panel to VC1-VC3, and proceed as follows. After making sure that the tuner diode d.c. bias is operational, set the signal generator to 4.5MHz unmodulated, fully unmesh the tuning

capacitor, and peak the output meter reading by adjustment of TC3. Now set the signal generator to 4MHz, tune in the signal with the tuning capacitor, and trim TC1 and TC2 for maximum output. The front end of the panoramic receiver will now be correctly aligned, and all that remains is to obtain a satisfactory response from the following i.f. stages.

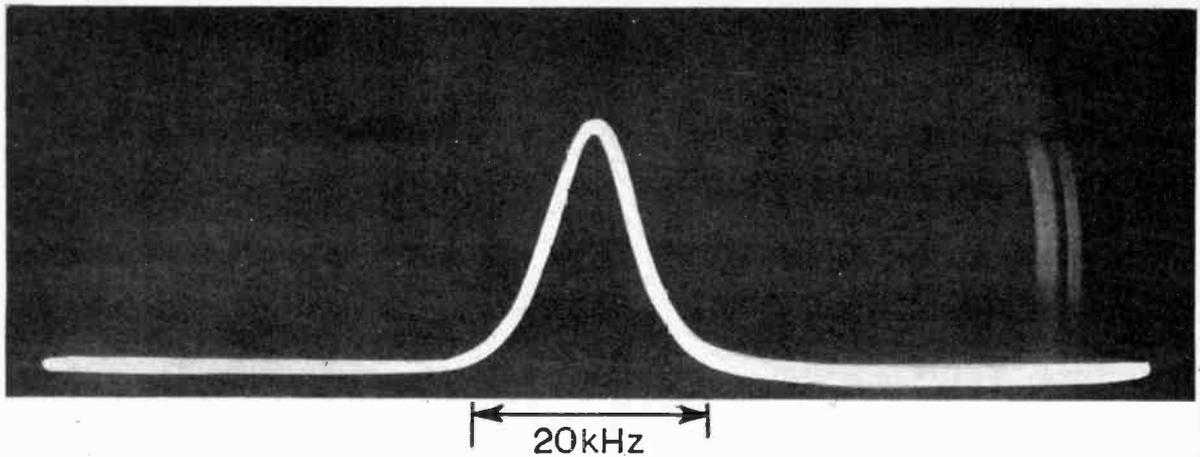
Couple the panoramic receiver to an oscilloscope, according to Fig. 9a. Set the signal generator to 3.5MHz unmodulated, put S1 in the "sweep" position, VR3 at minimum magnification, and VR4 at maximum resistance, and adjust the tuning capacitor until a narrow response curve is seen at the centre of the display. Adjust VR3 until the curve is similar in width to that shown in Fig. 10a. Normally, the sharpest possible response will be required for DX listening, so trim all i.f. transformer cores, including IFT1 on the converter panel, for a steep-sided, symmetrical response curve. Avoid the flat-topped response normally used for broadcast reception.

To complete the setting up of the panoramic receiver, rotate the signal generator dial so that the curve displayed on the oscilloscope screen is moved across the display. With VR3 set for minimum magnification (full sweep bandwidth), look for any falling off in amplitude at the edges of the screen, particularly on the low frequency, left-hand side. Adjust VR4 to give a sweep of approximately ±250kHz at the centre frequency of 3.5MHz, as indicated by the rotation of the signal generator dial. In practice, a perfectly linear response over the full sweep bandwidth is not essential, and some falling off at the edges of the display can be tolerated. If necessary, retrim TC1 and TC2 to correct any tendency for the display to be wedge-shaped in amplitude response, but this correction should not be overdone.

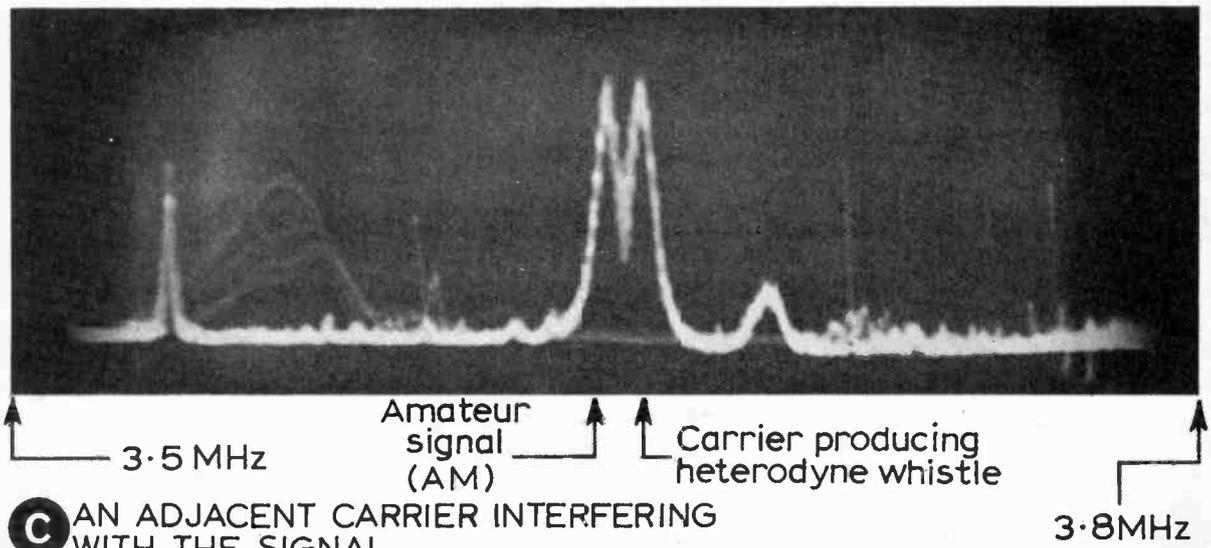
Figure 10 (see overleaf) serves to give some idea of the results obtained with the prototype, but static photographs cannot do real justice to this type of panoramic display, particularly when the timebase speed is slow. Figure 10a shows a plain carrier input signal from a signal generator. A c.w. signal will look like a plain carrier being switched on and off rapidly. In the case of a.m., a modulation ripple is superimposed on the response curve, and when the ripple peaks touch the trace baseline, this corresponds to 100% modulation. Speech clipping and excessive modulation are readily apparent, as is unintentional frequency modulation, which causes the response curve to shift sideways. As might be expected, an s.s.b. signal lacks a response curve during breaks in modulation, and manifests itself merely as a rising and falling modulation ripple.

Figure 10b depicts the 80 metre band on a quiet morning in the middle of the week. An amateur a.m. signal occupies the centre of the display, with another station on the left, and a frequency marker curve from a signal generator on the right. In Fig.

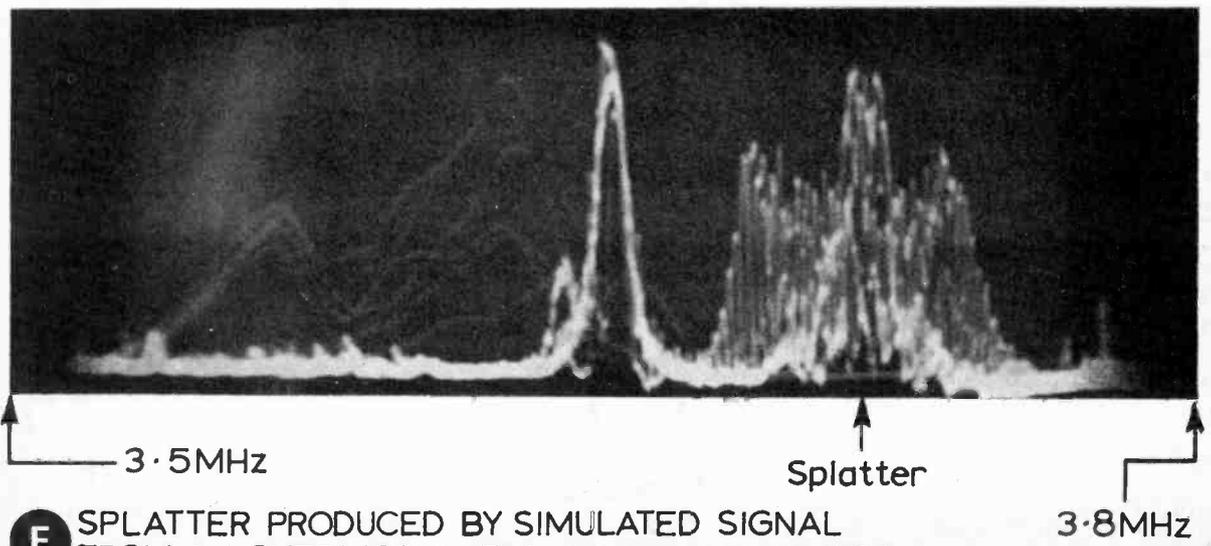
—continued on page 872



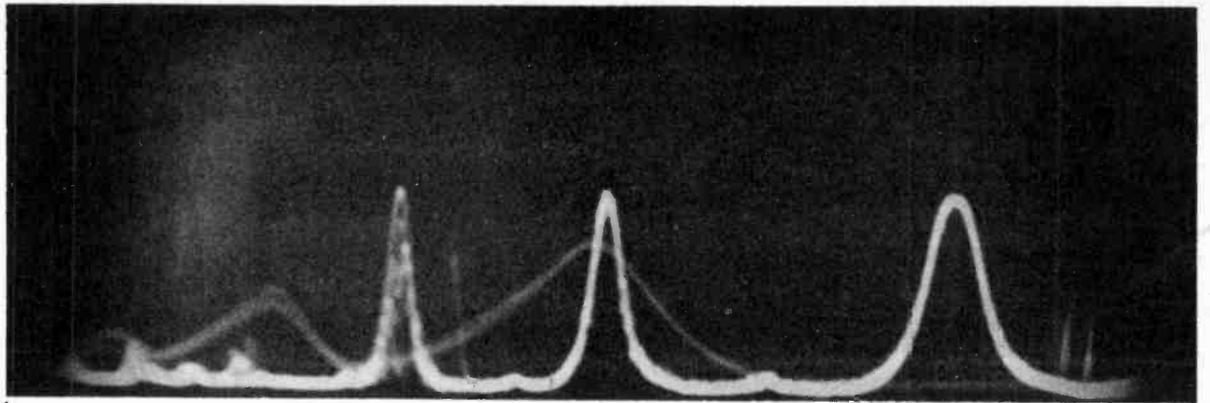
A SIGNAL GENERATOR INPUT PRODUCING RECEIVER RESPONSE CURVE



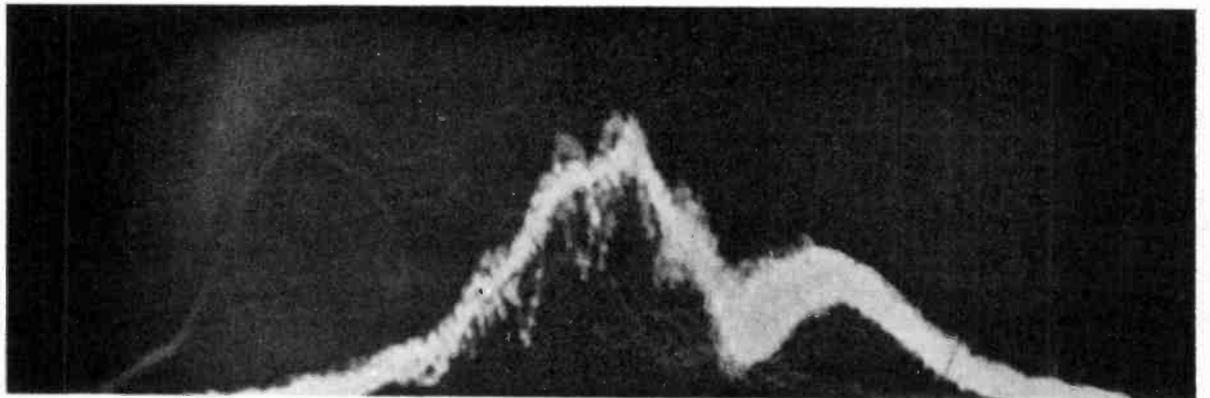
C AN ADJACENT CARRIER INTERFERING WITH THE SIGNAL



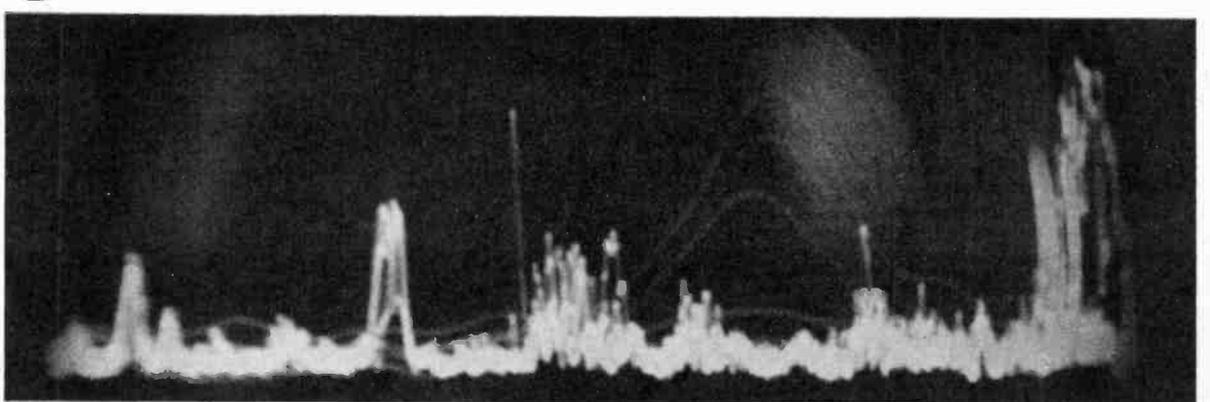
E SPLATTER PRODUCED BY SIMULATED SIGNAL FROM AN OVERMODULATED SIGNAL GENERATOR



B QUIET CONDITIONS ON A PORTION OF THE 80M BAND



D THE 'C' DISPLAY MAGNIFIED



F NOISIER CONDITIONS LATER IN THE DAY

BOOKSHELF

speaker

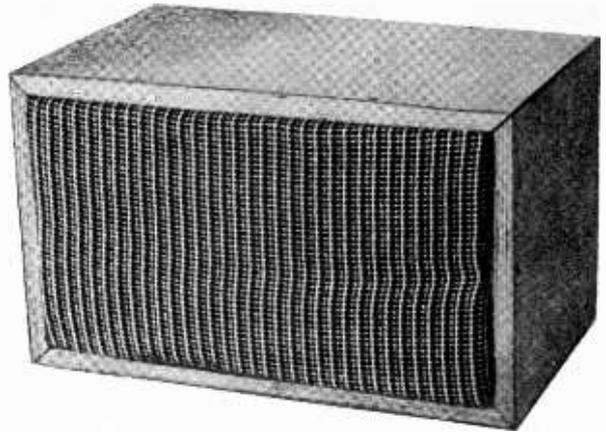
C. R. BRADLEY

THE 'bookshelf' size loudspeaker enclosure is the choice of many high fidelity listeners despite its unsuitability for sound reproduction. The function of a speaker enclosure is to contain the sound disturbance emitted from the back of the speaker cone and prevent it interfering destructively with the useful forward sound. The oft-quoted 'ideal' speaker mounting is in a hole in a wall between two large rooms. Here the sound pressures can escape from both sides of the speaker without mutual interference, but this arrangement is rarely practical and factors such as wall thickness have degrading effects.

The wavelength of the lowest audio frequencies required in a good quality system may be as long as 30ft. (frequencies down to around 30Hz). Practical speaker enclosures are considerably smaller than this and therefore sound congestion arises behind the speaker unit at low frequencies. The inescapable result is that the useful sound output at low frequencies is reduced. One trick is to provide a small port in the enclosure through which rear emitted sound can escape. It will of course interfere with the forward sound emission but if the round trip it has taken from the rear of the speaker is at least a quarter of the sound wavelength, serious cancellation will not occur. Thus congestion in the enclosure is reduced and bass interference is not serious down to a frequency determined by the enclosure dimensions; this is the bass reflex cabinet. Such a cabinet needs to be fairly large but gives excellent results. There are many standard designs for these which are generally available from the speaker manufacturers.

The infinite baffle enclosure is a perfectly sealed box. The speaker works against the volume of air sealed behind it, alternately compressing and rarifying it. The efficiency of the speaker is reduced but there is no interference between forward and rearward emission. The cabinet must be strong enough to contain high internal sound pressures without resonating. A large infinite baffle has been described by the author in "Practical Wireless" Oct. 1967 (Economic Speaker Enclosure).

The speaker manufacturers put much research into getting good sound from small enclosures. The usual result is to use an infinite baffle enclosure and concentrate on designing the most efficient bass speaker possible. The springiness of the trapped air raises the resonant frequency of the speaker so this must be low to start with. The bass speakers used in commercial bookshelf enclosures have very low resonant frequencies for their small size. They also have large, powerful magnets and permit large cone excursions for better efficiency. These speakers are



not often available as separate units.

The loudspeaker enclosure to be described is a two way unit i.e.: it contains a 'woofer' speaker for low and midrange frequencies and a tweeter for high frequencies. The speaker units specified are fairly new and have been found to give together excellent

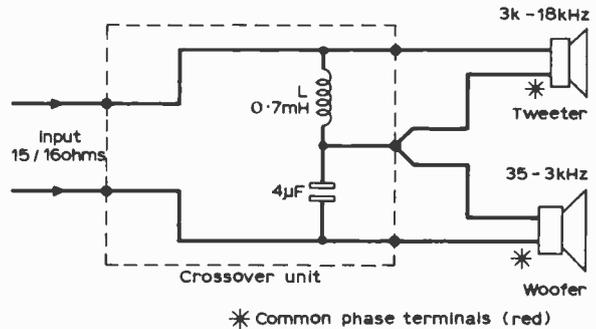


Fig. 1: The circuit of the cross-over network. The capacitor is a non-polarized electrolytic type.

coverage of the audio range. The enclosure is truly 'bookshelf' size as the frontal area is the same as a foolscap sheet (13in. x 8in.) and depth is 8½in. overall. A series L-C crossover network is used and is shown in Fig. 1. Frequencies above 3kHz appear across L and are fed to the tweeter. Frequencies

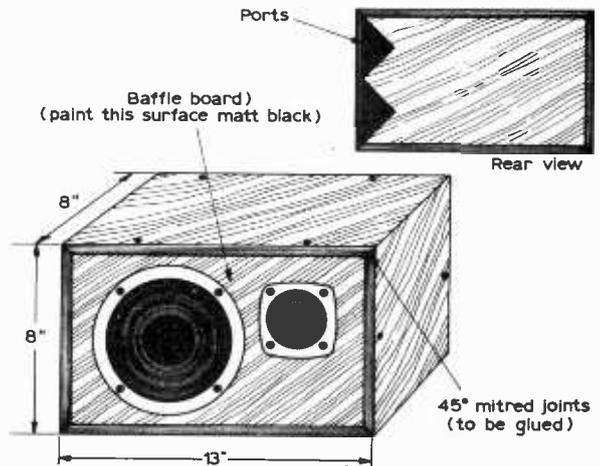


Fig. 2: The assembled enclosure.

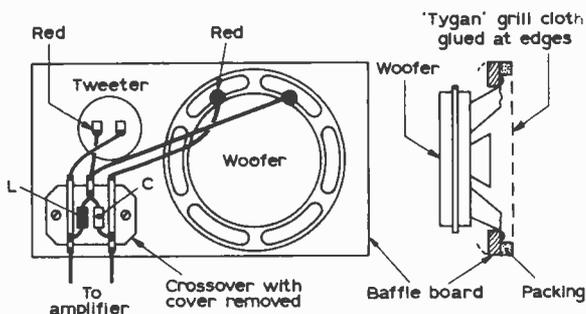


Fig. 3: Mounting and wiring of the speakers on the baffle board.

below 3kHz appear across C and are fed to the woofer. The crossover network can be made up; a non-polarized electrolytic capacitor must be used for C. Messrs. Wharfedale can supply the two components through a dealer. It is easiest to use the ready made crossover unit specified in the parts list. This, like the speaker units, is part of the Eagle product range and can be supplied by any electrical dealer.

The woofer is a 6½in. 11,000 gauss flux density unit that is capable of full range reproduction alone. However its response curve is very jagged above 3kHz where cone resonances and harsh reproduction occur. We therefore use only the smooth response from 35Hz to 3kHz, the excellent lower limit can be achieved with the help of some bass boost at the amplifier.

The tweeter is a 3in. horn cone type and provides a satisfactory response up to 16kHz and is only 5dB down at 20kHz. The quoted ratings of both woofer and tweeter units is 10W and response curves are supplied with both units. When the units are mounted in a well lagged enclosure this rating seems quite realistic and this input will give much more volume than will normally be required, thus there is good power capacity to handle strong transients such as percussive sounds. Any good valve or transistor amplifier that will provide at least 5W into 15Ω will suffice.

The unusual feature of the loudspeaker enclosure is the rear porting. The cabinet interior is heavily damped and the amount of wadding can be adjusted to vary the effect of the ports. If the ports are blocked by a layer or two of wadding material, the enclosure approximates to an infinite baffle. Alternatively, it is often possible to take advantage of the surroundings by using them to absorb the rear radiation from the ports. By using less wadding and allowing sound to escape from the rear, the effective volume of the enclosure is increased and bass response is improved.

Construction

The cabinet is built from six pieces of ½in. plywood and can be stained, painted, varnished or covered as desired. The joints between the top, bottom and sides are mitred at 45° for good appearance and rigidity. The mitred edges must be cut carefully for a neat fit. Two circular cutouts are required in the baffle board. The two speaker units are screwed to the front of the baffle board for best sound dispersion and avoidance of tunnel effects. Ensure that there is an airtight seal between the two speaker frames and the baffle board. Do not screw down the woofer unit too tightly, or to a warped baffle board, as the pressed steel frame will

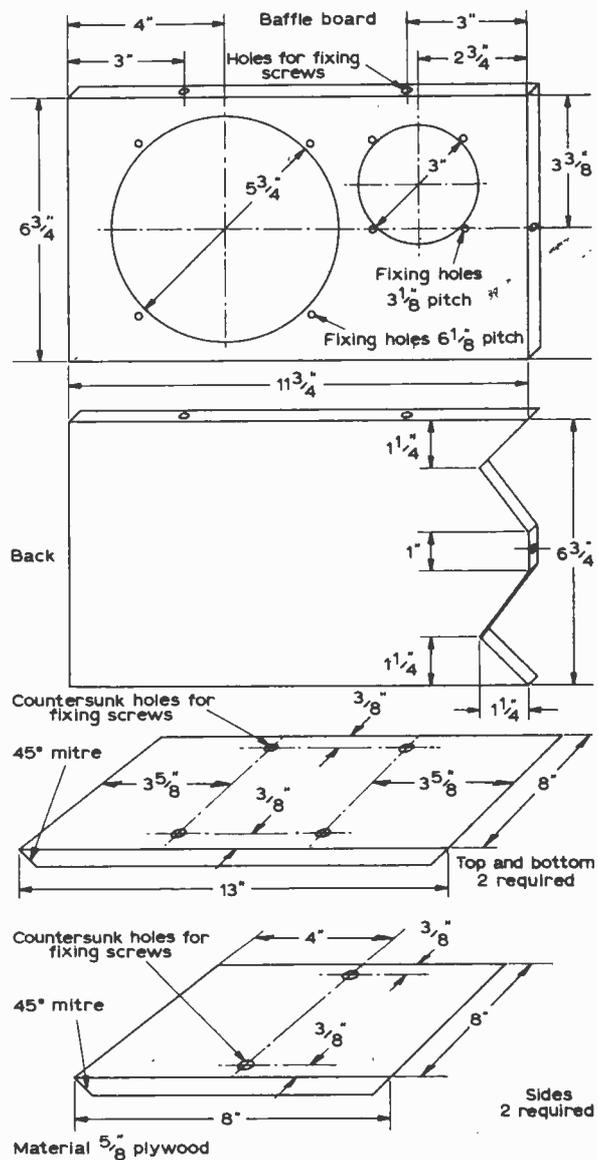


Fig. 4: The cutting details and dimensions.



The wadding is adjusted before the top is fixed in place.

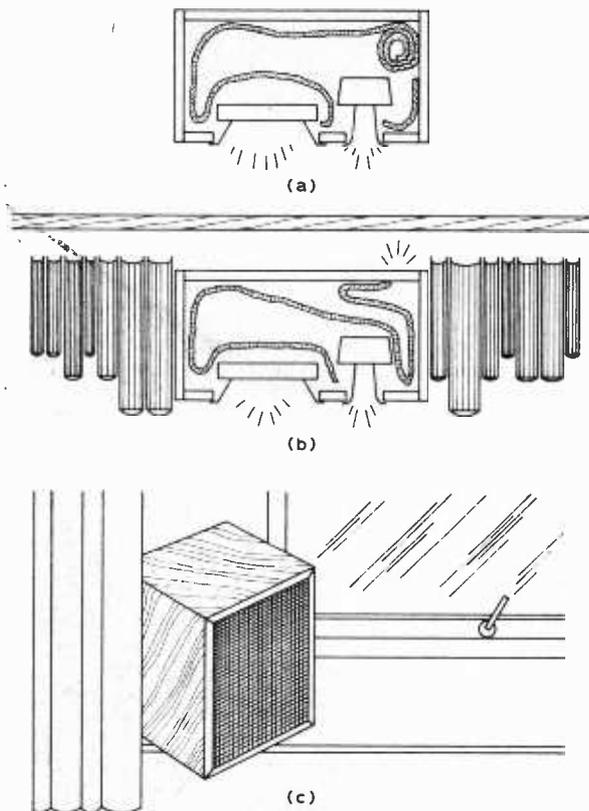
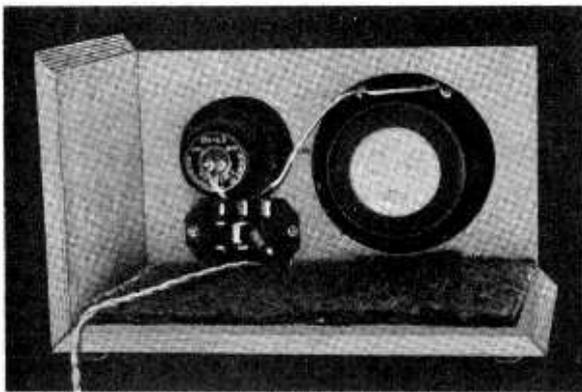


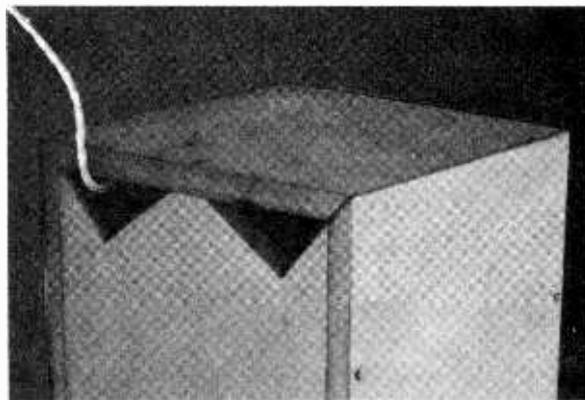
Fig. 5: Alternative wadding arrangements and possible ways of taking advantage of surroundings. a) Infinite baffle. Wadding blocks rear ports and prevents rear radiation. b) Literal bookshelf mounting using space behind books to absorb rear radiation. c) Use of heavy curtains to absorb rear radiation.



The partially assembled enclosure.

be distorted and the precise cone centering ruined. The front edges of the baffle board must be built up by about $\frac{1}{4}$ in. so that the grill cloth will stretch flat across the speakers. Any convenient material such as scrap wood, polystyrene, foam rubber or cardboard can be glued in strips around the edges of the baffle board to provide this packing.

The crossover unit just fits on the back of the baffle board if the solder tags are bent upward. The unit's metal case serves no purpose and wastes valuable cubic inches; it should be removed by extracting the two fixing rivets. The fibre base carrying the



The rear radiation ports.

★ components list

Mechanical

$\frac{3}{8}$ in. plywood as shown.
12 1 in. fixing screws.
10 $\frac{3}{8}$ in. speaker and cross-over mounting screws.
Carpet felt, $\frac{1}{2}$ in. thick—1 square yard. See text.
Rubber feet
Glue.

'Tygan' grille cloth, 15 in. x 10 in.

Electrical

Eagle FR65 $6\frac{1}{2}$ in. loudspeaker.
Eagle CT10 tweeter.
Eagle CN216 16 Ω cross-over.
Connecting wire.
Terminals, if required.

components is then screwed to the baffle board. The speakers are wired to the crossover as shown in Figs. 1 and 3.

The author used $\frac{1}{2}$ in. wool waste carpet felt material obtained from a carpet dealer for wadding. This material is preferable to fibreglass as there is less chance of particles finding their way into the speakers. Plastic foam is useless for this purpose. A layer of wadding is glued to the inside of the top and bottom pieces. The cabinet is now screwed and glued together and inspected for airtightness. Twin core cable can be brought out through one of the ports for connection to the amplifier or any desired form of sockets or terminals used for connections. Leave the top of the cabinet unglued so that the internal wadding can be adjusted. The arrangement of this is mainly experimental. Start with the rear ports completely blocked by two layers of wadding (infinite baffle). Then see if bass response can be improved by readjusting and taking advantage of the surroundings as suggested. Do not stuff too much wadding into the cabinet especially immediately behind the woofer or midrange response will suffer.

Fit rubber feet to the cabinet which can be stood horizontally or vertically. Two of these enclosures fed from a 10+10W stereo amplifier provide the author with excellent stereo listening. The enclosures are used horizontally and are placed 7ft. apart. There is a slight buzz from the woofer on some sounds but it is only audible a few inches away from the cone and does not detract from the reproduction. It apparently originates in the small 'whizzer' high frequency cone. As the woofer is not used for high frequencies, this additional cone could probably be cut away but the author has not cared to risk it. ■



Sign here..!

**for your
miniature
soldering
iron.**

CN 15 Watts. Ideal for miniature and micro miniature soldering. 18 interchangeable spare bits available from .040" (1mm) up to 3/16" For 240, 220, 110, 50 or 24 volts. **from 32/6**



318 watts. Fitted 3/32" bit for miniature work on production lines. Interchangeable spare bits, 1/8", 3/16" and 1/4" available. For 240, 220 or 110 volts. 32/6.



E20 watts. Fitted with 1/4" bit. Interchangeable spare bits 3/32", 1/8", 3/16" available. For 240, 220, 110 volts. From 35/-

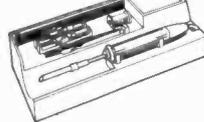


ES25 watts. Fitted with 1/8" bit. Interchangeable bits 3/32", 3/16" and 1/4" available. Ideal for high speed production lines. For 240, 220, 110, 24 or 12 volts. From 35/-



F40 watts. Fitted 5/16" bit. Interchangeable bits 1/4", 3/16", 1/8", 3/32" available. Very high temperature iron. For 240, 220, 110, 24 or 20 volts. From 42/6 Spare bits and elements for all models and voltages immediately available from stock.

Complete precision soldering kit



- This kit—in a rigid plastic "tool-box" — contains
- Model CN 15 watts miniature iron, fitted 3/32" bit. Interchangeable spare bits 3/32", 1/8", 3/16"
 - Reel of resin-cored solder
 - Felt cleaning pad
 - Stand for soldering iron

PLUS 36-page booklet on "How-to-Solder"—a mine of information for amateur and professional.

From Electrical and Radio Shops or send cash to Antex. **49/6**



Model CN 240/2
15 watts - 240 volts
Fitted with nickel plated bit (3/32") and in handy transparent pack. From Electrical and Radio Shops or send cash to Antex. **31/6**



PRECISION MINIATURE SOLDERING IRONS

Antex, Mayflower House, Plymouth, Devon.
Telephone: Plymouth 67377/8.
Telex: 45296. Giro No. 2531000.

- Please send me the Antex colour catalogue
- Please send me the following irons
- | Quantity | Model | Bit Size | Volts | Price |
|----------|-------|----------|-------|-------|
| | | | | |
| | | | | |

I enclose cheque/P.O./cash value

NAME

ADDRESS

PW-3

BENTLEY ACOUSTIC CORPORATION LTD.

Suppliers to H.M. Government

38 CHALCOT ROAD, LONDON, N.W.1

Telephone 01-722-9099

EXPRESS POSTAL SERVICE, SAME DAY DESPATCH BY FIRST CLASS MAIL.

All goods are offered subject to the standard three month guarantee.

NO EXPORT ORDERS

OA2: 5/9	6E5 7/6	12A6 3/6	90AG 67/6	E180F 17/6	EL81 0/-	PCC85 6/6	UB41 6/6	W77 2/6	BA102 9/1	OA10 8/6
OB2 4/6	6F1 8/9	12AC6 7/-	90AV 67/6	EA50 1/6	EL84 6/9	PCC88 9/6	UBC41 6/6	W81M 6/-	BA115 2/8	OA47 2/1
OZ4 6/-	6F6G 4/-	12AD6 6/-	90CG 34/-	EA76 13/-	EL84 4/9	PCC89 9/6	UBC41 6/6	W101 26/2	BA116 3/1	OA70 3/-
IA3 4/6	6F6M 12/6	12AE6 7/6	90CV 33/6	EACB80 6/-	EL85 7/6	PCC189 10/6	UBF80 5/9	W107 10/-	BA123 2/6	OA73 1/9
IA5GT 7/3	6F12 3/3	12AT6 4/6	90C1 16/-	EAC91 3/-	EL86 8/-	PCC805 13/9	UBF89 6/9	W279 10/-	BA130 2/1	OA79 1/9
IC1 5/6	6F15 10/-	12AT7 3/9	150B2 14/6	EAF42 8/9	EL95 5/3	PCC806 15/6	UBL21 9/-	X24 16/6	BCY10 5/-	OA81 1/9
IC2 9/-	6F18 7/6	12AU7 6/6	150C2 5/9	EB34 3/9	EM71 14/-	PCF80 6/6	UC92 5/6	X41 10/-	BCY12 5/-	OA85 1/6
IC3 7/9	6F23 13/3	12AV6 5/6	302 16/6	EB41 4/6	EM80 7/6	PCF82 6/3	UCC84 8/-	X61 5/9	BCY33 4/6	OA86 4/6
IC5 4/9	6F24 11/9	12AV7 8/-	303 15/-	EB41 4/6	EM81 7/6	PCF84 8/9	UCC85 6/9	X63 5/6	BCY34 4/6	OA90 2/6
ID3 6/9	6F25 13/-	12AX7 9/9	305 16/6	EB41 4/6	EM82 7/6	PCF85 16/-	UCF80 4/3	X64 12/6	BCY38 5/-	OA91 1/9
ID5 9/6	6F26 5/3	12AY7 9/9	306 13/-	EB41 4/6	EM83 11/-	PCF87 16/-	UCF81 8/9	X65 5/-	BCY39 4/6	OA92 2/1
IFD1 5/6	6F28 14/-	12BA6 6/-	807 11/9	EB90 4/9	EM87 7/6	PCF800 13/-	UCH42 13/-	X66 7/6	BCZ11 3/6	OA202 2/1
IFD9 4/3	6F29 6/-	12BE6 6/-	996 2/-	EB91 5/9	EY51 7/6	PCF801 7/9	UCH81 6/6	X101 20/6	BCI07 4/-	OA210 1/6
IG6 6/9	6F30 6/-	12BH7 6/-	1821 10/6	EBF80 6/9	EY81 7/9	PCF802 9/9	UCL82 7/9	X109 20/6	BCI08 3/6	OA211 13/6
IHSGT 7/9	6F32 3/9	12E1 17/-	5763 10/-	EBF83 6/9	EY84 8/3	PCF805 11/6	UCL83 10/-	X119 6/6	BCI13 5/-	OA220 12/-
IL4 2/6	6H6GT 1/9	12J5GT 2/6	6060 5/6	EBF89 6/9	EY84 6/6	PCF806 12/6	UCL83 10/-	X119 6/6	BCI15 3/6	OA220 10/6
ILDS 3/9	6J5G 3/9	12J7GT 6/6	7193 10/6	EBF91 6/9	EY87 6/6	PCL82 7/9	UCL83 10/-	X119 6/6	BCI18 4/6	OA220 9/6
ILNS 8/6	6J5GT 4/6	12K3 10/6	7475 4/-	EBF93 6/9	EY88 7/6	PCL83 9/9	UCL83 10/-	X119 6/6	BCI18 4/6	OA220 9/6
IPI 7/9	6J7G 4/9	12K7GT 5/9	A1834 20/-	EBF95 6/9	EY91 3/9	PCL84 7/6	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IP10 5/9	6K7GT 6/6	12Q7GT 6/9	A2134 10/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IP11 5/9	6K7G 2/-	12S2GT 3/-	A3042 15/-	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IR5 5/6	6K7GT 4/6	12SG7 3/-	AC2PEN 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IS4 4/9	6L1 19/6	12SH7 3/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IS6GT 4/3	6L6GT 7/9	12SI7 4/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IT4 2/9	6L7 12/6	12SK7 3/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IU4 5/9	6L12 5/6	12SQ7GT 7/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
IU5 6/9	6L18 6/-	12T1 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
2A7 12/6	6L19 19/6	14S7 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
2D13C 7/9	6L12 6/-	18 12/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
2D21 6/6	6L20 9/6	19A05 4/9	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
2X2 4/9	6N7GT 6/6	20D1 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3A4 3/6	6P1 12/-	20D1 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3A5 10/-	6P15 4/9	20D4 20/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3B7 5/9	6P25 12/-	20F2 14/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3D6 3/9	6P26 12/-	20L1 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3Q5 6/6	6Q6 6/6	20P1 17/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3Q5GT 6/6	6P12 6/-	20P1 17/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3S4 5/9	6Q7G 6/-	20P4 18/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
3V4 5/9	6Q7GT 8/6	20P5 18/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
4D1 3/9	6R7G 7/9	25LGT 5/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
5R4G 5/9	6R7 11/9	25Y5 6/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
5U4G 7/6	6S4 7/9	25Y5G 8/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
5Y3GT 5/6	6S4GT 6/6	25ZG 7/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
5Z3 8/9	6S7 6/-	25ZG 8/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6Z0G 12/6	6S7 3/6	30C1 6/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6A30 12/6	6S7 6/6	30C15 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6A6G 5/6	6S7GT 4/6	30C17 16/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AC7 11/6	6S7GT 4/6	30C18 17/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AG5 3/6	6S7GT 7/6	30F5 16/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AJ5 8/6	6S7 3/6	30FL1 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AJ8 5/9	6U4GT 12/-	30FL12 16/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AK5 5/6	6V6G 3/6	30FL13 16/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AK6 6/6	6S4 4/3	30L1 4/3	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AK8 6/6	6X3GT 8/6	30L13 12/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AL5 2/3	6Y6G 8/6	30L15 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AM6 3/3	6Y7G 12/6	30L17 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6A05 5/6	7A7 12/6	30P4 12/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AT6 20/-	7A6 6/3	30P4MR 17/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AT6 4/6	7B7 10/9	30P12 13/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6A16 5/9	7B7 6/9	30P18 6/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6AV6 5/6	7C6 6/6	30P19 12/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BB6 2/6	7D6 15/6	30P11 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BA6 4/6	7F8 12/6	30PL13 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BE6 4/9	7H7 5/6	30PL14 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BC6G 20/6	7K7 12/-	30PL15 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6B16 7/6	7T7 5/6	35A3 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6B16 8/6	7Y4 6/6	35A3 15/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BQ5 4/9	7Z4 4/6	35D5 12/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BQ7A 7/9	9B6W 7/9	35L6GT 8/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BR7 8/6	9D7 9/9	35W4 4/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BR8 8/6	10C1 12/6	35Z3 10/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BS7 16/6	10C2 10/6	35Z4GT 4/9	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BW6 12/9	10C4 6/6	35Z5GT 6/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BW7 11/9	10D1 8/6	42 5/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BX6 4/6	10D2 14/7	43 10/6	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6BZ6 6/6	10F1 15/6	50B5 6/3	AC2PEN/ 19/6	EBF99 6/9	EY94 7/6	PCL85 9/9	UCL83 10/-	X119 6/6	BCI19 4/6	OA220 9/6
6CSGT 6/6</										

practically wireless

commentary by **HENRY**

Tidying Up

IT is not even Spring and already I am being threatened. Vague references to 'How much nicer that room would be for Jane.' Now that she is at college, she wants more space for her books. Colour schemes are being compared, furnishing books pored over, the 'homey' magazines explored. Like a squatting hippy facing the Establishment, Henry is in danger of eviction.

Main weapon in the female armoury is the accusation that my den is untidy.

Women can never understand that a workshop, *per se*, is untidy. That clutter of cables—all made for special hook-ups, and hung where they are instantly to hand. You never know when the F layer may shift and someone like Bouvet Island come through weakly, crying out to be recorded, when the only machine switched on is the Humbox Rattler I am repairing for a neighbour. And this uses an odd plug—so I must have a jumper lead ready. Eaves-dropping is half the fun of DX.

Henry has the added crime of storing piles of papers. Magazines going back to Caxton, torn columns from newspapers (well, she is always borrowing my scissors, apparently to trim the dog. No harm in that? You haven't seen our dog!) My



You haven't seen our dog.

reference books are downstairs—in the several bookcases that catch visitors' first glances. I am going to start a campaign for Newnes, Butterworth, Odhams, etc., to bring out special engineers' editions in tattered covers.

My heart went out to Frank Young, guesting a CB article for me in the November 1969 issue of *Practical Wireless*.

'... then she wanted our sanctum door left open. Then she began hanging out in there. Then she said the place was untidy. Then, Lord help us, she cleaned it up.'

Note those doom-laden words, she cleaned it up. Henry cannot count the hours he has spent searching for the crimp-ended angle cutters, or an unrepeatable service manual that Her Ladyship has 'put safe.' I found my latest Heathkit catalogue among a pile of colour supplements. Filed there it seems, because it, too, has a pretty cover.

It has some pretty things inside it, also. Have you seen the latest line in test gear? Henry is aching to build himself an oscilloscope. His baby Cossor and old OS-3 are no longer adequate for the tests he has to make, Mr. Michaelis' projects seem much too complicated for the time available, off-the-peg models are beyond my means.

It will do most jobs, except perhaps some of the colour-TV or VTR tests that crop up. In conjunction with the S-3U dual-trace switch and the new IG-18 Sine-Square wave generator, which can supply both waveforms *simultaneously*, it would form the basis of a newly-planned workshop. Henry might be tempted to listen to the subversive hints about uprooting.

But have you seen the latest range? Gone the functional look. We are in the space-age now. If I completed those projects, they would end up in the kitchen with



"That's how I left it!"

the Mark VII All-Automatic Stove that FPY described. I wonder if Mr. Perriam would let me order a Heathkit instrument minus its case?

That little subterfuge of an unboxed chassis is the only means whereby Henry has retained the use of his Armstrong tuner-amplifier, which performs far better than any of the several radios around the house. All those glowing valves, that sur-realistic dial cord, those trailing wires—a deterrent to the tidier-upper.

I am reminded of Colin Reid, whose column in the Oct. 6 *Daily Mail* sparked off a pulse of sympathy. He began with a lovely tale of an actress whose flat was burgled and who led the investigating copper around. He opened the bedroom door and said: 'Whew! They've made a right mess in here, Miss.'

She was wounded. She looked at the drawers pulled open, clothes scattered across the bed, the dressing table a shambles, tights flung across the room, scripts strewn over the floor, and explained:

'No, that's how I left it!'

Colin sympathised, with a quick mental vision of his own den 'where the desk is littered, drawers tilt permanently open and papers, letters and bills are filed on the floor and window ledges for easy reference!'

AN EXTRA HEAD for the BSR TD2

A. OLIVER



The TD2 Tape deck used in a home constructed tape recorder.

A LARGE number of less expensive tape recorders use the TD2 tape deck, extra interest and use can be made by fitting a third head.

To do this, first remove the two push-on operating knobs, then the top-deck cover. (This is fixed by three screws.) The next operation must be done in the order given if the head alignment is to be maintained. Remove the outer fixing screw from the record-replay head base, in its place screw a one-inch length of 6BA brass stud, run a 6BA brass nut down to refix the base. Remove the inner fixing screw on the same head and countersink the hole to take a 6BA screw. The drilling requires only light pressure, the base being made of alloy. Refix the base with a brass countersunk-head screw.

Before altering the erase head, try the tape recorder with a pre-recorded tape to make sure the head alignment is still in order. An easy way to check this is to see that the tape is passing in the same wear groove on the head. A slight adjustment on the screw at one side and the nut at the other side will easily correct any error that is apparent. When satisfied that the playback is correct alter the fixing screws in the erase head base, the 6BA stud on the outside and the countersunk screw on the inside. Test the recorder again to ensure the erase head is in order.

The head to be fitted is the BSR type MN1 55-2R5 which is a half track head, standard fitting to the TD2 deck. When obtained the head is mounted into a base, it is removed from this and fitted with the same screws to a brass strip measuring $2\frac{1}{2}$ in. \times $\frac{1}{2}$ in. \times $\frac{1}{8}$ in. as shown in Fig. 1. This is now fitted as shown. In the authors case it was found that two washers about 0.008 in. thick were needed to pack the head to give the correct alignment.

All that remains now is the wiring. This must be done quickly with a hot iron, not dwelling too long on the head terminals. Connect a piece of wire between the terminals shown. Connect a piece of wire between the terminals shown, remove the wires from the original head and solder to the same terminals on the new head. Now connect a piece of twin screened cable on the original head and bring this out to a suitable socket on the tape-deck panel.

A pressure pad was made by glueing a piece of soft felt to a strip of springy-brass, this in turn being glued or soldered to the existing pressure pad strip on the tape-deck as shown in Fig. 1.

The extra head can be used for monitoring whilst recording, repetitive echo can be given to recordings by feeding the outputs from the new head into the mike input of the tape recorder whilst recording an echo effect can be given to pre-recorded tapes by feeding the output of the new head into a suitable amplifier, these effects can be varied by moving the new head nearer to, or further away from the original head.

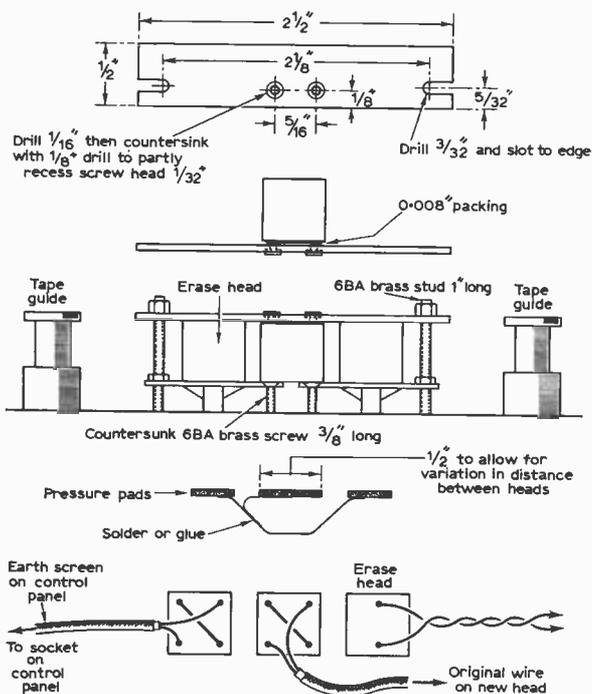


Fig. 1: The constructional details for fitting an extra tape head.

4! brings you a mountain of components at manufacturers' prices

The serious amateur should never be without this comprehensive price list and guide to semiconductors and electronic components from RCA, IR, SGS, Emihus, Semitron, Keyswitch, Plessey, Morganite, Litesold and others (together with manufacturers' application data) which you can buy direct from us at manufacturers' prices e.g. IN914 1/3d.

- IN916 1/11d. □ 2N697 4/5d. □ 2N706 2/3d. □ 2N706A 2/9d. □ 2N929 5/8d.
- 2N1613 4/8d. □ 2N3011 9/1d. □ 2N3053 6/2d. □ 2N3055 15/9d. □ 3N140 15/3d. □ BFY50 4/8d. □ BFY51 3/9d. □ BSY27 18/- □ BSY95A 3/3d. □ C407 4/6d. □ CA3012 18/3d. □ CA3014 25/6d. □ CA3020 25/9d. □ OA200 1/9d. □ OA202 1/11d.



Build the NEW Mainline Audio Amplifier kits - UP TO 70 WATTS

The result of the combined resources of SGS and RCA, these quasi circuits set new standards in quality and performance. Each kit is complete with circuit diagram, all semiconductors, resistors, capacitors and printed circuit board.

12A	£7. 0. 0.
25A	£8. 5. 0.
40A	£9. 0. 0.
70A	£10.10. 0.

Any two will make an outstanding stereo equipment.



To: Mainline Electronics Limited, Thames Avenue, Windsor, Berkshire

I enclose 4/-. Please send me your price list and guide

I am interested in Amp Mainline Audio Amplifier Kits. Please send me full data

I am interested in receiving data on preamplifier & power supply kits

NAME _____ ADDRESS _____

(A member of the ECS Group of Companies)

PW370

SAVE
OVER



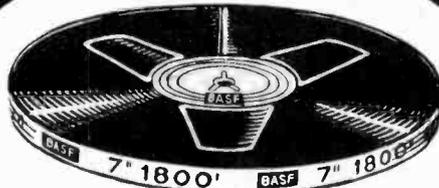
35%

AKG-K20 STEREO PHONES

available for a limited time only.
75 or 600 ohm.

79/6 2/6
P/P

Normal List Price
125/-



SAVE UP TO 40% BASF ROUND TAPE

Brand new, top quality recording tape with leaders, trailers, stop foil, in factory sealed rigid Polythene container.

		List Price	KJ Price
LP 35	900' on 5" reel LP	25/6	16/6
	1200' on 5½" reel LP	32/6	20/6
	1800' on 7" reel LP	47/6	29/6
DP 26	1200' on 5" reel DP	39/6	24/6
	1800' on 5½" reel DP	52/6	32/6
	2400' on 7" reel DP	75/-	45/-

Post and Packing 2/6. Orders over £5 post free.

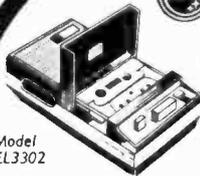
**BASF—ONE OF THE PREMIER
TAPES SUPPLIED BY**



SAVE
£6.60

CASSETTE RECORDER by
PHILIPS

List Price £28.7.0



Model
EL3302

21 gns.
Price
P & P 7/6

Battery operated with up to 120 min. recording from microphone, radio etc. Supplied with carry case, cassette, mic. and recording lead. Fully guaranteed and Brand New

FREE

1970 CATALOGUE
180 ILLUSTRATED PAGES
FANTASTIC DISCOUNTS
SEND TODAY



K. J. ENTERPRISES
(Dept. PW3)

(Head Office & Mail Order Div.)

33 Bridle Path, Watford, Herts, WD2 4AA
SHOWROOMS—(For Callers only)
17 The Bridge, Wealdstone, Middx.
(Opposite Harrow & Wealdstone Stn.)
Hours: 9.30 a.m.—5.30 p.m.
Lunch: 12.30—1.45 p.m.

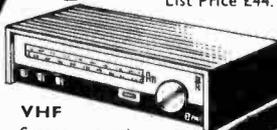
Telephone:
WATFORD
22338 or
25634

SAVE
£15

Philips GH 927 FM Stereo Tuner

PRICE £29.19.6

List Price £44.19.6



VHF

Stereo reception with AFC and MPX Decoder. Cabinet finished in teak. Dimensions 14" x 6½" x 3½".



Brand
New

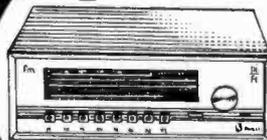


SAVE **£23**

Philips GH 944 AM-FM Stereo tuner with AFC, MPX Decoder, moving coil meter and silent FM tuning. Receives long, medium and short waves as well as stereo VHF. Cabinet finished in teak. Dimensions 15" x 8½" x 5½".

PRICE £49.18.0

List Price £72.18.4



Fully Guaranteed

SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT • Frequencies in kHz

THE BROADCAST BANDS Christopher Danpure

EDWARD (EDDIE) STARTZ of Radio Nederland's Happy Station programme has been a shortwave personality for nearly twice as long as I have been alive, which makes my task of writing an article on the occasion of his retirement a very difficult one.

I will always remember the first time I heard a shortwave broadcast; that fateful Sunday morning when, more by accident than design, I tuned our old domestic receiver to 6020 and heard Eddie's voice. I say fateful because that Sunday morning made me a shortwave listener for life!

I am sure that every reader of this column has heard Eddie at some time in the past and on your behalf I send him the very best wishes for his retirement with thanks for the years of enjoyment and entertainment that he has given us. Let me conclude by saying that I hope his successor, Tom Meyer, will find as big a place in the hearts of shortwave listeners as Eddie did.

The address of the World DX Club which I gave in the December 1969 issue was incorrect and I apologise to Alan Thompson, former-President of WDXC, for any inconvenience this may have caused. The correct address is: 11 Wesley Grove, Portsmouth, PO3 5ER.

Reader's logs and news

John W. Smith, of Anstruther, Fife owns an Eddystone 840C and a Joystick antenna and a.t.u. which enabled him to hear the Broadcasting Service of the *Kingdom of Saudi Arabia* at 1900 on 11855 (SINPO 33443) and enjoy their English music programme.

John also contributed a news item which says that *Radio Havana*, Cuba, is using 17705 for its English language transmissions to Northern Europe from 2110 to 2140.

Bob Loukes, of Richmond, also mentions the Saudi Arabian station adding the information that English is broadcast from 1700 to 2000 and French at 0900-1100 and 2000-2200. He heard the broadcast using an Eddystone EC10 with a Joystick and a.t.u.

Richard Royall, of London, E.14, has the following equipment: 20 year old, four-valve, domestic superhet. (Pye 19a); a 30 watt p.a. amplifier and a 30 metre sloping wire, despite these difficulties he managed to get: *Radio Baghdad* on 6095 at 1930 (good signal); *Radio Damascus* on 9660 at 2030; *Radio Ghana* on 9545 at 2200 (fair signal); HCJB, Ecuador, on 6050 at 0830 (poor signal); WINB at 1700-1900 on 17820 and 1900-2100 on 11795 and, finally, RSA, South Africa on 17745 from 1800 to 1850.

Frank Plumb, of Londonderry, contributed several news items: *Deutsche Welle* transmits in English to North America on 9605, 11795 and 15245 at 1900-1910; *Radio Canada* transmits to Europe on 17820, 15325 and 11720 at 2115-2152 daily and *Radio Nederland* (weekdays only) transmits to Europe on 6085 and 6020 from 2000 to 2120.

Many thanks to this month's contributors, I hope to receive many more reports by the 17th. of the month to 58 Kensington Gardens, Ilford, Essex.

Africa

Malawi: The 100kW transmitter of *Radio Malawi* should start operation in early 1970, until it does the schedule of the station is: 0300 (0400 on Sunday) to 2110 (2310 on Saturday) on frequencies of 3380 (20kW) and 5995 (10kW).

Europe

Andorra: *Radio Rupert* is a new station which is due to start transmissions in English from Andorra in the early part of 1970. I understand that the programming will be similar to that used by Radio Luxembourg but do not know whether the station will use mediumwave, shortwave or both.

Oceania

Australia: *Radio Australia* has moved its morning transmission to North America to one hour later, i.e., 1215 on 9580 and 11710. The evening transmission is still at 0100 on 15170, 17775 and 21740.

South America

Mexico: *Radio Mexico* (first reported last month) can now be heard on the new frequency of 9535 which you probably recognise as the frequency of SBC, Berne, Switzerland. The Mexican can be heard from 0430 to 0545 whilst Berne is off the air.

Panama: HP5B, *Radio Miramar*, Apt. 4402, Panama 7, is a new shortwave station. It operates from 1030 to 0330 on a frequency of 6030.

Venezuela: *Radio Merida* is a new station operating as YVTR on the frequency of 9720 with a power of 1kW. The address for reports is Radio Merida, Avenida Principal, Merida, Venezuela.

Well we are now right in the middle of the winter and the sunspot number has been falling steadily for some months which has led to good reception on the tropical bands. There must be many I.f. specialists who have excellent logs so how about sending them along for us all to have a look at.

73 and good DX until the next time.

THE AMATEUR BANDS

David Gibson, G3JDG

THINK of all that lovely DX you missed last year just because you couldn't read c.w. How about making this a New Years resolution? Just imagine, lovely narrow selectivity cutting out all that QRM, and the feverish logging of exotic call-signs to boot.

Another resolution worth thinking about is to listen on eighty and forty before going on to the "easy" DX bands. If you are licenced, how about a serious assault on t.v.i. this year so that you can enjoy your hobby all the time, instead of sneaking out a whiff of r.f. when the telly isn't on?

To all those with nice, shiny, commercial gear, how about a constructional project this year. Aerial enthusiasts might make an antenna impedance bridge, then they can be sure just what impedance the poor old pi-tank is struggling desperately to match. For the more daring, a grid dip oscillator or one of the many transistor variants is an extremely useful item.

If you haven't got a ticket yet, what about a crystal marker. You can find plenty of circuitry for both valve and transistor frequency markers and you can give a far better report if you are able to specify a reasonably accurate frequency.

For the poor but practical, send 9d. to the RSGB and receive your very own countries list. The prefixes change so much these days that it's always worth getting a list at the beginning of each year just to see what all those funny call-signs are which keep popping up on twenty metres.

Many people write in asking what is the best aerial, a question which is impossible to answer. Probably most s.w.l.'s use a piece of wire, usually as long a piece as they can get out. For those who are in this category an aerial tuner unit (a.t.u.) is highly recommended.

Spies have written in to say that Marion Island is on twenty and another island to listen for is St Brandon Is., also on twenty. If any sleuths hear of anything worth while, please drop me a line but mention the times and, if possible, the frequencies when the DX stations are about.

Don't forget that the long cold nights favour DX on the lower frequency bands and eighty is well worth a listen. Remember that some countries can work from 3.5MHz right up to 4MHz, so don't stop spinning the dial at 3-8.

Fifteen metres should continue to provide some good DX. Best times to listen, according to the Gibby crystal ball, are 0800 to 1800. Similar remarks for listening times apply to ten metres.

Trevor Southern (Sussex), reports many G stations on top band. Incidentally, 160 is always worth a listen since there are nearly always a number of local stations on, and many interesting (and sometimes hilarious) discussions take place. Unbelievers of DX on 80 should prepare to weep. Those who only hear G stations and Europeans should re-connect the antenna.

J. Jackson (Leeds), has a TCS 13 receiver and "A length of wire thrown round the loft." Goodies heard roaming the s.s.b. trail on 80 include; CO2DC, CR4BC, EA3OF, EA4JL, HK3NO, HP1JC, HP9FC/MM/EA9 (fancy sending that on c.w.), K3UZE,

OE1JPA, OY9LV, VE1ART, VE2LD, VE3CBG, VE8RX, VO1FX, W1FRR, W4OUK, W4WQB, WB2YYI, 3Z3ATI, 3Z5CK, 3Z7AWA, 3Z9BLF.

James advises that the best times for a listen on eighty are 2400 to early morning. He also heard that the 3Z prefix for Poland went in January so it looks like we are back to the good old SP's. James says that SM7CRJ is a YL named Britt. further afield Bill logged; VE, VO and 4X4.

W. Waldron (Monmouthshire) sends a log of EU's logged in the 50kHz from 3750 to 3800. From further afield Bill logged; VE, VO, and 4X4 plus a

Allan Horne (Middlesex), CR70A, PR30X and 40ft. indoor wire sends in a list of c.w. stations heard on 40. These include DM, DJ, UA1, UA3, and OK. Come on you superhet types, you can't let a t.r.f. get away with that, or can you?

If you are allergic to RA1 receivers, and PR30 preselectors bring you out in spots then be spotty and get some DX. A. Crooks (Leicester), has both (but not the spots!), and coupled into a 45ft. end fed logged; CR4BC (Cape Verdi Is.), CT2AS, FG7XT (Guadeloupe), PY7AUT and ZS5KS on ten metres. On fifteen, Andy hooked; EA8GK, HP1RC, HR1KAS, PY1BIM, VE3OSC, VK2AVT, VK4TT, VK7GK, W0JW, ZL4PD, ZS6VE. Twenty raised; CR6FP, KH6BB, OH2AJ/AM on flight from Santa Cruz to Helsinki, PY7BDY, SV1CD, VO1FX, ZS5FC, 9Q5EP.

M. Needham (Kent), has a B40 receiver and the antenna is claimed to be a "Piece of wet string" some 70ft. long. (What gauge OM?) According to the receiver, sigs on fifteen arrived from; F5HN/P/W4, JAIWZV, JA6MVO, KP4DCR, KR6KV, VE3ELP, VE4ZX, VP9MI, 9G1BY.

A quick, but damp, dangle on twenty revealed; VE1AJG, VK2BKM, VK4SD, VK5MS, VK5QX, W8ODV, ZC4AK, ZL1AV, ZL2APT, ZL3SE, ZM2QK. Ten metres proved fruitful with squirts of r.f. from; SV0WA, K8AQS, UA6XA, VE3EWY, W8LBI, ZC4JW, ZE1CX, ZE2JA, ZS6OS.

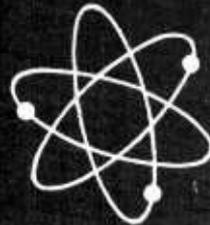
D. Yearman (Renfrewshire), Electroniques front end feeding an HRO and a half size G5RV antenna, reports these sigs on twenty: CN8AD, CT1BT, JA4OI, K1MVT/MM/VR2, K2IXT/M/CT1, KG4AN, MP4TCE, OX2TX, SV0WX, TU2C, ZS2FU, VK3FZ, VK7CW, W4CHH/P4, W4ZDW/MM/VR2, WA4DOU/MM, ZS2PX, ZS6XL, ZL1AV, ZL2AUW, ZL2US, 3V8AL, 5N2AAJ, 5R8DB, 6W8DY.

M. Williams (Lincs.), tells of a European/Canadian net on Friday nights. Time to QRX is 2230BST and frequency around 3.8MHz. Maurice has a 9R59DE and reports good sigs on ten metres, mostly from American stations plus a 5 and 9 from HP9FC/MM/operating off the West coast of Africa.

I think that two metres is just a myth. All you can hear is the spotty-faced G8 in the next block at 5 and 5! Once you've worked both local stations you're dead. Don't agree? Well, how about proving me wrong with some juicy logs. Get those eight-over-eight mechanical monsters swivelling and see what you can sniff out.

Happenings of the month scribbled down in my diary include: February 7-8th., 144MHz contest; 7-8th., ARRL phone contest; 14-15th., 1.8MHz c.w. contest; 21-22nd., ARRL c.w. contest; 23rd., 432MHz contest; 28-March 1st., French phone contest; 7-8th., March, ARRL phone contest (second part).

Address for logs is 5, Edward Close, St. Albans, Herts. and must arrive by the 18th. of the month.



VERSATILE POWER SUPPLY STABILISER

P. R. BROADBENT

THE circuit, see Fig 1, takes in a "rough" d.c. input V_i of variable d.c. level and high a.c. ripple and converts it to a stable d.c. output V_o , having low ripple. The rough d.c. input would normally be provided by a conventional power supply unit with choke or capacitor input filter. Basically using only seven components, the circuit described gives an improvement in a.c. ripple and d.c. stability of the order of 500 times, so that with typical values, a final output of ± 10 to 100 millivolts d.c. stability and 1 to 5 millivolts peak to peak a.c. ripple should be attained. The output current can be from milliamps up to several amps and a wide open choice of component types is possible.

THEORY OF OPERATION

Referring to Fig. 1, current through Tr3 establishes an "intermediate" voltage, V_x . This value is maintained by the amplifier containing all three transistors and its level is defined by zener diodes Z1 and Z2. In the steady state, the base input voltages of the long-tailed pair Tr1 and Tr2 are equal. The voltage at Tr1 base is zener voltage Z1 (V_{Z1}) and the voltage at Tr2 base is V_x minus zener voltage Z2 (V_{Z2}) so that V_x equals $V_{Z1} + V_{Z2}$. In this case, provided R2 is appropriately chosen, the collector currents of Tr1 and Tr2 are reasonably balanced and the current in Tr3 base is just sufficient to produce a current from V_i to maintain V_x at its correct value. Now suppose that for some reason V_x rises, the voltage V_{Z2} remains substantially constant so that Tr2 base voltage rises, Tr2 emitter and hence Tr1 emitter voltage rises. Tr1 collector current falls since Tr1 base voltage is already constant at V_{Z1} . Tr3 base current is thus reduced, its collector current falls, and V_x is allowed to fall back to its original value. The voltage V_x is therefore substantially stabilised with regard to V_i .

Now consider the base of Tr2, which is regarded as the circuit output. Provided no transistors are saturated or turned off, V_o must equal $V_{Z1} \pm$ difference in V_{be} drops of Tr1 and Tr2. But V_{Z1} is fairly constant since its current drive is taken via R1 from V_x , already seen to be stable, and changes in $(V_{be1} - V_{be2})$ will be small provided the design allows for a fairly low and roughly equal current in these collectors. Thus, the output V_o is highly stable and is almost exactly equal to V_{Z1} . Note that both zeners are driven from stabilised current sources giving very low voltage variation.

DESIGN NOTES

The circuit of Fig. 1 deliberately gives no component values, these can be chosen to suit many different requirements as outlined below:

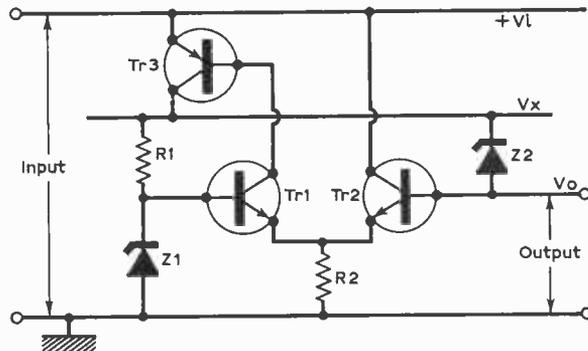


Fig. 1: The skeleton circuit of the power supply.

Transistors. As drawn the circuit is negative earth and requires NPN transistors for Tr1, Tr2, with Tr3 PNP. If an NPN type is desired as the power transistor Tr3, then Tr1 and Tr2 will of course be PNP, the zener polarities should be reversed, and earth will be positive.

Transistors may be silicon or germanium, but Tr1 and Tr2 should be of the same type. These last may be a matched pair for highest stability (although not critical), and are low power, but preferably fairly high gain. Their collector voltage rating *must* exceed V_i .

The power rating of Tr3 should exceed $(V_i - V_x) \times$ (output current + R1 current), although this may be greatly reduced by connecting a suitable resistor in the collector lead.

As suggested below, Tr1 collector current may be of the order of 1mA. This must produce at least the full output current through Tr3. If the current gain of this transistor is insufficient, it may be increased by connecting a driver transistor Tr4, collector to V_x , base to Tr1 collector, emitter to Tr3 base (having disconnected the latter!). Almost any transistor types can be used provided the above requirements are met, a few suggestions follow:

Tr1 and Tr2	PNP	2N3702 or 2N3703
	NPN	2N3705 or BC183L or 2N2926
Tr3	NPN	2N3055 (up to 110 watts on good heat sink) or as for Tr1 and Tr2 (up to $\frac{1}{4}$ watt)

Zener diodes. Both are low power, Z1 is chosen equal to desired output voltage V_o . Z2 is any value, provided not below $V_i - V_o - 1V$ and not above half V_o (preferably).

Resistor R1. Should give a normal current around 5mA or as appropriate for chosen Zener Z1.

Resistor R2. The normal output current divided by gain of Tr3 (and that of Tr4 if used) gives half the current to be allowed for—this should be of the order of 1 milliamp. The resistor value can then be calculated since the voltage is close to V_o .

Low output currents. If output current can be low or zero, a load resistor is needed across the output sufficient to maintain, say, 5 milliamps through Z2+extra (say 20 milliamps) to avoid cutting off the stabiliser loop.

GENERAL CONSIDERATIONS

1. The circuit is intrinsically safe against indefinite short-circuit output conditions since in this case Tr1 and Tr2 and thus Tr3 are turned off. Partial overload may be protected against by suitable Tr3 collector resistor.

2. It is interesting to note that if all the transistors are initially turned off, then there is no reason for them to turn on. In normal use, these may require a resistor between V_i and V_x to give at least half a volt to turn on Tr1. Alternatively, the whole circuit can be regarded as a bi-stable whose "on" level is the stable output V_o and "off" level zero. For such an application, trigger pulses might be applied to any or all transistor bases. Alternatively, a momentary short circuit of V_o could be allowed to leave the output permanently zero until reset.

3. It will be clear that V_x (Fig. 1) provides a second stabilised output although not quite so good. If this is used as such, it will have a current capability comparable with V_o , but any ripple imposed on it will be reflected in V_o . ■

WATCH OUT FOR THE PRACTICAL TELEVISION SINGLE-STANDARD 625-LINE TELEVISION RECEIVER

Constructional details commencing in
the March issue, on sale February 20th.

CORRIGENDA

Semiconductor Technology—Two errors occurred in Part 1 of this series, published in the May 1969 issue. First the negative charge on an electron is 4.8×10^{-10} e.s.u. and not 1.6×10^{-12} e.s.u. (which is in fact the numerical value of 1eV expressed in ergs). Secondly regarding the isotopes of hydrogen, deuterium has one and tritium two neutrons: hydrogen itself has none.

Beginners Portable Receiver—January 1970 issue, page 693. Tr6 is incorrectly drawn in both Figs. 1 and 2. For correct operation the emitter and collector connections must be transposed.

I.C. of the Month—February 1970. It has been suggested that the Weyrad RA2W ferrite rod aerial may be used in this design. The long wave winding should be ignored or alternatively removed from the ferrite rod.

THE MW COLUMN

THE new high power station in Calcutta is coming in very well in the afternoons and should provide newcomers to MW DXing with the opportunity to hear their first Asiatic. The new station is on 1130kHz and has a programme in English daily, between 1530 and 1600hrs GMT. The writer has logged Calcutta several times recently using a loop aerial. Look for the burble on 1133kHz and Calcutta will be found on the l.f. side of it. Wait for a minute or two if you do not hear it at first, although the signal is strong it does suffer from fading. Peking on 1000kHz is another prominent signal when the path is open but in this case the programming is in Chinese.

Last October a DXer resident in Hawaii logged a number of European m.w. stations on two successive nights. The great circle path to Hawaii lies right across the north magnetic pole and it was previously thought that m.w. signals would be absorbed in this region making DX between Hawaii and the UK impossible. A new Alaskan station, KYAK, has now come on the air on 650kHz, its programming is 'country and western' style and it broadcasts for 20 hours a day with a power of 25kW. KYAK is the most powerful m.w. station in Alaska and it ought to be audible in the UK. After midnight, on a night when North American DX is really good, would be the time to try for this station. Others that might be heard on 650kHz are YVLH Venezuela (in Spanish), Godhavn Greenland (sometimes in English) and WSM Nashville Tennessee. WSM is logged occasionally and since its programming too is country and western in the evenings, it is essential that a clear identification be had of the Alaskan to be sure of it. The writer would be glad to hear from any DXer who manages a 'first' from this difficult country.

The band has been quite lively this winter and the following have been logged recently by the writer during the period 2300hrs to 0100hrs GMT. On 590kHz VOCM, St John's, Newfoundland, Tenerife on 620, Canary Islands, YVLH (650) in Spanish, *Radio Giradot*, Maracay, Venezuela, WNBC (660) in New York City, CBF (690) Montreal (CBC French Network), CJOX (710) Grand Bank Nfld., WJR (760) Detroit, Michigan, Dakar (764) Senegal (in French), *Radio Caribbean* (840) on the island of St Lucia (in French), WHDH (850) Boston, CJON (930) St John's Nfld., CBM Montreal (940) (English Network), CKBW Bridgewater, Nova Scotia on 1000, WINS (1010) NYC. WBZ, *Radio 103*, Boston on 1030, CBA (1070) Moncton, N.B., LR1 (1070) *Radio el Mundo*, Buenos Aires, Argentina, WBAL (1090) Baltimore, WBT, Charlotte, North Carolina on 1110, WOWO (1190) Fort Wayne, Indiana, ZBMI (1235) Bermuda (American style programming), PJD2 (1295) St Maartin, Netherlands Antilles, with programmes in English and Dutch, Conakry (1403) Guinea (in French). These are only a selection of what can be heard when conditions are favourable.

Charles Molloy

P.W. GUIDE TO COMPONENTS

PART 15

M. K. TITMAN, B.Sc. (Eng)

Silicon Controlled Rectifier (s.c.r.) or Thyristor

The thyristor or s.c.r. is a four-layer, three-junction structure compounded of alternate p- and n-type semiconductor material and is invariably made from silicon wafers. The circuit symbols commonly used are shown in Fig. 20 and the B.S. preferred symbol is indicated.

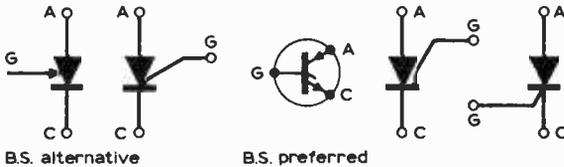


Fig. 20: Thyristor symbols.

The basic structure is illustrated in Fig. 21(a) with the structure split to show the two transistor equivalent structures in Fig. 21(b). The stable operating conditions of the thyristor are best understood by referring to the equivalent circuit of Fig. 21(c). With the polarities indicated the thyristor has two stable modes of operation. If the potential is applied whilst the gate electrode is shorted to the cathode then no conduction takes place as transistor Tr1 is off. The maximum voltage that can be withstood by the thyristor in this mode is known as the peak forward voltage (p.f.v.) and if this is exceeded voltage breakdown occurs.

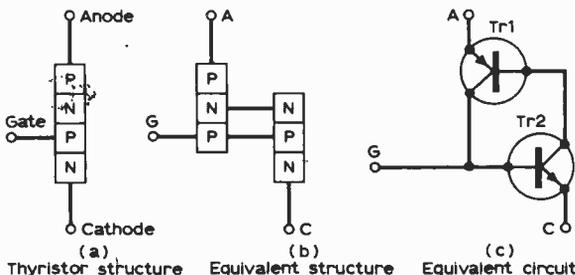


Fig. 21: Basic thyristor structure and the equivalent circuit.

The second stable state with the polarities shown occurs when a positive voltage is applied to the gate. In this mode the thyristor conducts heavily to a saturation potential since Tr1 is made to conduct and its collector current provides the base current for Tr2 which in turn conducts and supplies base current for Tr1. It can be seen therefore that if the gate is shorted to cathode after conduction has taken place this will not affect the conduction of the device. It should be noted that the saturation potential is $V_{be2} + V_{ce(sat)}$ and has a value of 0.8V to 1.5V.

When a reverse voltage is applied to the thyristor it

behaves as a reverse biased diode and blocks current flow providing the maximum peak reverse voltage (p.r.v. or p.i.v.) is not exceeded. The three conditions of operation are therefore forward on or off and reverse off, and it should be noted that either a positive-going pulse or d.c. voltage can be used to trigger the device into the conducting state.

The basic parameters defined by manufacturers are shown in Table 3, together with typical values. From a knowledge of the basic operation discussed above the parameters are self-explanatory. One parameter often neglected is the minimum holding current and this is the current required to maintain saturated conduction. This value is utilised in the operation of thyristors as relaxation oscillators when the device goes out of conduction

Table 3: Typical thyristor parameters and range of values

Parameter	Symbol	Typical values
Max. peak reverse voltage	p.i.v. p.r.v.	50-1,000V
Max. peak forward voltage	p.f.v.	50-1,000V
Max. average forward current	lf(av)	1-100A
Min. holding current	Ih	1-100mA
Turn on time	t on	approx. 3μsec
Turn off time	t off	approx. 12μsec

Table 4: Variation in price and encapsulation with thyristor ratings

Maximum average forward current lf (av)	Maximum reverse voltage p.i.v.	Encapsulation	Price from
1	50	Wire ended plastic or metal	5s.
1	800	Stud mounting (4BA)	15s.
6	50	Stud mounting (OBA ½ UNF)	15s.
6	800	Stud mounting (OBA ½ UNF)	50s.
30	50	Stud mounting (OBA ½ UNF)	£2
30	800	Stud mounting (OBA ½ UNF)	£15
60	50	Stud mounting (OBA ½ UNF)	£8
60	800	flexible terminations	£22

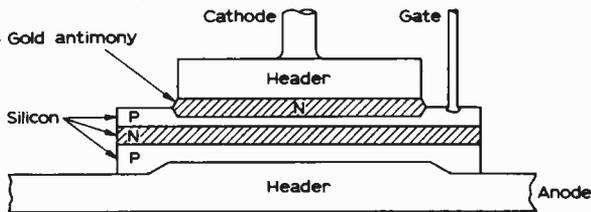


Fig. 22: Thyristor construction.

after discharging a capacitor and the current falls below the minimum holding current.

Thyristors are used in power switching applications such as phase control of heating and motor circuits as well as general a.c. applications. In pure d.c. circuits thyristors require commutation circuits to provide energy in order to switch off and either capacitors or inductors can be used. Thyristors are also widely used in fuse blowing crowbar circuits where the enormous power gain is fully utilised.

The basic construction is very similar to the power rectifier where the junctions are formed by successive diffusions as described in an earlier part of this series. The construction has the advantage of high forward current values but as with rectifiers the disadvantage of slow turn on and turn off times. Thyristor operation at frequencies above 20kHz results in switching power losses. A typical thyristor construction is illustrated in Fig. 22 and this is obtained by successive diffusions. Planar construction techniques are now employed to enable thyristor operation at high frequencies but as yet these devices are considerably more expensive than the conventional diffused construction. As with power rectifiers transient breakdown is limited by edge channelling and such devices are known as avalanche thyristors.

Since thyristors are essentially power devices they are encapsulated in high heat dissipation metal cases. Low current (~1A) devices are available in TO-5 cans but above 1A stud mounting encapsulations are used. Plastic encapsulations are also used and a selection of encapsulations is shown in Fig. 23.

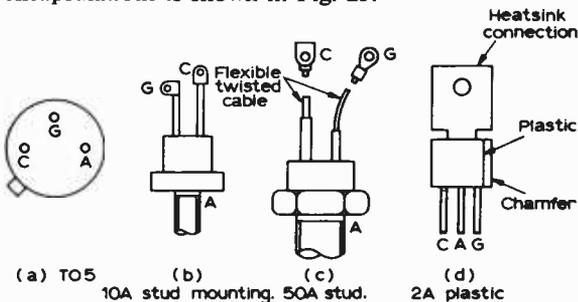


Fig. 23: Thyristor encapsulations.

Thyristor prices vary enormously and generally follow that of power rectifiers in that prices rise with increase in forward current ratings and with maximum blocking voltages. Typical costs are illustrated in Table 4 and in common with other semiconductor devices plastic encapsulations have resulted in price reductions.

Triac

Triacs are four-layer semiconductor devices which are a development of the thyristor. Essentially they operate as two thyristors in anti-parallel as shown in the equivalent circuit of Fig. 24(b) and the symbol is shown in Fig. 24(a).

Triacs are used for a.c. switching purposes and were

developed to replace the thyristor-diode bridge arrangements used previously to allow conduction in both directions. The triac is switched into the conducting state by either positive or negative voltages between gate and anode 1 and can conduct in a saturated mode in either direction. Switch off takes place when the current is zero. When the gate-anode 1 electrodes are shorted no conduction can take place, provided the maximum blocking voltage is not exceeded. Unlike the thyristor however the triac will not sustain damage if the voltage is exceeded since it merely reverts to the saturated mode, but naturally a breakdown at the wrong time could have serious consequences on the following circuitry.

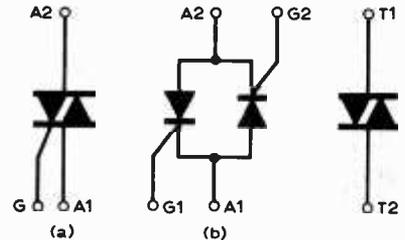
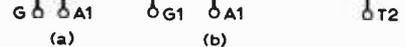


Fig. 24: (a) Triac circuit symbol and (b) thyristor equivalent circuit.

Fig. 25 (right): Diac circuit symbol.



Triacs are available in standard thyristor encapsulations and are available at current ratings in excess of 40A. High voltage ratings are not at present available and the maximum peak voltages available of 500V allow operation up to 250V r.m.s. but not three-phase (440V r.m.s.) switching. Prices are remarkably low and triacs are available from 7s. 6d. for 240V r.m.s. 2A or £2 for 240V, 15A (3.6kW) types.

Diac

Diacs are bidirectional breakdown diodes which conduct only when a specified breakdown voltage is exceeded. They are used primarily as trigger sources for triacs and otherwise have limited applications. They are available in normal diode encapsulations and cost approximately 5s. to £1. The symbol for the diac is shown in Fig. 25 and since it is a bidirectional device it is non-polarised.

Light Emission Diodes

Visible light or infra-red radiation is emitted from semiconductor junctions by the recombination of electrons and holes in the junction. Many semiconductor materials produce useful radiation at suitably constructed diode junctions but at present gallium arsenide (infra-red) and gallium phosphide (visible light) are the most commonly available. Because the light output is directly related to the current they are used as light modulating devices for film marking and in transmission systems where electrical-light-electrical-conversion efficiencies of 70% are possible together with operating frequencies up to 1GHz. Another application for these devices is as indicator lamps with extremely long life times and high efficiency and reliability though at present cost precludes this use.

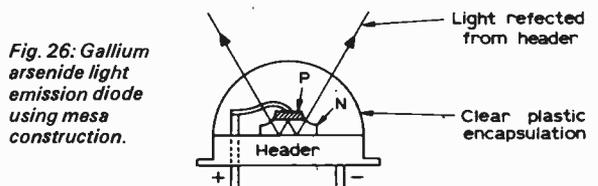


Fig. 26: Gallium arsenide light emission diode using mesa construction.

The basic construction is illustrated in Fig. 26 and consists of a diode junction bonded to a metal header for heat dissipation purposes. The light is emitted from the junction through a transparent cover which is either

glass or plastic and often preformed as a lens to give the required optical characteristics.

At present these devices are expensive and are available from £2 to £25 which has prevented their use as alternatives to normal indicator lamps. However much research is continuing and with the demand for increased reliability and low power dissipation it is quite likely that they will supersede standard low voltage indicator lamps. Another application is in solid state viewing tubes to replace c.r.t.s and an experimental version based on diode arrays is in current use. Widespread use still depends on improved technology and perhaps with planar techniques the necessary improvement will result.

Light Operated Devices

Since photon or light bombardment of p-n junctions causes current to flow most devices are available in light activated varieties. These devices, including photodiodes phototransistors, light activated s.c.r.s and triacs, were discussed in a previous part of this series, together with other light operated devices.

The Future

It is extremely difficult to foretell future trends with semiconductor devices. The more important devices discussed in this article will become widely used and understood and a further miscellany of devices introduced. F.E.T.s are particularly likely to become popular due to the simplicity of design, whilst photoemissive diodes can be expected to have a major impact as the technology of manufacture improves.

Thyristors and triacs will increase in popularity and it is very likely that multiple encapsulations performing the functions of power controllers, switches and contactors will become generally available. It is to be hoped in all these improvements that standardisation of symbols, terminations and designations be carried out at the earliest point of mass production.

TO BE CONTINUED

PRACTICAL TELEVISION *in the MARCH issue*

★ BUILD THIS 625-LINE RECEIVER

Now that all programmes are available in most areas on 625 lines is the time to consider building a single-standard set for optimum u.h.f. performance. Our design features a 20in. c.r.t., double-wound mains transformer, effective black-level clamping, and uses surplus components wherever possible to keep costs down.

★ SIMPLE UHF SLOT AERIAL

And with all-programme u.h.f. you'll want an effective u.h.f. aerial. This simple design is for indoor use.

★ FAULT-FINDING PITFALLS

TV fault diagnosis poses many problems for the unwary. Vivian Capel provides a detailed account of the types of difficulties that can mislead and how to avoid them.

**PLUS ALL THE REGULAR FEATURES
on sale**

FEBRUARY 20th

NEXT MONTH IN

PRACTICAL WIRELESS

TRANSISTOR MINIGENERATOR

Describes the construction of an almost pocket size r.f. signal generator covering 180kHz–2.8MHz on fundamentals and to 30MHz on harmonics. An audio oscillator is included for modulation of the r.f. signal or for external use for audio circuit checking. The complete Minigenerator measures 5 x 6 x 2in.

FET AUDIO PREAMPLIFIER

The matching of ceramic and crystal pickups to transistorised amplifiers often presents problems. The outputs of these transducers must be fed into a high impedance load in order to achieve a satisfactory frequency response and signal to noise ratio. This design using a field effect transistor offers an ideal solution to the problem.

PORTABLE RADIOACTIVITY DETECTOR

The high voltage required to operate geiger tubes in portable equipment is usually obtained from high tension batteries. This article describes a method for operating one of these tubes from a 7½ volt battery thus eliminating the need for large and cumbersome power supplies. The pulses produced by radioactive particles are heard as clicks from a loudspeaker or headphone.

**PLUS ALL THE REGULAR FEATURES—
INCLUDING "I.C. OF THE MONTH",
"TAKE 20", AND OTHER CONSTRUCTIONAL
ARTICLES**

**All in the April issue of Practical
Wireless—on sale 6th March—price
3s 6d.**

UNIT BUILT

GENERAL CC RECEIVE

SSB • CW •
550kHz to 30M

THIS receiver employs twelve transistors and four semiconductor diodes in all, but can be built in simpler form to begin, extra stages being added later. Proceeding in this way has several advantages. A useful, working receiver is obtained as soon as possible, then additional features can be provided in due course. It can also be helpful to check that portion of the receiver already wired, before fitting further stages. Excellent reception is in fact possible over all frequencies with the basic circuit having only six transistors and two diodes.

Coverage is for medium waves and three short wave bands, or about 550kHz to 30MHz in all. The receiver is self-contained with battery. It is capable of long distance reception with the tele-

scopic aerial, though range is naturally greater with a conventional external aerial.

Block Diagram

The simplified block diagram in Fig. 1 will make stages clear, and also clarify which may be omitted during early or intermediate construction.

Tr1 is the r.f. amplifier, a panel trimmer allowing peaking of this circuit with any aerial. Tr2 is the mixer, Zener stabilised by diode D1. Tr3 and Tr4 are intermediate frequency amplifiers, with double-tuned transformers. VR1 allows manual control of r.f. and i.f. gain, which is often useful. Diode D2 furnishes automatic volume control bias, and also detection for a.m. only, if required.

Tr5 is the S-meter amplifier, working a small meter of the ready calibrated type. Tr6 and Tr7 function in the common-emitter product detector circuit, with Tr8 as beat frequency oscillator. This permits reception of a.m., s.s.b. and c.w., a "function switch" controlling this part of the receiver, and also a.v.c.

VR2 is the audio gain control, followed by audio amplifier Tr9, driver Tr10, and push-pull pair Tr11 and Tr12, which will give plenty of loudspeaker volume. Phones may be used when wanted. Diodes D3 and D4 function as audio limiters, considerably reducing interference of static and similar type and avoiding sudden bursts of uncomfortable volume with phones.

In the completed receiver, Tr1 and Tr2 are under the metal chassis, with bandswitch, coils, etc. Tr3, Tr4 and Tr5 occupy a paxolin panel, forming the i.f. and meter amplifier section.

Tr6, Tr7 and the b.f.o. Tr8 are wired on a separate panel, and a.m. reception over all bands may be had even if this part of the receiver is wholly omitted, so it can be constructed later.

The audio section, Tr9, Tr10 and Tr11/12 occupy another insulated panel. These various panels are attached to the chassis and grounded to it.

To take advantage of the step-by-step method of wiring, sections are tested as completed. This enormously simplifies the process of locating any fault.

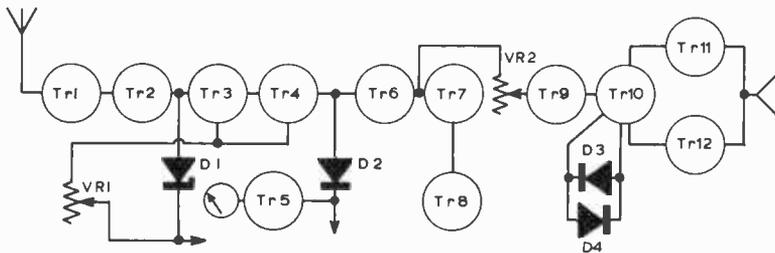
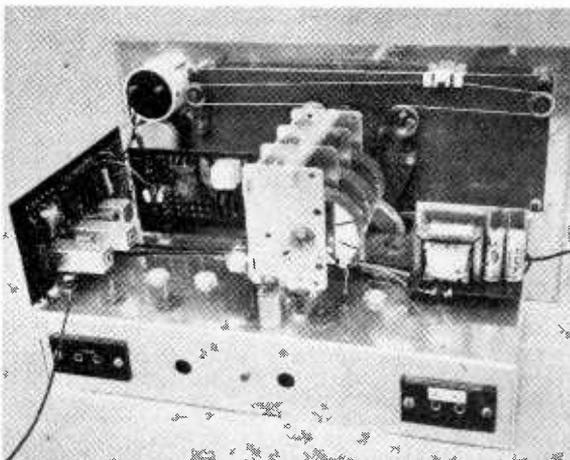


Fig. 1: Block diagram of the complete receiver.



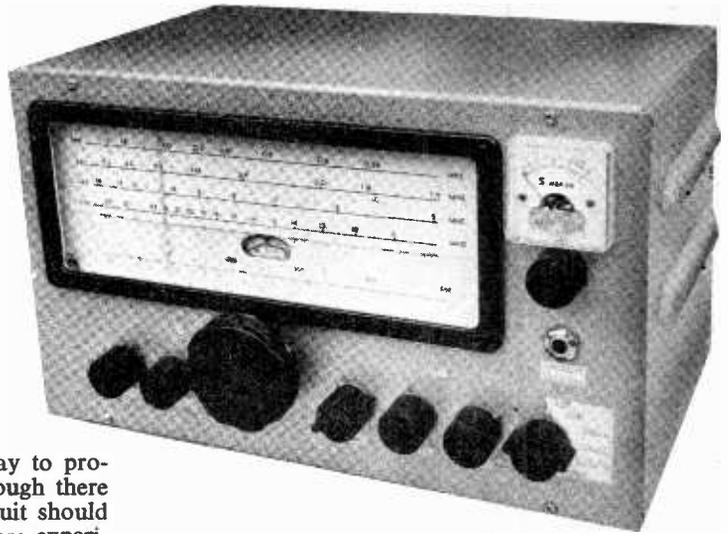
Rear view of the receiver

VERAGE

R

M
IZ

F. G. RAYER G30GR



The following is probably as good a way to proceed as any, especially for a beginner, though there is naturally no reason why the whole circuit should not be used from the beginning by the more experienced constructor.

(1) Wire mixer Tr2, i.f. amplifiers Tr3 and Tr4, and diode D2, with coils for one band. Feed phones from D2. This will give many transmissions at good phone volume, and allow initial alignment of the i.f. amplifier.

(2) Build the a.f. amplifier, Tr9, Tr10, Tr11/12. Those signals previously heard with phones should now give excellent speaker strength. If a little simplification is wanted, Tr9 can be temporarily omitted.

(3) Add the r.f. amplifier Tr1, with aerial coil for the single band chosen, and check working.

(4) Wire Tr5 and the S-meter. The i.f. panel is so placed and arranged that Tr5 can be wired without removing the panel.

(5) Wire the sets of coils for the other three ranges to the wavechange switch, testing and roughly aligning each range as it is added. This will avoid errors in switch wiring, which could be troublesome to locate.

(6) Wire the product detector and b.f.o. panel, insert and wire it. This is also the time to add the a.m./a.v.c./c.w./s.s.b. switch, and minor extras such as p.u. input, tape output, phone jack, diode limiter, etc.

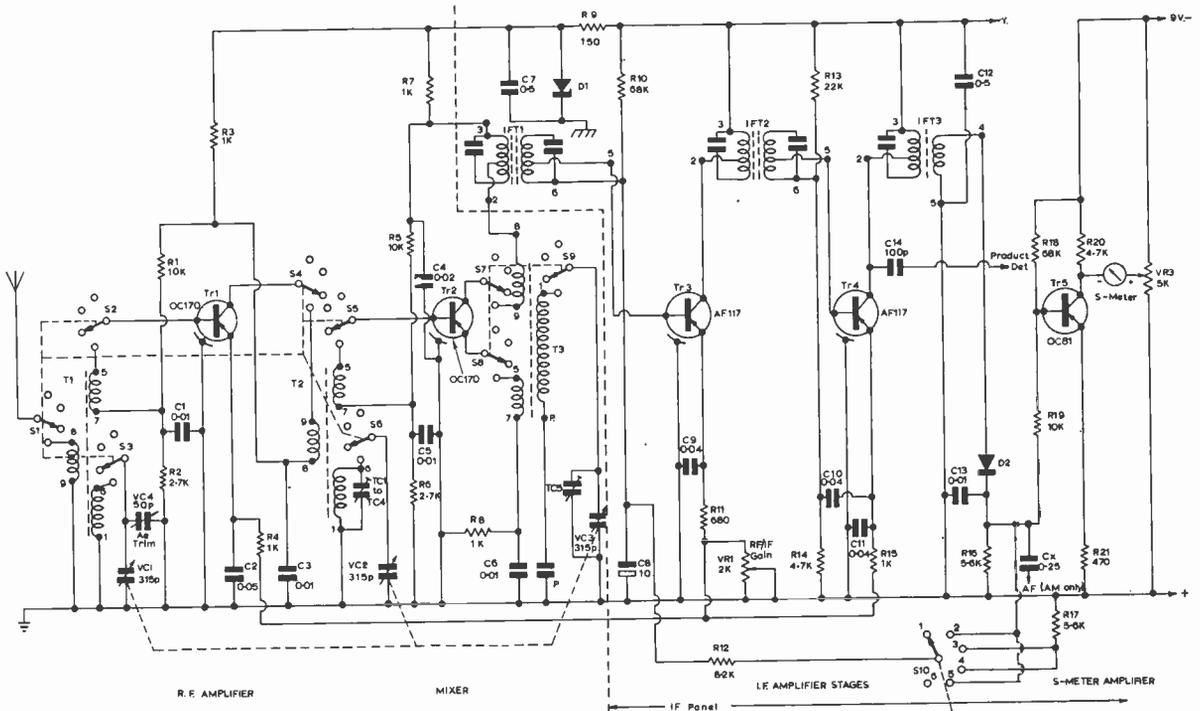


Fig. 2: R.F., mixer, i.f. and meter amplifier stages. See text p.870 for values of padder condenser P. Note: S6 should be shown as ganged to S8.

Coils and Coverage

The bands are approximately as follows:
 S.W.1. 30-11MHz. 10-27 metres.
 S.W.2. 14-5MHz. 21-60 metres.
 S.W.3. 5-1.6MHz. 60-190 metres.
 M.W. 1400-550kHz. 210-550 metres.

If a pre-set trimmer were used with each coil, there would be twelve in all. The number of trimmers is reduced to five by having a single trimmer common to all oscillator coils, and an individual trimmer for each mixer input coil. Then the aerial circuit is adjusted with a panel-mounted capacitor, so giving maximum efficiency with any aerial.

There is clearly no reason why a separate trimmer should not be used for each oscillator coil, if preferred. There will then be eight trimmers, plus the panel capacitor.

Circuit Details

Notes on the various stages should prove useful at various periods during construction. Almost no changes to existing circuitry are needed when adding other stages, but there are a few points which must not be overlooked.

Figure 2 shows the r.f., mixer, two i.f., and meter amplifier stages. Band changing is accomplished by using a switch having three wafers, each three-pole four-way. Figure 2 shows coils for one band only. In the aerial section, S1 switches the aerial, S2 Tr1 base, and S3 the tuning capacitor VC1.

The central wafer on the spindle has S4 for Tr1 collector, S5 for Tr2 base, and S6 for VC2. The

rear wafer uses S7 and S8 for collector and emitter switching of Tr2, and S9 for the tuned windings of the oscillator coils.

Tag P of the oscillator coils is different for each range, as is the value for the related capacitor P. For S.W.1 (highest frequency band) connect pin 6 to chassis, as no padder is required. With range S.W.2, the padder P is 3,000pF, from pin 4 to chassis. For S.W.3, the capacitor is 1,200pF, from tag 3 to chassis. With the m.w. range, the padder is 350pF, and connected from tag 2 to chassis.

To avoid difficulty in wiring here, it is wise to check that the receiver works correctly on one band, before adding the coils for other bands.

The receiver can be tested without Tr1 and associated circuitry by taking S4 to the aerial, and temporarily connecting 8 to chassis, instead of C3. Results should be good.

Tr1 and Tr2 operate on a stabilised 5.6V line, from D1. D1, i.f.t.1, and the other items shown are on the i.f. panel.

Tr3 and Tr4 are the i.f. amplifiers, operating on the supply Y obtained from the audio amplifier. VR1 controls emitter bias of Tr1, Tr3 and Tr4, and its main use is to reduce the strength of powerful signals, which may overload some stages. It must also be used when the a.v.c. is out of action.

S10 is one pole of the "function" switch. Two positions give a.v.c. from D2, while two substitute R17, eliminating a.v.c. This is primarily of use with some s.s.b. and c.w. signals. The receiver may initially be operated without S10, by connecting R12 to D2. The six positions of the switch are (1) Receiver off, (2) A.M. reception with a.v.c., (3) A.M. reception

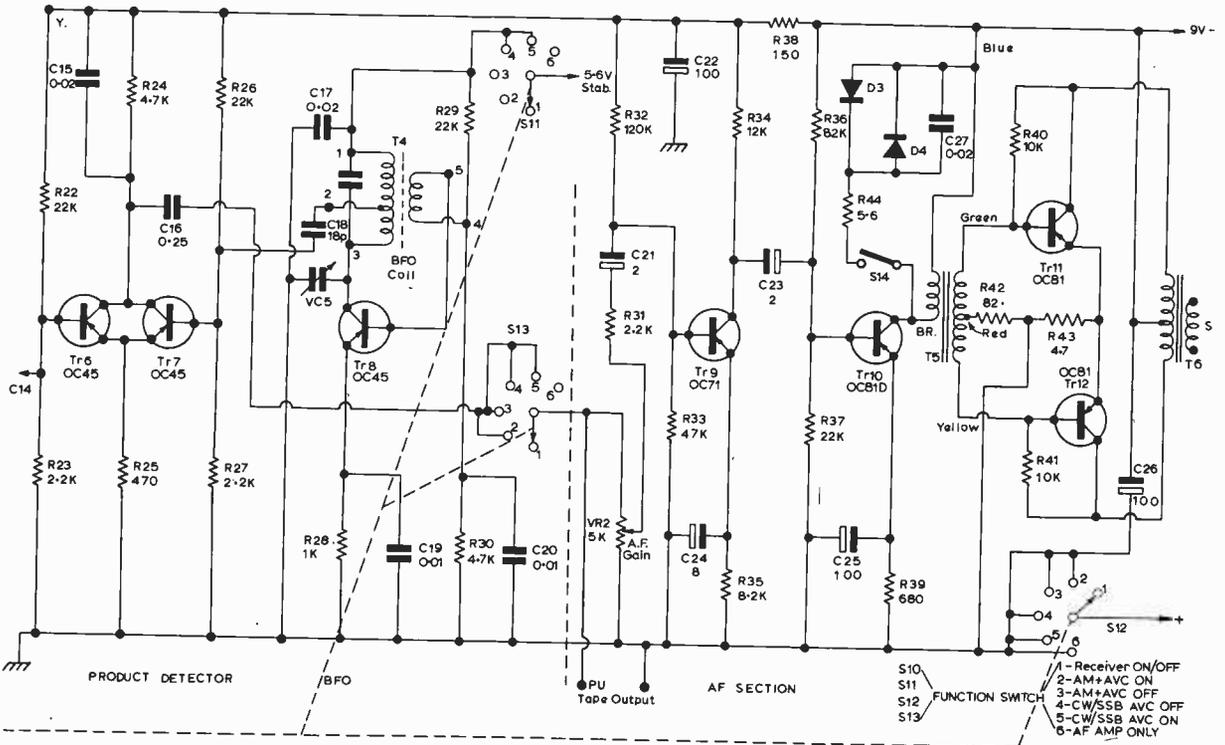


Fig. 3: Product detector, b.f.o., a.f. and output stages. The 5.6 volt stabilised line is taken from the junction of D1/R9 (Fig. 2).

★ sectional components list

Coils:

Aerial (T1): "Blue". Mixer (T2): "Yellow".
Oscillator (T3): "Red". Denco miniature transistor type.

S.W.1: Range 5. S.W.2: Range 4. S.W.3: Range 3.
M.W.: Range 2.

VC1/VC2/VC3 Jackson E3 three-gang or similar.

VC4 Jackson C804, 50pF.
Eddystone C898 drive.

R.F. Stage:

Tr1	OC170	R4	1k Ω
R1	10k Ω	C1	0.01 μ F 150V
R2	2.7k Ω	C2	0.05 μ F 150V
R3	1k Ω	C3	0.01 μ F 150V

Mixer Stage:

Tr2	OC170	R8	1k Ω
R5	10k Ω	C4	0.02 μ F 150V
R6	2.7k Ω	C5	0.01 μ F 150V
R7	1k Ω	C6	0.01 μ F 150V

Padders: 350pF, 1,200pF, 3,000pF

TC1 to TC4, each 60pF miniature compression trimmer.

TC5 30pF beehive trimmer.

I.F. Amplifier:

D1	5.6V 1 watt Zener, Z1104		
D2	OA81		
Tr3	AF117		
Tr4	AF117		
I.F.T.1	Denco I.F.T. 18/465		
I.F.T.2	Denco I.F.T. 18/465.		
I.F.T.3	Denco I.F.T.14.		
VR1	miniature 1 watt wire-wound, 2k Ω (Home Radio VR25)		
R9	150 Ω	R14	4.7k Ω
R10	68k Ω	R15	1k Ω
R11	680 Ω	R16	5.6k Ω
R12	8.2k Ω	R17	5.6k Ω
R13	22k Ω		

C7	0.5 μ F 150V	C11	0.04 μ F 150V
C8	10 μ F 6V	C12	0.5 μ F 150V
C9	0.04 μ F 150V	C13	0.01 μ F 150V
C10	0.04 μ F 150V	C14	100pF silver mica
Cx	0.25 μ F 150V required for "A.M. only" circuit.		

Meter Amplifier:

Tr5	OC81		
R18	68k Ω	R20	4.7k Ω
R19	10k Ω	R21	470 Ω
VR3	Pre-set or panel linear 5k Ω wire-wound 1W.		

1 $\frac{1}{2}$ in. sq. 1mA S-meter.

Product Detector and B.F.O.:

Tr6	OC45	Tr8	OC45
Tr7	OC45		
R22	22k Ω	R27	2.2k Ω
R23	2.2k Ω	R28	1k Ω
R24	4.7k Ω	R29	22k Ω
R25	470 Ω	R30	4.7k Ω
R26	22k Ω		
C15	0.02 μ F 150V		
C16	0.25 μ F 150V		
C17	0.02 μ F 150V		
C18	18pF silver mica		
C19	0.01 μ F 150V		
C20	0.01 μ F 150V		
VC5	15pF variable		

B.F.O. coil, Denco IFT14 (T4)

A.F. Section:

VR2	small 5k Ω log. pot.		
R31	2.2k Ω	R38	150 Ω
R32	120k Ω	R39	680 Ω
R33	47k Ω	R40	10k Ω 5%
R34	12k Ω	R41	10k Ω 5%
R35	8.2k Ω	R42	82 Ω 5%
R36	82k Ω	R43	4.7 Ω
R37	22k Ω		
C21	2 μ F 6V	C24	8 μ F 6V
C22	100 μ F 12V	C25	100 μ F 6V
C23	2 μ F 6V	C26	100 μ F 12V
Tr9	OC71		
Tr10	OC81D		
Tr11/12	Matched pair OC81/NKT251/ AC128 or similar OC81 types.		
T5	Osmor QXD1		
T6	Osmor QX02		

Limiter:

Two GD9 diodes.
R44 5.6 Ω
On-off switch S14
C27 0.02 μ F 150V.

Miscellaneous:

12 x 7 x 7in. Type W cabinet, H. L. Smith & Co, 289 Edgware Road, W.2. 10 $\frac{1}{2}$ x 6 $\frac{1}{2}$ x 2in. Type I chassis (three-sided plus flanges), H. L. Smith & Co, 289 Edgware Road, W.2. WS27A (Home Radio) switch assembly with three WS29 three-pole four-way wafers, studding and spacers (see text). WS27 switch assembly, with two WS29 two-pole six-way wafers, studding and spacers. 1 $\frac{1}{2}$ x 2 $\frac{1}{2}$ in. 16 s.w.g. heatsink, knobs, sockets, tags, 6BA bolts, etc. (Home Radio).

without a.v.c., (4) C.W./S.S.B. reception without a.v.c., (5) C.W./S.S.B. reception with a.v.c., (6) A.F. amplifier only in use.

When the product detector and b.f.o. panel is not ready, Cx from D2 is taken to the audio gain control, giving a.m. reception only. For general broadcast s.w. listening, the product detector may be permanently omitted. When it is employed, it is of a type which furnishes a.m. detection with no b.f.o. injection to the emitter pair.

As mentioned, Tr5 and the S-meter may be omitted until some later date. When in use, increased

bias from D2 moves Tr5 base positive, reducing current through R20. The collector voltage of Tr5 thus moves negative, due to reduced voltage drop in R20. This operates the meter. With the aerial removed, VR3 is adjusted until the meter reads zero. Readings then rise with signal strength.

This is a lively S-meter circuit, operating with a.v.c. on or off, and not upset by b.f.o. injection. With a steady signal, from a signal generator or BBC transmitter (with extremely short aerial) the S-meter can be used to aid alignment. All trimmers and cores, including those of the i.f.t.s., are peaked

for the best S-meter reading.

In normal use, the meter shows any improvement in signal strength, as from changes to aerial or earth, adjustments of an aerial tuner, peaking VC4, or the relative strengths or improvement to amateur signals, etc.

Band Notes

In order to reduce damping on m.w., a 1k Ω resistor is placed between S2 and tag 5 of the coil for this range only. To avoid squegging, a 100 ohm resistor is wired between S7 and tag 9 of the oscillator coil for this band.

For a similar reason, a 470 ohm resistor is placed between S7 and tag 9 on the S.W.1 and S.W.2 (higher frequency) ranges.

The need for these resistors depends somewhat on the actual transistor Tr2, and also on the run of wiring. If excessive oscillation, shown by hissing and whistles, does not arise on a band, no resistor is required. When resistors are fitted, they are best of the lowest value which will prevent this trouble, and values such as those mentioned give no apparent reduction in sensitivity.

Product Detector and BFO

This is built in a panel holding all components except the pitch control VC5, Fig. 3. This item is connected to the metal chassis, and to 3 on the b.f.o. coil.

When this panel is made, Cx in Fig. 2 is not required. D2 now provides a.v.c. only, and signals go from C14 Fig. 2, to Tr6 Fig. 3. Tr6/7 act in such a way as to provide a.m. reception when no input is available from the b.f.o., Tr8. With the b.f.o. in use, mixing gives reception of s.s.b. or c.w. signals. The function switch wafer S11 brings the 5-6V stabilised supply to Tr8, in s.s.b./c.w. positions. In each case audio passes from C16 to the audio amplifier.

This circuit was found particularly easy to adjust for s.s.b., and though VC5 must be correctly adjusted, it is of small value, so not critical to operate. VC5 and Tr8 are completely out of use for a.m. reception, in the usual manner. About 7V is available at Y, which also supplies the i.f. amplifier.

It is often convenient to have an audio amplifier. The last section of the function switch breaks the circuit from C16 to VR2, in the 6th position. A rear socket strip gives input across VR2, so the a.f. section can be used as an audio amplifier. The same socket provides tape output, VR2 being turned to zero, or adjusted to monitor signals.

Function Switching

The operations described are carried out by a four-pole six-way rotary switch. This gives one control, for all modes of use. But there is no reason why separate switches should not be fitted, if preferred.

If VR2 has a switch, this can be wired for "on-off" in the usual manner. A small rotary or slide single-pole two-way switch can substitute for S10, Fig. 2, for a.v.c. on, a.v.c. off. A further on-off switch may replace S11, so that the b.f.o. can be off for a.m., and on for s.s.b./c.w.

AF Section

This is also shown in Fig. 3. A lead runs from C16 to VR2, via S13, mounted on the panel. VR2 is earthed to the chassis, and its slider tag wired to the audio panel input point.

Tr9 is the first audio amplifier, Tr10 the driver, and Tr11/12 the output pair, with individual feedback. This is a very straightforward type of circuit, with the direct current operating conditions of each stage separate from other stages.

If necessary, the first stage Tr9 can be tested by plugging phones across R37, while Tr10 can be checked with phones across the primary of the driver transformer T5.

The exact value of R42 considerably influences results. If Tr11/12 draw almost no current with no signal, and reproduction is distorted, R42 may be slightly increased in value. But if Tr11/12 draw much more than 4mA to 5mA or so, with no signal, R42 should be reduced in value. This depends somewhat on the actual transistors and R40 and R41. The values given should usually be suitable.

Output from the secondary of T6 is taken to a 5in. or other reasonably large 2-3 ohm permanent magnet moving coil speaker, which should occupy a cabinet.

For headphone listening, we may use a jack with contacts which open when the plug is inserted, these contacts being in series with one speaker connection. The loudspeaker is then silenced when the phones are plugged in. Alternatively, T6 secondary may go to a jack outlet, so that speaker or phones can be plugged in, as wanted.

Audio Limiter

This is optional, and formed by D3 and D4, Fig. 3, with C27 and R44. With S14 open, results are normal. With S14 closed, the diodes place R44 across T5, to limit output. VR2 should not be so far advanced that all signals are constantly limited, but only those of excess level, such as static crashes, or the sudden bursts of volume sometimes uncomfortable when tuning with phones. Actual results can be modified by changing the value of R44.

TO BE CONTINUED

A PANORAMIC RECEIVER

—continued from page 849

10c an unidentified carrier is beating with a amateur a.m. signal in the centre of the display, and when this is magnified by adjustment of VR3 (see Fig. 10d) the thickening of the trace between the two peaks is visible to the eye as a heterodyne waveform. Figure 10e demonstrates the effect of splatter resulting from a grossly overmodulated signal. Finally, Fig. 10f was recorded late in the afternoon and shows a marked increase in the number of stations and amount of noise. At the centre of the display are two s.s.b. signals side by side.

An interesting feature of the panoramic receiver display is that it distinguishes between noise derived from the mains and other sources. If the oscilloscope timebase is not locked to a sub-multiple of the mains frequency, mains noise is seen as "clumps" of spiky waveforms drifting across the display. Other noise just causes a thickening of the trace baseline, as seen in Fig. 10f.

INCREASE YOUR KNOWLEDGE

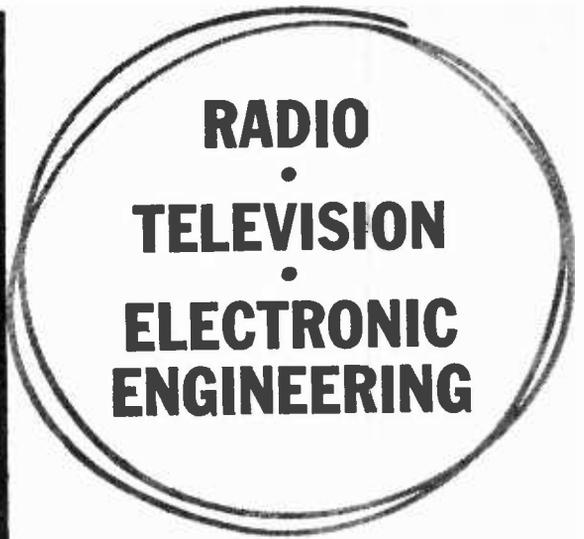


Established 1891

MANY COURSES TO CHOOSE FROM incl.
 RADIO & TV ENGINEERING & SERVICING,
 TRANSISTOR & PRINTED CIRCUIT SERVICING,
 CLOSED CIRCUIT TV, ELECTRONICS,
 NUMERICAL CONTROL ELECTRONICS,
 TELEMTRY TECHNIQUES, CONTROL SYSTEMS,
 ELECTRONICS FOR AUTOMATION,
 COMPUTERS, ETC.

ALSO EXAMINATION COURSES FOR
 C. & G. Telecommunication Technicians' Certs
 C. & G. Electronic Servicing
 R.T.E.B. Radio/TV Servicing Certificate
 P.M.G. Certificates in Radiotelegraphy
 Radio Amateurs' Examination
 General Certificate of Education, etc

BUILD YOUR OWN RADIO AND INSTRUMENTS
 With an ICS Practical Radio & Electronics Course you gain a sound knowledge of circuits and applications as you build your own 5-valve Superhet Receiver, Transistor Portable, and high-grade test instruments, incl. professional-type valve volt meter (shown below). Everything simply explained. All components and tools supplied. For illustrated brochure, post coupon below.



MEMBER OF THE ASSOCIATION
 OF BRITISH CORRESPONDENCE COLLEGES

THERE IS AN **ICS** COURSE FOR YOU

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

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

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

FILL IN AND POST THIS COUPON TODAY

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

PLEASE SEND FREE BOOK ON.....

NAME

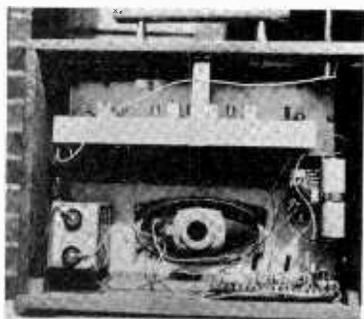
ADDRESS

.....

OCCUPATION..... AGE.....

INTERNATIONAL CORRESPONDENCE SCHOOLS
 Dept. 170, INTERTEXT HOUSE, PARKGATE ROAD, London, SW11
 3/70

A reader's special



The two photographs are of a v.h.f. portable comprising the PRACTICAL WIRELESS V.H.F. Tuner (Feb.-March 1968) and basic amplifier (November 1967).

I have used this as a portable for several months now and it even works well in the car. Good reception can be obtained within 40 miles of the transmitter.

The units could have been installed in a smaller enclosure, but it was felt that to do justice to the output a large as possible speaker should be employed.

I have spent many enjoyable hours assembling these units and many more enjoying the results.—C. W. Britnell (Norwich, NOR 76).

Electric fires

G3TWZ's letter ("P.W.", December 1969) re TO3 "electric fires" reminds me of a true story that I heard about a year ago.

A certain American TV manufacturer was happily producing TV receivers with a power transistor in the line output position. The supply started to dry up so an equivalent (???) from another maker was tried and hence LOPT

electric fires. No matter who made these transistors they all did the same. The only solution was a different circuit design for each transistor manufacturer!

If G3TWZ gets the full spec on these transistors and reads it carefully he will see what I mean—they were the same types and the difference only shows up when the circuit uses the characteristics to the full. It seems that the moral is to use the same type and make that the original circuit-designer specified.—A. M. Levett (Sussex).

The early days

Reading a letter in the November copy of PRACTICAL WIRELESS, from F. Towndrow (Newquay, Cornwall), made me think of my early days in Radio. I still have my first licence issued in October 1923. This was the first licence one could obtain, otherwise than a transmission one for a home-built broadcast receiver, cost was 15s. to cover anytime, before that date one had used one without licence, after that, cost was to be 10s. My first set was also a crystal one built in June 1923. At that time one could obtain very few ready-made components, a pair of phones and crystal was about all. Coils had to be hand wound on cardboard formers, studs and switches could be bought. The hours I spent building this set and all taped out at every 10 turns to studs for tuning. Then the great moment trying to get 2LO 30 miles away in London. "NO luck, dead silence." Laying awake at 2.30 a.m., realised mistake I had made in wiring, got up and put right and waited until 2LO started up again and wonder of wonders, after making nearly everything stats, I got 2LO on phones.

In High Wycombe at that time there were 3 of us in town, the dealers and 2 home-built receivers. How much I owed to Mr. Millner the dealer of West Wycombe Road for his help at that time. From this I went on to make a unit-built valve set again hand wound coils, 400 turns of double silk-covered 20-gauge wire in one coil on a former 6×3in. of cardboard. No light

needed in room with this set's four bright valves on top of set.

Then on to kit sets obtainable to make up yourself. The old "Cossor Melody Maker set," I made one up for myself and quite a few for other people, with the excitement of hearing people speaking overseas. Now at 73 years old I have a modern 7-valve receiver, a domestic 4-band f.m. short-, medium- and long-wave can listen all over the world on an internal aerial, and with a long wire outside and earth, well you know what can be done.

This has always been a hobby for me not my job, as I was in the furniture trade and still enjoy picking up an old set perhaps at a jumble sale and getting it to work again. An old lady has just given me a very old Marconi set, just medium band, only portable mains line cord with a pancake frame aerial inside back. This is now working very well again great fun working out.

I do not know how long I have taken your PRACTICAL WIRELESS, a great number of years, so I wish you continued success with same.—F. W. Wells (Eastbourne).

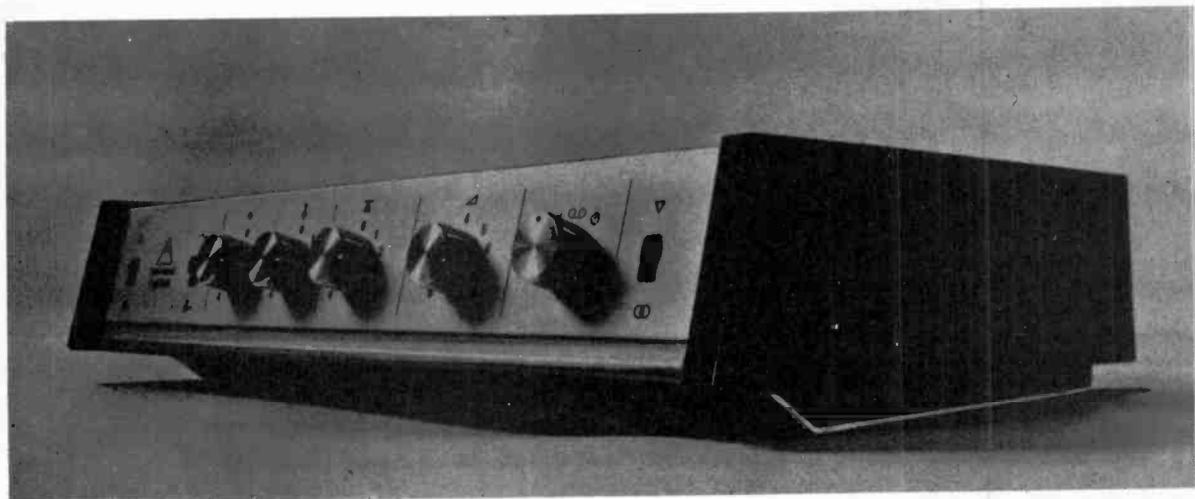
Please leave us be Ladies

I agree most wholeheartedly with F. G. Sadler, G3UZ in his article on page 775 of the February 1970 issue of PRACTICAL WIRELESS. It is one of the World's hardest problems trying to convince a wife or mother that the box or pile of valuable priceless equipment lying in a corner of the bedroom or lounge is not a load of blooming old junk, as many of them will term our equipment.

If us chaps were to go around tidying up heaps of knitting, recipes and piles of *Woman's Owns*, we would soon get a rocket.

So come on wives and mums, let's call a truce. You leave all our equipment, components and service manuals where we put them, or we will gang up on you and start shifting all the piles of ladies' magazines and carefully laid out dress patterns when we feel like having a little tidying up session!—R. Smith (Southgate).

peak sound englefield



developed out of the highly successful PW. 12+12 and now in complete kit form to save you still more

The **Peak Sound Englefield** is a system offering great flexibility whilst providing cost-performance ratios which have never been bettered in high fidelity. Here top-flight circuitry is housed in a cabinet of elegantly original styling which is both beautiful and completely practical front and back. Now we carry design standards further by offering a 12+12 watt version completely in kit form. The resultant specification surpasses that even of the original PW.12+12 which again was based on Peak Sound design. In this Englefield kit, printed circuit boards are supplied for you to mount the components on. Standards of input sensitivity and overload factor on all channels as well as filter performance are all improved. By giving you the satisfaction of building the Englefield this way, you save considerably and finish with a completely professionally styled instrument. Go to your dealer and start building now, or send direct for delivery by return in case of difficulty.

and this is the Peak Sound Specification Guarantee

Peak Sound guarantee that their equipment meets all specifications as published by them and that these are written in the same terms as used in equipment reviews appearing in this and other leading British hi-fi journals. Audio output powers are quoted at continuous sine wave power in terms of Root Mean Square values (R.M.S.) into stated loads at stated frequencies.

The specification that tells you everything (See guarantee)

Using two Peak Sound PA. 12-15's, driven simultaneously at 1 KHz from 240 V. mains supply.
 Output per channel: 11 watts into 15Ω: 14 watts into 8Ω.
 Frequency bandwidth: 10Hz to 45 KHz at 1dB at 1 watt.
 Total Harmonic Distortion at 1 KHz at 10 watt into 15Ω—0.1%.
 Input sensitivities: Mag. PU.3.5 mV. R.I.A.A. equalized into 68KΩ: Tape, 100mV linear into 100KΩ: Radio, 100mV linear into 100KΩ.
 Overload factor: 29dB on all input channels.
 Signal/noise ratio: —85dB on all inputs.
 Vol. control at max.
 Controls: Volume, Treble, Bass, Low-pass Filter. Mono/Stereo: On/off; Balance.
 Complete kit of parts including cabinet assembly, knobs, transistors, well-prepared instructions and wire to length, colour coded and stripped at ends as well as built-in mains power supply. (Post free in U.K.)

£32.12.6

Englefield assembly as above, but in easy-to-put-together modules. (Post free in U.K.)

£38.9.0

Peak Sound ES.10-15 BAXANDALL LOUD-SPEAKER. Fantastic performance and value. Ideal with your Englefield. Cabinet 18"x12"x10" natural teak finish. Ready built—18½ gns. Parts available separately for building yourself with appreciable saving. Leaflet on request.

peak sound

PEAK SOUND (HARROW) LTD., SAINT JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY. Egham 5316

To Peak Sound, Saint Judes Road, Englefield Green, Egham, Surrey
 Details of Englefield systems, please send.....
 Name
 Address
 PW2
 Write your stockist's name and address in margin below and cut out with coupon if necessary

BI-PRE-PAK LTD

DEPT. D, 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX
TELEPHONE: SOUTHEND (0702) 46344

FULLY TESTED AND MARKED

AC107	3/-	OC170	3/-
AC126	2/6	OC171	4/-
AC127	2/6	OC200	3/6
AC128	2/6	OC201	2/6
AC176	3/-	2G301	7/6
ACV17	3/-	2G303	2/6
AF114	4/-	2N1302-3	4/-
AF115	3/6	2N1304-5	5/-
AF116	3/6	2N1306-7	6/-
AF117	3/6	2N1308-9	9/-
AF239	12/6	2N3819 FET.	9/-
AF186	10/-	2N3844A	5/-
AF139	10/-	Power	
BF50	10/-	Transistors	
BSY25	7/0	OC20	10/-
BSY26	3/-	OC23	10/-
BSY27	3/-	OC25	8/-
BSY28	3/-	OC26	5/-
BSY29	3/-	OC28	7/6
BSY95A	3/-	OC35	5/-
OC41	3/6	OC36	7/6
OC44	2/6	AD149	10/-
OC45	2/6	AUY 10	30/-
OC71	2/6	2N3055	15/-
OC72	2/6	Diodes	
OC73	3/6	AAY42	2/-
OC81	2/6	OA95	2/-
OC81D	2/6	OA70	1/9
OC83	4/-	OA79	1/9
OC139	2/6	OA81	1/9
OC140	3/6	IN914	1/6

NEW UNMARKED UNTESTED PAKS

B78	12	Integrated Circuits. Data and Circuits of types, supplied with orders.	10/-
B80	8	Dual Trans. Matched O/P pairs NPN. Sil. in TO-5 can.	10/-
B82	10	OC45, OC81D and OC81 Trans Mullard glass type.	10/-
B83	200	Trans. Makers rejects. NPN/ PNP, Sil. and Germ.	10/-
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202.	10/-
B66	150	High quality Germ. Diodes. Min. glass type.	10/-
B86	50	Sil. Diodes sub. min. IN914 and IN916 types.	10/-
B87	100	Germ. PNP Trans. equiv. to OC44, OC45, OC81, etc.	10/-
B88	50	Sil. Trans. NPN, PNP, equivalent to OC200/1, 2N706A, BSY95A, etc.	10/-
B60	10	7 Watt Zener Diodes. Mixed voltages.	10/-
H5	16	1 Amp. Plastic Diodes, 50-1,000 Volts. 6 large, 10 small	10/-
H6	40	350mW. Zener Diodes DO-7/10 min. Glass Type. AV. 40% Good.	10/-

NEW TESTED & GUARANTEED PAKS

B2	4	Photo Cells, Sun Batteries .3 to .5 volt, .5 to 2 ma.	10/-
B77	2	AD161-AD162 NPN/PNP Trans Comp. Output, PNP.	10/-
B79	4	BY127 Sil. Rec. Diodes. 1,000 P.I.V. 1 amp. Plastic.	10/-
B81	10	Reed Switches, mixed types. large and small.	10/-
B89	2	5SP5 Light Sensitive Cells. Light Res. 400Ω, Dark 1MΩ.	10/-
B91	8	NKT163/164 PNP Germ. TO-5 equivalent to OC44, OC45.	10/-
B92	4	NPN, Sil. Trans. AO6 BSX20 2N2369 500 MHz, 360mW.	10/-
B93	5	GET113 Trans. equiv. to ACY17 to ACY21 PNP Germ.	10/-
B96	5	2N3136 PNP Sil. Trans. TO-18. HFE 100-300 I.C. 600mA. 200MHz.	10/-
B98	10	XB112 and XB102 equiv. to OC126, AC156, OC81/2, OC71/2, NK271, etc.	10/-
B99	200	Capacitors, Electrolytics, paper silver mica, etc. Post and packing, this Pak 2/6.	10/-
H4	250	Mixed Resistors, Post and packing 2/-.	10/-
H7	40	Wirewound Resistors. Mixed Values. Postage 1/6.	10/-

FREE! Packs of your own choice up to the value of 10/- with orders over £4.

RETURN OF THE UNBEATABLE P.1. PAK. NOW GREATER VALUE THAN EVER

Full of short lead semiconductors and electronic components, approx. 170. We guarantee at least 30 really high quality factory marked Transistors PNP and NPN, and a host of diodes and rectifiers. Mounted on printed circuit panels. Identification chart supplied to give some information on the transistors.

P1 PLEASE ASK FOR PAK P.1.
2/- P. & P. on this Pak **ONLY 10/-**

Complementary Set.
NPN/PNP Germ.
trans., Pak F.3. **2/6**
PAIR

P.O. RELAYS 8 FOR 20/-
Various Contacts and Coil Resistances.
Post & Packaging 5/-

★ ALL OUR TESTED SEMICONDUCTORS HAVE A WRITTEN GUARANTEE ★

SEND FOR OUR FREE LISTS AND CATALOGUE OF ALL OUR PRODUCTS. CHECK YOUR OWN EQUIVALENT WITH OUR FREE SUBSTITUTION CHART.

NO CONNECTION WITH ANY OTHER FIRM. MINIMUM ORDER 10/-, CASH WITH ORDER PLEASE. Add 1/- post and packing per order OVERSEAS AND EXTRA FOR AIRMAIL.

THE RSGB AMATEUR RADIO CALL BOOK

1970 edition containing 120 pages.

Complete up to date listing of all amateur stations in the U.K. and Eire together with much operating information including beam headings and list of prefixes.

7s 3d post paid



over **20,000** copies sold

Now in its second printing

Radio Communication Handbook

832 pages of everything in the science of radio communication. The Handbook's U.K. origin ensures easy availability of components. The standard work in its field.

69s post paid

THE VHF-UHF MANUAL

By George Jessop, G6JP

A complete manual for frequencies above 30 MHz. Covers aerials, receivers, transmitters and test equipment. The first book of its kind outside the USA.

23s post paid

Obtainable from:

RADIO SOCIETY of GREAT BRITAIN
35 DOUGHTY STREET, LONDON, WC1

BUILD YOUR CIRCUITS ON VEROBOARD

—the Universal Wiring Board— obtainable from your local Retailer

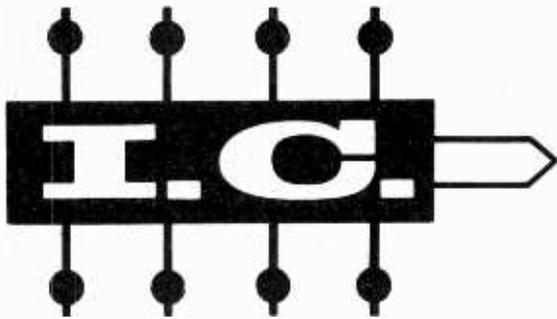
Trade enquiries to:
NORMAN ROSE (ELECTRICAL) LTD.
8 St. Chad's Place, Gray's Inn Road, London, W.C.1

Technical enquiries to:
VERO ELECTRONICS LTD.
Industrial Estate, Chandler's Ford, Hants

INTEGRATED CIRCUITS—DIGITAL & LINEAR

RCA Linear CA Series			
CA3000	D.C. Amplifier	41/-	CA3028A Differential/Cascade Amp.(100MHz) 19/-
CA3011	Wide Band Ampl'r	18/-	CA3029 Operational Amp. 27/-
CA3020	½w Wide Band Amplifier	28/-	CA3035 Very High Gain Amplifier 28/-
CA3005	28/-	CA3021 37/-	CA3030 34/-
CA3010	33/-	CA3022 31/-	CA3033 56/-
CA3010A	57/-	CA3023 30/-	CA3036 18/-
CA3012	22/-	CA3026 25/-	CA3037 38/-
CA3013	26/-	CA3028B 26/-	CA3038 60/-
CA3014	29/-	CA3029 27/-	CA3039 22/-
CA3015	48/-	CA3029A 38/-	CA3041 27/-
CA3018	21/-		CA3042 28/-
			CA3043 32/-
			CA3044 29/-
			CA3045 29/-
			CA3046 22/-
			CA3048 48/-
			CA3051 25/-
			CA3053 16/-

DATA SHEETS 1/- each post free.
Comprehensive range of R.C.A. Linear (CA Series) and Digital (CD Series) available.
DISCOUNTS 5% for orders over £4. 10% off price for 25+ of 1 item. 20% off price for 100+ of 1 item.
S.A.E. with all enquiries please. Postage 1/-.(5/- min. Overseas).
Postal Orders/Money Orders to:—
R. INGRAM, 189 SALMON STREET, LONDON, N.W.9



OF THE MONTH

L.A.J. IRELAND

Number 5

The PA246 used as an Audio Amplifier

THE General Electric (U.S.A.) type PA246 integrated power amplifier has finally become freely available on this side of the Atlantic, and is certainly deserving of our attention this month. With a five watt rated output, it is the culmination of a development process which began with the PA222 described in "Practical Wireless" as long ago as August 1968. That device introduced the idea of mounting the monolithic "chip" of silicon carrying the integrated components on a metal tab; when soldered to an area of a printed circuit board this provides a path of low thermal resistance to a

heat sink, with the result that a one watt device dissipation figure could be achieved. The disadvantage of the number of external discrete components required was next overcome with the PA234, again a one watt unit, while a variation in the driver stage on the chip enabled the PA237 to dissipate two watts. Finally, with an improved heat sinking method, the PA237 chip was upgraded to a higher operating voltage and dissipation, with the PA246 designation. The table gives the characteristics of this family of devices, and the development sequence outlined above can be followed.

Characteristics of the G.E. series of audio power i.c.'s.

	PA 222	PA 234	PA 237	PA 246
Supply Voltage ..	18-24	9-25	9-27	12-34
Audio Output .. (r.m.s.)	1 Watt	1 Watt	2 Watts	5 Watts
Frequency Response	55Hz-15kHz	30Hz-100kHz	30Hz-100kHz	30Hz-100kHz
Input signal ..	52mV	600mV	8mV	12mV
Input impedance	55kΩ	100kΩ	40kΩ	40kΩ
Load impedance	22Ω	22Ω	16Ω	16Ω
Output impedance	1Ω	2Ω	0.85Ω	0.6Ω
Heat Sink Area ..	1 sq. in.	1 sq. in.	2 sq. in.	6 sq. in.
Device Noise ..	-65dB	-80dB	-75dB	-70dB

The PA246 package is a specially designed variant of the familiar 14-lead dual-in-line epoxy i.c. format, with the addition of two wide heat transfer tabs, and staggered leads for greater convenience in the design of printed circuit boards. As with the PA237, only eight of the leads are actually in place, though the manufacturer's literature refers to them by the numbering convention for a full 14-lead package. Further, only six of these leads are actually functional connections to the chip. Figure 2 shows

continued on page 894

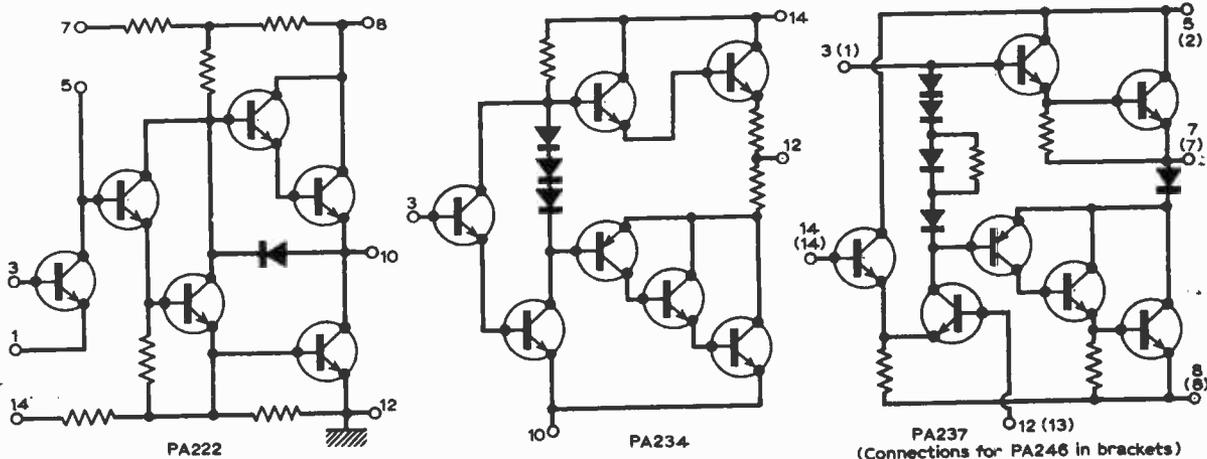
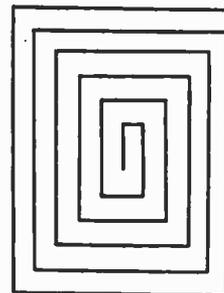


Fig. 1: Equivalent circuits of General Electric (U.S.A.) audio power Integrated circuits.

BASIC SEMICONDUCTOR TECHNOLOGY

PART TEN



by M.F. DOCKER, M.Sc.

LAST month the type of logic integrated circuits which are available were described. The average amateur will not find many applications for these devices in his workshop although they serve very well for use in counting circuits, voltage level detector circuits, automatic morse senders and so on. However the integrated circuit industry can still serve this customer with its products—with linear circuits.

Operational Amplifiers

Perhaps the most widely used type of linear integrated circuit is the operational amplifier. Available at well under one pound this circuit has uncountable applications in the home laboratory. With a few external resistors and capacitors they can be used to produce high stability d.c. amplifiers using resistive feedback elements. Bandwidths approaching 10MHz can readily be reached. Using capacitive feedback the circuit can be used to produce an integrator, or with resistive feedback and capacitive input a differentiator is obtained. These three arrangements are shown in Fig. 1. In order to achieve stable operation over a wide bandwidth it is necessary to utilise suitable frequency compensation. Details of this simple procedure, requiring only resistors and capacitors, are obtainable from the device manufacturer—usually free of charge.

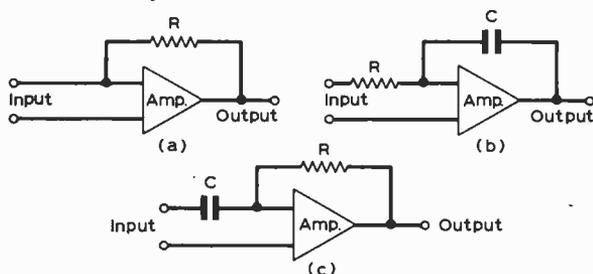


Fig. 1: Operational amplifier applications

Other uses of the operational amplifier are as active filters, using suitable resistor and capacitor arrangements in the feedback networks. Either band-stop or bandpass filters with very high Q values can be obtained without the necessity for the large inductors required with the usual low-frequency filter. Using a diode as the feedback element it is possible to produce a logarithmic amplifier in which the output bears a logarithmic relation to the input voltage. Summing and differencing amplifiers can also be made, using only resistors and operational amplifiers. These have numerous applications in many enthusiasts' experiments.

Also available in integrated circuit form are audio amplifiers. A one-watt amplifier is currently avail-

able at under two pounds and a preamplifier utilising a MOST is available at less than ten shillings. The integrated circuits in this field enable remarkable miniaturisation. A one-watt amplifier in a space of less than one-tenth of a cubic inch is quite an achievement, especially as the reliability is also high.

Other Circuits

Numerous other circuits are now becoming available including i.f. amplifiers with built in a.v.c. circuits; combinations of transistors with external connections to suit the user; video amplifiers for use in television equipment; d.c. voltage comparators; and one firm is even making an integrated car radio with all the active elements, including a three-watt output stage, on one chip. The list of circuits which are available grows week by week and not only is the list of available circuits rising but also their prices are falling, some being only one-third of what they were two years ago. Several manufacturers of integrated circuits are now offering customer design services to the users of integrated circuits: in this way the number of integrated circuits which are available can be expected to grow and both the amateur and the professional engineer can hope to benefit from this development!

Thin Film Circuits

Another field of integration which has been in existence for some years is that of the thin film circuit. These circuits consist of microminiature arrangements of resistive, conductive and dielectric films on inert substrates. Using these films it is possible to make resistors, capacitors and inductors. Unfortunately there are no reliable active devices available yet which can be made in thin film form. This means that discrete semiconductor devices have to be attached to the thin film circuit after it has been completely processed. The steps in making a thin film circuit are similar to those used in making a silicon integrated circuit, but instead of diffusion of impurity atoms into the substrate an evaporation of metal or dielectric material on to a glass or mica substrate is carried out.

Resistors are produced by depositing a long, thin filament of metal on to the glass. Metals commonly used are nichrome, well known as the metal used in electrical heating elements, and tantalum. They are deposited on to the substrate by heating them strongly so that metal from their surface evaporates and after passing through a suitable mask lands on the substrate. With thin film resistors a much larger range of values can be obtained than can be obtained with monolithic resistors, and also the parasitic capacitances are smaller.

CODAR CR.70A

Communications Receiver 540-10 metres



The Codar CR.70A is an excellent general coverage communications receiver for the keen short wave listener. Very reasonably priced at just £21 the CR.70A is outstanding value for money. In four stable ranges, the receiver covers from 540 metres medium wave, right through the shipping and coastguard frequencies all the short wave and international amateur bands up to and including 10 metres, where the rapidly improving conditions that now prevail allow the regular reception of world-wide call-signs!

The CR.70A has a high 'Q' aerial input stage using exclusive CODAR COIL air space inductor. Double tuned, iron cored I.F. transformers produce high selectivity. Ready to plug into 200-250 volt AC mains, the CR.70A needs only your aerial and a 2-3 ohm loudspeaker. The cabinet measures only 13" x 5 1/2" x 7 1/2" and the control panel is finished in black and white with chrome trim knobs. Fully guaranteed for 12 months!

New model has separate direct output socket for feeding tape recorder, Hi-Fi equipment, etc.

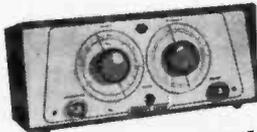
20 gns.

Carriage 7/6 extra

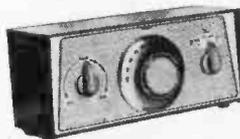
- *Ideal for SWLs
- *5 valves (inc. two twin triodes) giving 7 valve line-up
- *Excellent on amateur and shipping frequencies
- *Calibrated signal strength meter (illuminated)
- *Automatic volume control
- *Separate B.F. oscillator for morse and S.S.B. signals
- *Two speed vernier tuning
- *Separate output for recording etc.



72 RECEIVER FOR 160 & 80 METRES AMATEUR BANDS
 8 transistors, bandspread 1.8-2Mc/s and 3.5-8 Mc/s 12 volts, only 8" x 4" x 3 1/2", ideal portable, mobile or home receiver. Efficient BFO, printed circuits. ONLY £15.17.6. Carr. 4/6.



CR45 MAINS T.R.F. SHORT-WAVE RECEIVER
 World wide reception. * Separate electrical band-spread. * 3 slow motion drives. * Output 3 watts for 2/3 ohm speaker. * Valves ECC81, EL34, EZ80. Size 12" x 5 1/2" x 7". CODAR-KIT CR.45K with 3 coils (10-28, 25-75, 60-176 metres). £10.10.0. Carr. 6/-. or CR.45B Ready Built £13.10.0. Carr. 6/-. Extra coils 6/3 each.



R.F. PRE-SELECTOR MODEL P.R.30
 1.5-30Mc/s
 Provides up to 20dB gain plus substantial image rejection. Improved signal/noise ratio and selectivity. Power requirements 180-250 volts 12mA H.T. 8.3 volts, 3 amp L.T. Size 8 1/2" x 5" x 4". Ready built complete with cables, plugs and instructions. £5.19.6. Carr. 4/6. Self-powered P.R.30X £7.19.6. Carr. 4/6.



MINI-CLIPPER—OUR FAMOUS SHORT-WAVE RECEIVER
 * Can be built in one evening.
 * Complete with valve, one coil 25-75 metres and 4 page instruction manual. Price £29.0. Carr. 3/-. Extra coils 6/3.

CRC

CODAR RADIO COMPANY
 UNIT 1, MEADOW ROAD, INDUSTRIAL ESTATE,
 EAST WORTHING, SUSSEX. WORTHING 37315

World-wide Mail Order Service

Please supply—
 (tick as required)
 I enclose cheque/
 M.O./P.O. value of
 £.....

Add stamp enclosed
 for leaflets

NAME

ADDRESS

POST ORDER FORM TODAY

LOW PRICE, HIGH QUALITY SPEAKER SYSTEMS

All cabinets are new and carefully designed acoustically with speakers mounted on ½ in. chipboard baffles. All speakers are ex-TV high quality with hi-flux magnets carefully matched and tested.



COWDREY FIVE. Specially designed Corner Cabinet 20½ x 13 x 7½ in. deep. Finished in natural teak veneers with Vynair front. Fitted rubber feet. Five speaker units 15 ohms. Impedance handles 15 watts). £6.8.0 P. & P. 8/6 each.



ADASTRA DOUBLE 5 stereo solid state amplifier housed in handsome cabinet veneered in natural teak. Size 11½ x 6 x 5½ in. 10 Transistors—power output 5 watts peak per channel. 220-240v A.C. Output Impedance 12 to 15 ohms (our Cowdrey speaker system eminently suitable). Smart blue escutcheon. £14.14.0. P. & P. 10/6.

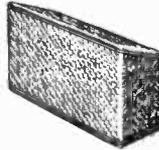
SCOTT. This elegant tapered cabinet 10½ x 16 x 5½ in. deep is attractively finished in black cloth with striped grey Vynair front. Suitable for table or for wall mounting. Fitted with 13½ x 8 in. speaker unit and volume control. 3 or 15 ohms Impedance—please state Impedance required. £4.5.0. P. & P. 7/6d each. Fitted with E.M.I. 13 x 8 in. speaker unit and twin tweeters. 15 ohms Impedance, capacity 10 watts. 30/- extra.

SPEAKERS: Elac Heavy duty Ceramic Magnets 11,000 lino, 10in. round, 10x8in, 3 ohm or 15 ohm, 48/6. P. & P. 3/6. 8in. round 15 or 3 ohm, 42/8. P. & P. 3/6. E.M.I. 13½ x 8in. 3ohm, 45/-, 15ohm 48/6. P. & P. 1/6. E.M.I. 3in. tweeter 17/6. P. & P. 1/6. E.M.I. 13½ x 9in. fitted two 2½ in. tweeters. 15ohm 77/6. P. & P. 4/6. E.M.I. 13½ x 8in.



CAXTON COLUMN. This is a column cabinet 23½ x 5½ x 5½ in. deep finished in black or wood grain cloth with blue Vynair front. Keyhole slot for wall mounting. Fitted with three speaker units, 8 ohms Impedance. Handles 8 watts. Makes all the difference in quality and volume of tape recorders and record players. Real bargain at 59/6d. P. & P. 10/6d. each.

ELF. An extension speaker of quality 9 x 5 x 3½ in. deep veneered in natural teak with smart gold and brown Vynair front trimmed in white. Fitted with 3 ohm speaker unit mounted on ½ in. baffle. Exceptional value 37/6d. P. & P. 3/9d. each.



IMP. Wedge shaped extent sion speaker 7½ x 6½ x 4 in. (max.). Covered in walnut wood grain cloth with foam Vynair front. Keyhole slot at back. Fitted with 3 ohm speaker unit. Only 25/6d. P. & P. 3/9d. each.

(15 ohm) Hi-Fi quality £5.19.6. P. & P. 4/6. E.M.I. Woofers, 6½ x 6½ in. square, 8 ohm, 59/6. P. & P. 4/6. E.M.I. Crossover, 16/6. P. & P. 1/-. EAGLE Crossover units 3 or 16 ohms, 16/- P. & P. 1/-. Bakers 12in., 25 watt 15 ohm £6.8.0. P. & P. 3/6.



TEAK PLINTH AND PERSPEX DUST COVER for SP25 etc. £5 5 0 P. & P. 5/-.

VYNAIR Widths from 40 to 54in., 17/6 yd. off roll. P. & P. 1/9. ¼ yard, 9/-, P. & P. 1/9. Send 1/- stamps for samples.

SPEAKER MATCHING TRANSFORMERS. 3, 7, 15 ohms. 8 watt. 13/6. P. & P. 1/6.

MICROPHONES: Xtal Hand Mikes. B1201 with stand, 54/6. P. & P. 3/6. Dyn. Mike DM-391, 30/- CM21 Xtal, 12/6. Telephone Pick-up, 10/6. P. & P. 1/-. Xtal label Mike, 7/6. Guitar Mike, 12/6. P. & P. 1/-.
FERROX RODS: 6 x ½ in., 2/6; 4½ x ½ in., 2/-; 6 x ½ in., 2/6; 8 x ½ in., 4/9. P. & P. 1/- each.
FERROX RODS WITH COILS. 4½ x ½ in., 3/6; 8 x ½ in., 5/6. P. & P. 1/- each.
ROTARY SWITCHES: 1 pole 12 way, 2 pole 2 way, 3 pole 3 way, 3 pole 4 way, 4 pole 3 way, 3/6 each. P. & P. 1/-.
TRANSISTOR SPEAKERS 8 ohm 2 in., 8/6, 3in., 10/6. P. & P. 1/-.

CARTRIDGES. Stereo: Sonotone 9TA H/C Diamond, 47/6. Ronette S105 Medium Output, 28/6. S106 High Output, 28/6. Acos GP93/1 Sapphire, 37/6. GP94/1 Sapphire, 39/6. GP81 Diamond, 42/- GP91 Stereo Compatible (High, Medium or Low Output), 25/- TA800 converts Philips AG3301, AG3306 to B.S.R. SX1H. Plug-in head complete with cartridge, 50/- TA700 equivalent to B.S.R. SX1M, 35/- Japanese equivalent to B.S.R. TC8s, 35/- P. & P. 1/6.
Mono: Acos GP67/2 will replace Collaro and Garrard Mono cartridges, 18/6. T.T.C. Crystal High Gain, 15/- B.S.R. TC8H Jap. equivalent, 26/- Sonotone 2TSS, 15/- P. & P. 1/6.

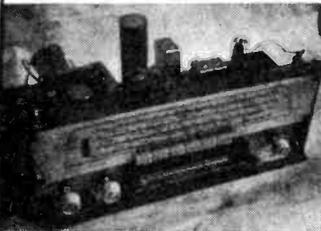
EARPIECES WITH CORD and 3.5mm. plug, 8 ohm magnetic, 3/- 250 ohm, 4/- 180 ohm with clip, 6/6. Xtal. P. & P. 6d.
PIANO KEY PUSH BUTTON SWITCHES. 7 button inc. mains on off. 6 banks of 6 P.C.O., 8/6. P. & P. 1/-.

BROADWAY Electronics (Few minutes from Tooting Broadway Underground Stn)

92 MITCHAM ROAD, TOOTING BROADWAY, LONDON, S.W.17 01-672 3984 (Closed all day Wednesday)

CANCELS PREVIOUS LIST

6 PUSH-BUTTON STEREOGRAM CHASSIS



M.W.: S.W.1.; S.W.2; V.H.F.; Gram; Stereo Gram; Vol; Tone; Mains Trans; 200-250 Volts; 2 o.p. for 3 ohm. Also operates with two speakers on Radio. Chassis size: 15 x 7 x 6½ in. high. Dial silver and black 15 x 3in. 190-550M; 18-51M; 60-187M; VHF 86-100 Mc/s. Valves: ECC85, ECH81, EF89, 2 x ECL86, EM84 and Rect. Price £19.19.0, carr. paid. With Stereo Decoder fitted £8 extra.

STEREO AMPLIFIER type HV— 2 x 3 Watts

Fully built. On off. sep. vol. and tone each channel 12 x 4½ x 6in. high. EZ80, 2 x ECL86; for 3 ohm speakers, double wound main trans; fixing flanges and base plate, suitable for crystal cart, tuner etc. £6.10.0 (8/- p. x p.)



STEREO AMPLIFIER type RC— 2 x 3 Watts

Fully built. 2 x UCL82, metal rect; ganged vol. and tone cont; on-off. balance. 11 x 3½ x 4in. high. Double wound mains trans. with supporting brackets. For 3-ohm speakers. £6 (8/- p. & p.).



MONO GRAM CHASSIS 3 WATT

3 Wave band long-med-short. Gram., 200-250v AC Ferrite aerial. Chassis 13 x 7 x 5in. Dial 13 x 4in. Double wound mains transformer 5 valves ECH81 EF89, EBC81, EL84, EZ80. Price £10.12.6. (7/6 p. & p.) Output trans. for 3-ohm speaker.

BAKERS' Selhurst Speakers. 12in., cast frame, 3, 8 or 15 ohm (state which). Group 25 (25 watt) for guitars, etc. £6.6.0; Sialwart 45-13,000 cps. 15W £6.6.0; de Luxe Mk2 dual cone 25-16,000cps. 15W £9 (all carr. paid) less 10% for 2 speakers.

GLADSTONE RADIO

66 ELMS ROAD, ALDERSHOT, Hants.

(2 mins. from Station and Buses). FULL GUARANTEE. Aldershot 22240 CLOSED WEDNESDAY. S.A.E. for enquiries please.

FABULOUS VALUE

TRANSISTORISED STEREO HI-FI RECORD PLAYER

Build your own Hi-Fi Record Player with the Serenade fully transistorised amplifier which comes complete with 2-10" x 6" speakers and the latest BSR 4 Speed Stereo/Mono Record Changer. Advanced solid state amplifier only 4½" deep, 14 transistors plus 4 diodes, separate Bass and Treble—10 watts total power. Frequency response 50-15,000 c/s.

EASY TO INSTALL NO TECHNICAL KNOWLEDGE REQUIRED

Only 28 Gns. + P & P 17/6 Credit terms available, first monthly payment £3.6.2 followed by 9 monthly payments of £3.6.2. (Total "Credit Sale" Price £33.1.8). Send £4.3.8 today.

FANTASTIC BARGAIN OFFER!

"TRANSCONTINENTAL"

FULLY TRANSISTORISED STEREOPHONIC RADIOGRAM CHASSIS

Complete with 2-10" x 6" speakers and the latest BSR Mono/Stereo Record Changer—a complete radiogram at half normal price ONLY

10 Watts Total output £36.10.0 P&P 17/6 17 Transistors & 10 diodes

EASILY FITTED NO TECHNICAL KNOWLEDGE NECESSARY Credit Terms available. First monthly payment £4.2.2 followed by 9 monthly payments of £4.2.2. (Total "Credit Sale" Price £41.1.8.) Send £4.19.8 today.



Callers Welcome

POST THIS COUPON NOW!

PLEASE SEND ME FREE DETAILS OF YOUR RANGE

Name _____ Address _____

LEWIS radio 100 CHASE SIDE, SOUTHGATE. Dep. P170 LONDON, N.14. TELEPHONE PAL 3733/3666

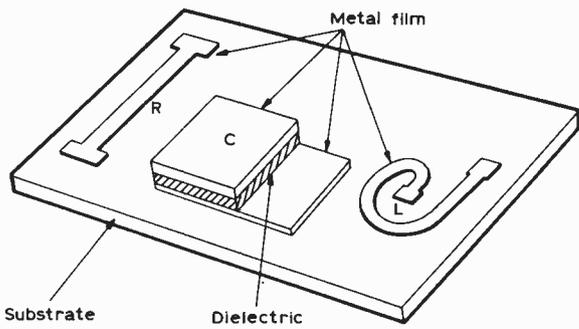


Fig. 2: Examples of a resistor, capacitor and inductor in thin film form.

Thin film capacitors can be produced by first depositing a layer of metal as one electrode, then a layer of alumina or tantalum oxide to act as a dielectric insulating layer, and finally a top electrode of metal. Inductors can also be produced by thin film techniques although values of inductance greater than one microhenry are difficult to produce. They are made by depositing spirals of metal on to the substrate, connections being made to each end of the spiral. Figure 2 shows an arrangement of thin film resistors, capacitors and inductors on a suitable substrate.

Mounting Discrete Components

The active devices required in most circuits are obtained in thin film technology by using discrete semiconductor diodes and transistors as mentioned previously. However there are various methods of mounting them on to the substrate. Either they are attached as complete devices, although this is very rare, or they are supplied to the film manufacturer in an unencapsulated form. Three such forms are shown in Fig. 3: these are the flip chip, tag chip and leadless inverted device (LID). They are soldered into place after all the passive components have been deposited on to the substrate. Finally the circuit is encapsulated.

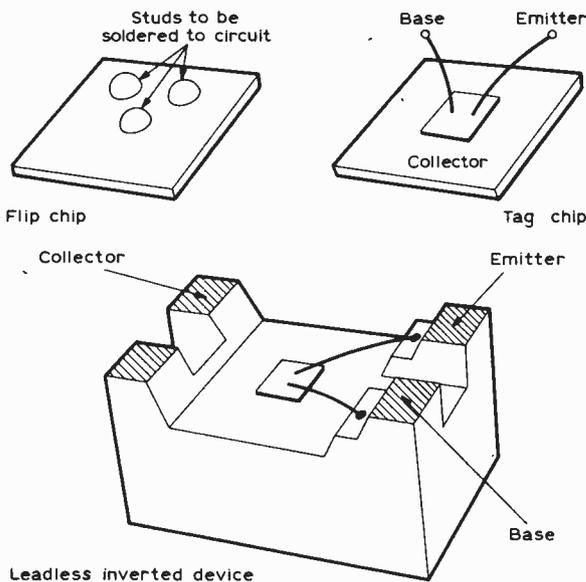


Fig. 3: Three types of device construction for use with thin film circuits.

Thick Film Circuits

A variation on the thin film circuit is the thick film circuit. The essential difference between the two types is not so much in the thickness but in the method of manufacture of the circuit. Thin films are deposited by evaporation of metal whilst thick films are screen printed on to the substrate using special inks which form conductive layers after they have been baked. The advantage of this system is one of cost as using this technique it is possible to mass produce the film circuits. However they have disadvantages in that the accuracy of the components is several times worse with thick film circuits than it is with the thin film equivalents. This is because of the diffusion of ink which takes place during printing and baking and because of the variation in the quality of ink between different circuits. Nevertheless the thick film circuit has sufficient economic advantage to ensure that it will be here for some time to come.

Advantages and Disadvantages

What are the relative advantages and disadvantages of film and silicon integrated circuits? Firstly silicon integrated circuits are considerably cheaper to make in large quantities than film circuits. They are capable of more variety since virtually all components can either be produced on the semiconductor chip or else they can be simulated by the use of other components as in the active filter described previously. Secondly film circuits have far better isolation properties, alleviating the need for special techniques to be applied. Their cost is comparable with the cost of discrete components and it is possible to provide more variety of resistors and capacitors.

Hybrid ICs

A third form of integrated circuit is the "hybrid integrated circuit" or "chip circuit." These are formed by producing all the components in discrete semiconductor form and connecting them with fine wires. This provides the isolation of the film circuit with the ease of production of the semiconductor device. Another advantage of the chip system is that small quantity orders can be met at much lower cost. Several manufacturers are now producing complete film circuits with functions similar to those of silicon integrated circuits but with better properties as regards temperature stability, isolation and specification tolerances.

Conclusion

In this series of articles I have tried to show the enormous range of semiconductor devices which are now available to the circuit designer and to the amateur. Although space has been somewhat limited I have tried to point out the essential mechanisms in the manufacture and operation of the devices and a little of their relative advantages. Only occasionally have I been able to give any specific applications but I trust readers will find this information elsewhere and hope that having read this and other more fully explained texts on these devices they will be able to design their own circuits knowing the limitations imposed on them by the devices themselves. ■

VOX CONTROL UNIT

S. G. WOOD
G5UJ

IT is perhaps not too well known that a simple but effective Vox control unit can be incorporated into almost any transmitter using only a handful of components. Apart from the zener diode, most constructors will probably have the components in their junk boxes.

Basically the Vox unit consists of only four items: a 470kΩ log. potentiometer, a fairly sensitive relay, a capacitor of about 50μF (its actual value will depend on the desired drop-out period) and a zener diode. The actual zener used in the prototype is a type MZ27 and the circuit is based around this one. Operation is as follows: VR1 is advanced until the relay just closes and is then backed off very slightly until it opens. A short space of time must be allowed for the delay in drop-out caused by the holding action of C1, this delay being necessary to prevent the relay from following the peaks of speech which occur when the transmitter is modulated.

Conduction of the zener is brought about by these modulation peaks adding to the d.c. level exceeding the zener voltage and so actuating the relay. When the basic circuit was applied to the authors transmitter it was found that the audio voltage required to operate the Vox unit detracted overmuch from the voltage required to drive the following audio stage. Since it was not possible to 'tap-off' the requisite feed from a further stage the circuit shown in Fig. 1 was evolved. It will be seen in this particular case a double triode was used, one half being used as a voltage amplifier for the microphone whilst the second half is used

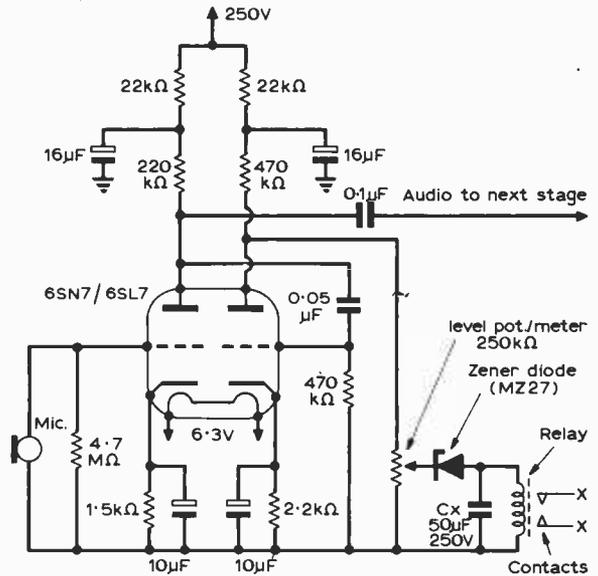


Fig. 1: The circuit of the Vox Control Unit.

solely for the operation of the Vox circuit; in this case the circuit solved this problem and it worked perfectly.

The relay can be a G.P.O. '3000' type with an operating current of between 5-10mA although one of the popular plug-in types manufactured by Omron, Siemens or Keyswitch would be suitable. ■

Readers are cordially invited to the

Practical Wireless and Practical Television Filmshow

(in collaboration with Mullard Ltd.)

at

Caxton Hall, Caxton Street, London, S.W.1

(Great Hall Site)

on

Friday 6th March, 1970

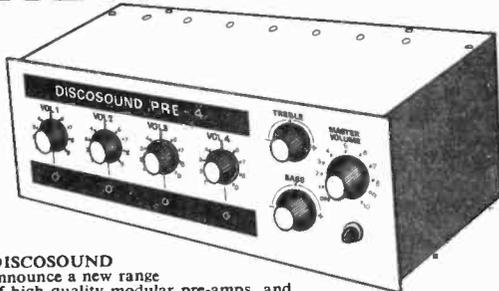
7-15 p.m. for 7-30 p.m.

W. N. Stevens, Editor Practical Wireless and Practical Television
will be in the chair

The film this year is entitled "Something big in Micro-Circuits" and the principal speaker will be Ian Nicholson of Mullard Ltd. Free refreshments will be served during the interval. For tickets send a stamped addressed envelope marked FILMSHOW to: Practical Wireless Editorial, I.P.C. Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4.

DISCOSOUND

NEW DISCOSOUND PRE-4



DISCOSOUND announce a new range of high quality modular pre-amps, and main amplifiers which offer a wide range of facilities to suit all types of applications.

Model Pre-4. This is a four channel fully mixable pre-amp, with separate treble, bass and master volume controls, and is completely self powered. All four inputs are by standard jack socket on the front panel with the addition of inputs 3 and 4 being duplicated on the back panel, with two paralleled outputs also featured for versatility in use.

Specification:

Inputs.	Vol. 1.	10 mv at 50k Ohms	} Other Impedances can be made to special order.
	Vol. 2.	10 mv at 50k Ohms	
	Vol. 3.	50 mv at 500k Ohms	
	Vol. 4.	50 mv at 500k Ohms	

Frequency Response: 30—20,000 HZ \pm 3db.

Signal/Noise Ratio: -65db.

Bass: continuously variable 20db. at 100 HZ.

Treble: continuously variable 20db. at 10 KHZ.

Output: variable up to 1 volt RMS at 25k Ohms.

Size: front panel 12½ x 5½ cut out required 11½ x 4½.

Completely built and tested.

PRICE £18.0.0 inc. P. & P.

NEW DISCOSOUND 70 MAIN AMPLIFIER

This is a 70 watts RMS (8 Ohms) High Fidelity power Amplifier which utilises all silicon transistors of modular construction and features, full automatic overload protection against short or open circuits. The High output is ideally suited for discotheques, groups, clubs, etc., or anywhere where reliability and quality are required. This unit is the companion model for use with our control pre-amp Discosound PRE-4, or can be used with any other high quality pre-amp control unit.

Specification:

Power Output: 70 watts RMS into 8 Ohms.

Frequency response: 20—20,000 Hz \pm 2db.

Harmonic distortion: less than 0.5% at 70 watts RMS.

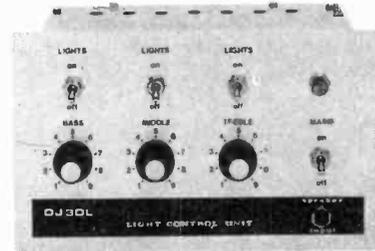
Input Impedance and Sensitivity: 700 mv at 20-30k Ohms.

Size: 7" x 9" x 6".

Completely built and tested on steel Chassis.

PRICE £30.0.0 inc. P. & P.

DJ 30L PSYCHEDELIC LIGHT CONTROL UNIT



3 channel light control unit that handles up to 1,000 watts per channel. Separate bass, middle and treble controls for full frequency separation.

Completely built and tested.

PRICE £37.10.0 inc. P. & P.

NEW RANGE OF COMPLETELY BUILT & TESTED MODULES USING P.C. BOARDS. FIRST GRADE COMPONENTS AND SILICON TRANSISTORS THROUGHOUT

Model 106F. 4 channel mixer with separate bass and treble controls. Complete with pots, connecting diagram, etc. Power requirements 18 volts D.C.

Specification:

Vol. 1.	10 mv at 50k Ohms	} Other Impedances can be made to order.
Vol. 2.	10 mv at 50k Ohms	
Vol. 3.	50 mv at 500k Ohms	
Vol. 4.	50 mv at 500k Ohms	

Frequency: 30—20,000 Hz \pm 3db.

Signal/Noise: -65db.

Output: variable up to 1 volt RMS.

PRICE £7.0.0 inc. P. & P.

Model 100SP. 2 channel mixer with separate bass, treble and master volume controls. Fibre-glass P.C. board complete with pots, connecting diagrams etc. Power requirements 18 volts D.C.

Specification:

Vol. 1/2 can be from 50k upwards. Please state requirements.

All other details as 106F.

PRICE £5.0.0 inc. P. & P.

For full details of these and all Discosound Products write direct to:—

DISCOSOUND, 170 ALBION ROAD, LONDON, N.16. Tel: 01-254 5779

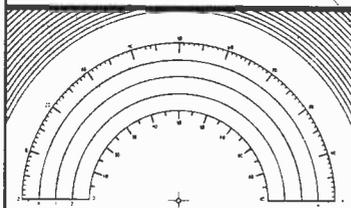
Full money back guarantee if returned within 10 days.

All Discosound Products are guaranteed for 12 months.

Demonstrations given at any time.

USE
**PANEL SIGNS
TRANSFERS**

The Perfect Transfer for
the Home Constructor



- Set 3 Wording—WHITE
- Set 4 Wording—BLACK
- Set 5 DIALS—clear background
- Set 6 DIALS—black background

WORDING (Sets 3 and 4) COMPLETELY REVISED. Over 1,000 words. Height of Letters $\frac{3}{32}$ in. FREQUENCY LISTS (Sets 5 and 6). Now in kHz and MHz.

Each Set contains Six Sheets

- Easy to fix
- Permanent and durable
- Stapled in booklet form
- Designed to hang above work-bench
- Pocket for loose cuttings
- Professional finish

Supplied to Universities, Technical Colleges, Government Establishments, Research Laboratories and industry.

5/- per set
(postage 4d.)

To Data Publications Ltd.
57 Malda Vale, London, W.9

Please supply:

.....Set 3.....Set 4.....Set 5.....Set 6

I enclose cheque/crossed postal
order for

Name

Address

BLOCK LETTERS PLEASE

The Unique
MULTI-MINI TWIN-VICE



An extra "Pair of hands" for
those tricky jobs

**ASSEMBLY—SOLDERING—
GLUING—WIRING—DRILLING
ETC.**

- INDEPENDENT ADJUSTMENT OF THE TWO VICE HEADS TO ANY ANGLE WITH POSITIVE LOCKING.
- JAWS WILL FIRMLY GRIP, ROUND, FLAT, SQUARE, OR HEXAGONAL PARTS.

TWIN VICE: £5-18-0 (4/6 P & P)

ALSO AVAILABLE

SINGLE VICE: £3-7-6 (3/- P & P)

COVENTRY MOVEMENT CO LTD.
BURNSALL ROAD, COVENTRY
CV56BU STD OCO3-74363

TRADER SERVICE SHEETS

5/- each plus postage

We can supply Trader Service Sheets for most makes and types of Radios, Tape Recorders and Televisions—Manuals for some.

Cheques and open P.O.s returned if sheets not available.

**OAKFIELD ENTERPRISES
LIMITED**

30 CRAVEN STREET, STRAND
LONDON WC2

Make	Model	Radio/TV

1970 List now
available at 2/-
plus postage

If list is required
indicate with X

From

Address

enclose remittance of

(and a stamped addressed envelope)
s.a.e. with enquiries please

MAIL ORDER ONLY (February PW)

**JASON
RITS**

FANTASTICALLY POPULAR

★ **TAPE** ★

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

Standard Play		Long Play	
3in. 150ft.	2/8	3in. 225ft.	2/9
4in. 300ft.	4/6	4in. 450ft.	5/6
5in. 600ft.	7/6	5in. 900ft.	10/6
5 1/2in. 900ft.	10/6	5 1/2in. 1,200ft.	13/-
7in. 1,200ft.	13/6	7in. 1,800ft.	18/6
Double Play		Triple Play	
3in. 300ft.	4/-	4in. 900ft.	13/-
4in. 600ft.	8/-	5in. 1,800ft.	25/-
5in. 1,200ft.	15/-	5 1/2in. 2,400ft.	24/-
5 1/2in. 1,800ft.	19/6	7in. 3,600ft.	44/-
7in. 2,400ft.	27/-	Quadruple Play	
		3in.	600ft. 8/6

Postages 1/- each.

Post Free less 5% on three reels.

Quantity and Trade enquiries invited.

NOTE: Large tube stocks at all branches.

TUBES Highest Quality—
Compare Our Prices

Garr. & Ins.	12/6	6 Months	12 Months
14in.	..	£2.10.0	£3.10.0
17in. & 19in.	..	£3. 5.0	£4. 5.0
51in. & 23in.	..	£3.15.0	£5.15.0

SATISFACTION GUARANTEED

Most Mullard, Mazda, Gossor, Emilton, Emicosec, Brimar, Ferranti types processed in our own factory. NOTE: ALL tube orders only to Portsmouth branch please.

**NEW and SPECIAL Lines at
the keenest prices**

AM/FM STEREO MULTIPLEX RECEIVERS
18 transistors, 9 diodes, 1 variable diode, 2 Silicon Rectifiers. Push-pull Stereo Amplifiers. FM Stereo Separation 15dB. AM Medium Wave 180-550 Metres. Power output 10W R.M.S., 230/240V A/C Mains. Beautiful wooden plinth case—approximately 15" (w) x 8" (h) x 8" (d). Controls: Function Switch, Balance, Base/Treble Control, Volume, Tuning. Fine finish. Special purchase enables us to offer these superb machines of famous make at a ridiculously low price. Unrepeatable offer at a fraction of list price... only 26 GNS. POST FREE.

SHARP RD504 Mains Battery Tape Recorder, List 36 gns	28 gns
HITACHI SW/MAR/MW/LW Marine D/F Receivers	27 gns
GARRARD 1025 Changers with Stereo Cartridge	£8 10s
JASON 12in. Diecast full range twin cone Speakers	£4 10s
AJAX Mains/Battery, AM/FM larger Radio	12 gns
WELESMERE AM/FM High Sensitivity Black Leather	7 gns
HITACHI WH887E All-Wave, full size. Excellent Short Wave	13 gns
HI-FI By Leak, Wharfedale, Goodmans, WB, Dulci, Arona, Teleton, etc., etc.	

All items previously advertised available. Huge HI-FI and Component stocks at all branches. Please call and view without obligation.

**TECHNICAL
TRADING**

RETAIL BRANCHES:

LONDON, 10 Tottenham Court Rd. (MUS 2839)

PORTSMOUTH, 350-352 Fratton Road

(Tel. 22034)

SOUTHAMPTON, 72 East Street (Tel. 25851)

BRIGHTON, 6 Queen's Road (Tel. 23975)

MAIL ORDER WAREHOUSE:

Devonian Court, Park Crescent Place, Brighton.
(Tel. 680722)

BARGAIN PARCELS

Including variable condensers, i.f. coils, loudspeaker plug/sockets, knobs, pots, condensers, resistors, nuts, bolts, cabinet fittings, switches, transformer choke, rectifier, transistors at a small fraction of list value. Due to heavy demand we now pack them in several sizes—be amazed—try one now.

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

METAL LOCATOR

HAL MOORSHEAD

This article describes the theory of metal detection and gives realistic assessment of the performance expected. A practical circuit and constructional details are also given.

BEFORE even explaining the function of this project it is important to place home constructed metal detectors in perspective. They are great fun and within their limitations very useful but they are not practical for any but the most rudimentary form of treasure hunting. Using the techniques described here, and another technique described later, a maximum of about 18in. is the greatest detection range under ideal conditions and this is reduced to about 1in. under difficult ones.

The author has seen great claims made for the type of circuit used here but this has never been borne out in practice. Certainly there are metal detectors made which are very much better than the one shown but they cost hundreds of pounds and require great skill and experience to operate. The cost of the project here is unlikely to exceed 50s. including the headphones.

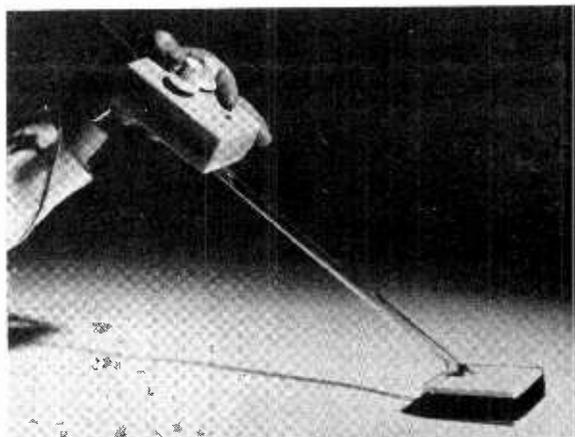
However even with the limitations mentioned, the finished project has considerable uses. Tracing house wiring is the most practical but it can also provide endless hours of fun and is easily adapted to a variety of games for fête side-shows etc.

METAL DETECTION THEORY

There are two common ways in which metal detectors work. The less common and more difficult type (from the point of view of construction) is to have an audio oscillator which relies on the feedback to maintain oscillation being connected through two coils at right-angles to each other. The gain of the oscillator is set so that oscillation is not quite achieved. When the coils are moved into the proximity of an object—especially a metal one—the coupling between the coils is increased causing oscillation to start.

The second more common type makes use of two oscillators, one of which is at a fixed frequency. The second oscillator is tuned near the frequency of first but its inductance takes the form of a search coil. When this comes into the proximity of some material which increases its inductance the frequency alters and beats with the reference oscillator, producing a beat note in the form of an audible tone whose frequency (but not intensity) varies with the inductance of the search coil.

The limitations of this type of detector are governed by the fact that *any* material can vary the inductance although metals have a very much



The prototype of the metal locator.

greater effect than others. A large stone, however, will produce a similar effect to a small nail and it will be quickly appreciated that searching for materials in anything but a few inches of earth is frustrated by many other effects.

The frequencies of the oscillators are not too critical but must lie between about 100kHz and 1MHz. Below 100kHz it is hard to detect the change in note since a 0.5% increase in inductance for instance will alter the frequency by only a few Hertz. Above 1MHz almost anything will change the inductance enough to send the beat note way out of audio range since a 0.5% change will have a considerable effect.

The reference frequency chosen was approximately 450kHz, or in other words the commonest i.f. frequency; this has several advantages. First, an i.f. transformer can be used to produce the reference frequency, secondly the secondary of the transformer can be used as the take-off point for the audio amplifier thus providing a good impedance match and thirdly this frequency enables a standard radio set to be used instead of two of the stages shown. The metal detector circuit shown is self-contained but a simpler version will be described later.

THE CIRCUIT

L1 is the search coil and is connected into a Hartley oscillator with a 250pF trimmer as the tuning capacitor, C1 as the feedback capacitor and R1 acting as the base bias resistor. The tuning capacitor is necessary since the frequency has to be tuned very closely to that of the reference oscillator and it can take account of strays that increase the inductance; In this way the background can be compensated for. The frequency must of course be set at the beginning of each search.

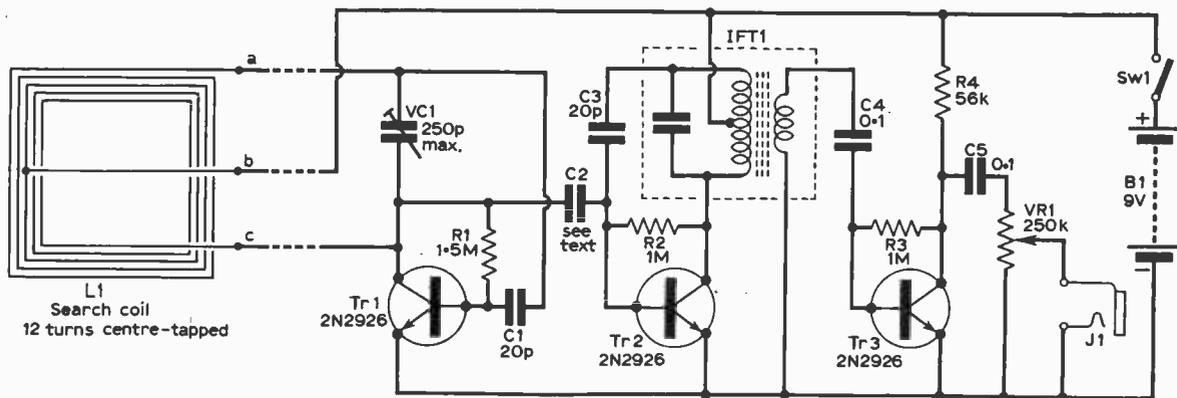


Fig. 1: The complete circuit of the metal locator. Note that C2 is not a physical component as it is stray capacitance; it is drawn here to simplify the explanation.

The i.f. transformer, Tr2, C3 and R2 are also connected to form a Hartley oscillator, the secondary of the i.f. transformer (in which the beat note is developed) couples to the simple amplifier comprising Tr3 with associated bias resistors etc. The output is fed to the volume control. Headphones—preferably good ones with an impedance of 2000Ω—are plugged into the jack to monitor the beat note.

The coupling capacitor which connects the output of Tr1 to the base of Tr2 needs some explanation. This coupling has to be very, very small otherwise one oscillator would trigger the other, clamping the two together. C2 was found unnecessary in practice and the loose coupling relied purely on strays.

CONSTRUCTION

All the components, apart from the search coil, are fitted into a plastic soap box and are fixed to its lid. The majority of the components are fixed to a small piece of Veroboard, 0.15in. matrix type, 6×12 holes; the actual layout is however uncritical.

The 250pF capacitor is of the postage stamp compressor type. To make use of this it is necessary to remove the screw used for compressing the vanes and replace this with a screw of the same thread but one inch long; this will enable the knob to be fitted.

The search coil consists of twelve turns of enamelled copper wire, centre tapped, wound around a 3in. square plastic box. The gauge of the wire is not very important—about 28 s.w.g. is right. The size of the box is not very important as a considerable amount of latitude is allowed for in tuning to bring it to the correct frequency. If a larger sized box is available fewer turns are needed, with a smaller one more turns. A plastic box is not essential and if difficult to obtain a 3in. square of wood about 1in. thick will do as an alternative. The windings around the former—whether it be plastic or wood—should be neat and tight and when finished should be covered with adhesive plastic tape or insulating tape.

The wires then run up a length of non-metallic tube which is connected at an angle of about 45° to the soap box which is clamped to the other end. If a plastic tube is not available then wooden doweling of ¼in. diameter will be a good substitute.

If the wires are run up through the tube a small amount of glue should be run down it to stop the wires flapping about; if doweling is used then the

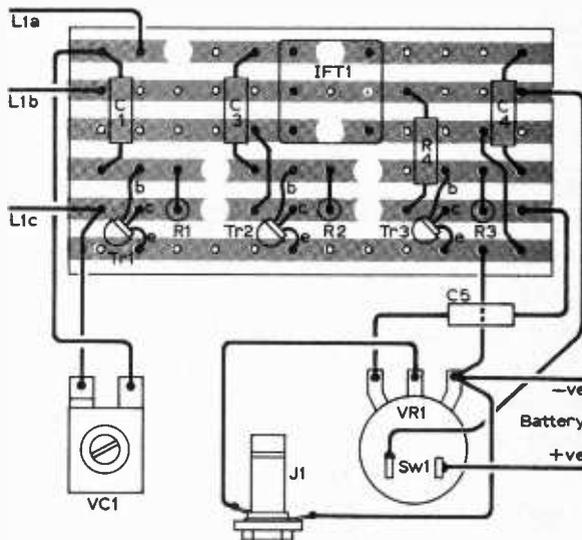
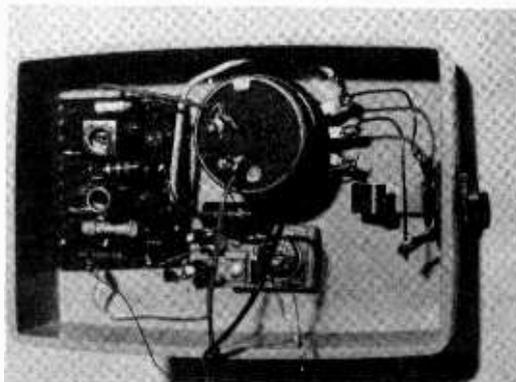


Fig. 2: The component layout inside the soap box.



An interior view of the prototype.

wires should be firmly taped to the side.

It is very important that the wires associated with the search coil are really firmly held for the detector makes use of the change in inductance and these are in the order of fractions of a per cent and loose wires or turns can easily cause this much when flapping about.

Continued on page 894

DOOR INTERCOM

Know who is calling and speak to them without leaving bed, or chair. Outfit comprises microphone with call push button, connectors and master intercom. Simply plugs together. Originally sold at £10. Special snip price 49/6, plus 3/6 postage.



5A, 3 PIN SWITCH SOCKETS

An excellent opportunity to make that bench dis. board you have needed or to stock up for future jobs. This month we offer 6 British made (Hicraft) bakelite flush mounting shuttered 5A switch sockets for only 10/- plus 3/6 post and insurance. (20 boxes post free).

TELESCOPIC AERIAL

for portable, car radio or transmitter. Chrome plated—six sections, extends from 7 1/2 to 47in. Hole in bottom for 6BA screw. 7/6 KNUCKLED MODEL FOR F.M. 9/6.

PHILIPS TRIMMER

0-30 pf of an old design but one which has never been bettered. 1/- each. 10/- doz. £4.00 per 100.

PP3 BATTERY ELIMINATOR

Run your small transistor radio from the mains—full wave circuit—made up ready to wire into your set and adjustable high or low current. 8/6 each.

TOGGLE SWITCH

3 amp 250v. with fixing ring. 1/6 each 15/- doz.

DRILL CONTROLLER

Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. 19/6 plus 2/6 post and insurance. Made up model 37/6 plus 2/6 p. & p.

230 VOLT SOLENOID

1in. stroke. Size 2 1/2in. x 2in. x 1 1/2in. 14/6, postage 2/9.

13 AMP FUSED SWITCH

Made by G.E.C. For connecting water heater etc., into 13 amp rings main. Flush type 3/6 each 30/- doz. Metal boxes for surface mounting 1/6 each 15/- doz.

MICRO SWITCH

5 amp. changeover contacts, 1/9 each 18/- doz.

ISOLATION SWITCH

20 Amp D.P. 250 volts. Ideal to control Water Heater or any other appliance. Neon indicator shows when current is on, 4/6. 48/- per dozen.

SUPPRESSOR CONDENSER TCC

.1 mfd. 250v. A.C., working metal case with fixing lug. 1/9 each 18/- doz.

15/20 AMP CONNECTORS

Polythene insulated 12-way strip. 2/6 each 24/- doz.

MAINS MOTOR

Precision made — as used in tape decks and recorders — ideal also for extractor fan, blower, heaters etc. New and perfect. Snip at 9/6. Postage 1/- for first one then 1/- for each one ordered. 12 and over post free.

0.005mFd TUNING CONDENSER

Proved design. Ideal for straight or reflex circuits 2/6 each. 24/- doz.

250V AC working condensers for power factor correction, motor starting etc. 3.5 mfd. 6/6 each. 6.5 mfd. 8/6 each. 8 mfd. 9/6 each.

3 amp battery charger kit comprises copper backed circuit board, 3 amp mains transformer, regulator resistors and smoothing condenser 29/6 inc. wiring diagram, post & ins. 4/6.

'GLADIATOR' 2 WAVE BAND TRANSISTOR RADIO

7 transistor, 2 wave band (medium and long) pocket radio with carrying handle and ear-plug. These radios use a ferrite slab aerial and a conventional superhet circuit with built in moving coil speaker. Completely built and ready to play. Offered at less than importers price due to bankrupt purchase. A remarkable bargain 39/6 plus 3/6 post and insurance.



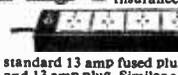
THERMOSTAT WITH PROBE

This has a sensor attached to a 15A switch by a 14in. length of flexible capillary tubing—control range is 20°F to 150°F so it is suitable to control soil heating and liquid heating especially when in buckets or portable vessels as the sensor can be raised out and lowered into the vessel. This thermostat could also be used to sound a bell or other alarm when critical temp. is reached in stack or heap subject to spontaneous combustion or if liquid is being heated by gas or other means not controllable by the switch. Made by the famous Teddington Co., we offer these at 12/6 each. Postage and insurance 2/9.



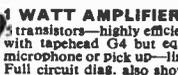
24 HOUR TIME SWITCH

Mains operated. Adjustable Contacts give 2 on/off periods 24 hours. Contracts rated 15 amps, repeating mechanism so ideal for shop window control, or to switch hall lights (anti-burglar precaution) while you are on holiday. Made by the famous Smiths Company. This month only 39/6 with Perspex cover, plus 3/6 postage and insurance, a real snip which should not be missed.



DISTRIBUTION PANELS

Just what you need for work bench or lab. 8 x 13 amp sockets in metal box to take standard 13 amp fused plugs. Supplied complete with 6 feet of heavy cable and 13 amp plus. Similar advertised at £5. Our price 39/6, + 4/6 P & I.



1 WATT AMPLIFIER & PREAMP

3 transistors—highly efficient, made for use with tapehead G4 but equally suitable for microphone or Pick up—limited quantity 29/6 Full circuit diag. also shows tape controls 5/-



THIS MONTHS SNIP

See in the dark INFRA RED MONSCOPE

This equipment is complete and portable. Basically it consists of an infra red image converter tube with optical lenses for focusing the image and a Zambini pile to provide the necessary E.H.T. The monoscope is housed in a hide case size 9in. x 6in. x 4in. approx.

Made originally for the army for night observations sniping etc. this equipment has many scientific and practical applications a limited quantity only is available in original sealed carton Price £9.19.6. Note—although unused in fact still in original sealed cartons. The equipment is approx 25 years old and consequently the Zambini pile may need drying out (a better idea might be to replace it with a battery operated power unit there is plenty of room).

MINIATURE EXTRACTOR FAN

Beautifully made by famous German Company. PAPST System. 230/240 A.C. Mains operated, size 3 1/2in. x 3 1/2in. x 2in. Made for instrument cooling but ideal to incorporate in a cooker hood, etc. 85/-.

WAFFER SWITCHES TO YOUR REQUIREMENTS

Standard Size 1 1/2 waffer—silver plated 5 amp contact standard 4" spindle 2in. long—with locking washer and nut.

Poles	2 way	3 way	4 way	5 way	6 way	7 way	8 way	10 way	12 way
1 pole	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
2 poles	6/6	6/6	6/6	6/6	6/6	6/6	6/6	10/6	10/6
3 poles	6/6	6/6	6/6	6/6	6/6	6/6	6/6	14/6	14/6
4 poles	6/6	6/6	6/6	6/6	10/6	10/6	10/6	18/6	18/6
5 poles	6/6	6/6	6/6	6/6	10/6	14/6	14/6	22/6	22/6
6 poles	6/6	6/6	10/6	10/6	14/6	14/6	14/6	26/6	26/6
7 poles	6/6	6/6	10/6	10/6	14/6	18/6	18/6	30/6	30/6
8 poles	10/6	10/6	10/6	14/6	18/6	18/6	34/6	34/6	34/6
9 poles	10/6	10/6	14/6	14/6	22/6	22/6	38/6	38/6	38/6
10 poles	10/6	10/6	14/6	18/6	22/6	22/6	42/6	42/6	42/6
11 poles	10/6	14/6	14/6	18/6	26/6	26/6	46/6	46/6	46/6
12 poles	10/6	14/6	14/6	18/6	26/6	26/6	50/6	50/6	50/6

15, 30 & 100 WATT H-FI SPEAKERS

FULL FI 12 INCH LOUDSPEAKER. This is undoubtedly one of the finest loudspeakers that we have ever developed, produced by one of the country's most famous makers. It has a die-cast metal frame and is strongly recommended for Hi-Fi load and Rhythm Guitar and public address. Flux Density 1,000 gauss.—Total Flux 4000 Maxwatts—Power Handling 15 watts R.M.S. Cone Moulded fibre—Freq. response 30-10,000 c.p.s.—Specify 3 or 15 ohms—Mains resonance 60 c.p.s.—Chassis Diam. 12in.—12in. over mounting lugs—Baffle hole 1in. Diam.—Mounting holes 4, holes—1in. diam. on pitch circle 1 1/2in. diam.—Overall height 5 1/2in. A 66 speaker offered for only £3.19.6 plus 7/6 p. & p. Don't miss this offer. 15in. 30 watt £7.19.6 18in. 100 watt £19.10.0.

3kW TANGENTIAL HEATER UNIT

This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. We have a few left. Comprises motor, impeller, 2kW. element and kW. element allowing switching 1, 2 and 3kW. and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only need control switch. 79/6. Postage and insurance 6/6. Don't miss this.

Where postage is not stated then orders over £3 are post free. Below £3 add 2/9. Semi-conductors add 1/- post. Over £1 post free. S.A.E. with enquiries please.

MINIATURE WAFFER SWITCHES

2 pole. 2 way—4 pole. 2 way—3 pole. 3 way—4 pole. 3 way—2 pole. 4 way—3 pole. 4 way—2 pole. 6 way—1 pole. 12 way. All at 8/6 each. 36/- dozen, your assortment

WATERPROOF HEATING ELEMENT

26 yards length 70W. Self-regulating temperature control. 10/- post free.

BLANKET SWITCH

Double pole with neon led into side so luminous in dark, ideal for dark room light or for use with waterproof element, new plastic case 5/6 each. 3 heat model 7/6.



COPPER CLAD ELEMENT

1250 watts—4ft. long but bent to U shape, ideal for overhead heater—just mount reflector above. 12/6 each, plus 4/6 post. £6 doz. post paid.

HEAT & LIGHT LAMP

275W. Internally mirrored bulb, with b.c. end for plugging into lamp holder. 19/6 each plus 4/6 post and insurance.

TUBULAR HEAT & LIGHT LAMP

Philips 500W. 29/6 plus 4/6 post and insurance.

ELECTRIC CLOCK WITH 2S AMP SWITCH

Made by Smith's, these units are as fitted to many top quality cookers to control the oven. The clock is mains driven and frequency controlled so it is extremely accurate. The two small dials enable switch on and off times to be accurately set. Ideal for switching on tape recorders. Offered at only a fraction of the regular Price—new and unused only 39/6, less than the value of the clock alone—post and insurance 2/9.



THERMOSTATS

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

Type "B" 15 amp. This is a 17in. long rod type made by the famous Sunvic Co. Spindle adjusts this from 50-550°F. Internal screw alters the setting so this could be adjustable over 30° to 1000°F. Suitable for controlling furnace, oven, kiln, immersion heater or to

make flame-stat or fire alarm. 8/6 plus 2/6 post and insurance.

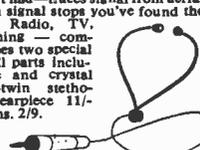
Type "D". We call this the ice-stat as it cuts in and out at around freezing point. 2/3 amps. Has many uses one of which would be to keep the loft pipes from freezing. If a length of our blanket wire (16 1/2 ft) is wound round the pipes. 7/6 P. & P. 1/-.

Type "E". This is standard refrigerator thermostat. Spindle adjustments cover normal refrigerator temperature. 7/6, plus 1/6 post.

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

RADIO STETHOSCOPE

Easiest way to fault find—traces signal from aerial to speaker—when signal stops you've found the fault. Use it on Radio, TV, amplifier, anything—complete kits comprises two special transistors and all parts including probe tube and crystal carpiece. 29/6—twin stetho- instead of carpiece 11/- extra—post and ins. 2/9.



BEKASTAT

This is an instant thermostat, simply plug your appliance into it and its lead into wall plug. Adjustable setting for normal temperatures. 13A loading Will save its cost in a season. 19/6. Post and insurance 2/9.



MAINS TRANSFORMER SNIP

Making a power pack for amplifier or other equipment? These transformers have normal mains primaries (230/240v.) and isolated secondaries two types (1) 12v. 500mA, at 8/6; (2) 15v. 500mA at 8/6.



ELECTRONICS (CROYDON) LTD

Dept PW 266 London Road, Croydon CRO-2TH
Also 102/3 Tamworth Road, Croydon

R.S.T. VALVE MAIL ORDER CO.

BLACKWOOD HALL, 16a WELLFIELD ROAD, STREATHAM S.W.16

Mon.—Sat. 9 a.m. — 5.30 p.m.
Closed Sat. 1.30—2.30 p.m.
Open Daily to Callers

Tel. 788-0199/1849

1A7	7/9	6BR8	12/6	6K7GT	4/6	10C1	12/6	25L6GT	7/—	150B2	11/6	DK32	7/9	BCH35	11/6	EY31	8/—	PCC189	10/6	R2	7/6	UF41	10/6
1D5	7/6	6BS7	25/—	6K8	2/9	10C2	12/6	25Y5	6/—	150C4	9/6	DK91	6/—	ECH42	12/6	EY86	7/—	PCF80	6/9	R19	7/9	UF89	7/6
1HS	7/—	6BW6	14/6	6K8M	11/6	10F1	14/9	25Z4	6/3	801	9/6	DK92	9/—	ECH81	5/9	EZ35	8/9	PCF82	6/6	RG5/50080	—	UL41	12/—
1LD5	6/—	6BW7	13/—	6K8G	3/—	10F3	18/—	25Z5	8/—	807	9/—	DK96	7/9	ECH83	8/6	EZ40	8/9	PCF84	8/—	S130	4/9	UL84	7/—
1NSGT	8/—	6C4	5/—	6K8GT	7/—	10F9	10/6	25Z6	8/6	813USA	—	DL66	25/—	ECL80	5/9	EZ41	9/6	PCF86	9/—	SP4	3/—	UM80	5/6
1R5	6/—	6CS5	5/—	6K25	15/—	10F18	8/—	28D7	9/3	—	120/—	DL92	6/3	ECL82	7/—	EZ80	5/6	PCF801	9/9	SP41	5/6	UU6	21/—
1S4	5/6	6C6	3/8	6L1	12/—	10L1	8/—	30C1	6/9	813	75/—	DL93	4/—	ECL83	10/3	EZ81	5/6	PCF802	0/0	SP61	5/6	UU7	21/—
1S5	4/6	6C8	6/—	6L6	7/9	10LD11	10/6	30C15	15/—	866A	15/—	DL94	6/9	ECL86	5/9	GY501	15/—	PCF805	15/—	STV280	80/—	UU8	21/—
1T4	4/6	6CD6G	24/—	6L18	6/—	10P13	13/6	30C17	16/—	954	5/6	DL95	7/9	ECL87	3/—	GY502	10/—	PCF808	15/6	STV25	95/—	UU9	8/3
3A4	4/—	6CH6	7/6	6Q7G	6/—	11E3	70/—	30C18	15/—	1625	6/6	DL96	7/9	ECL88	7/9	—	—	PCF809	15/6	STV25	95/—	UY21	9/6
3Q4	7/9	6CW4	12/—	6Q7GT	8/6	12A7	6/9	30F5	17/—	4022AR	67/—	DM70	6/—	EF9	20/—	GZ34	11/—	PCL82	7/9	STU150	12/6	UY41	8/6
3Q5	7/—	6D6	3/9	6SA7M	7/—	12A7	6/9	30L11	16/—	5763	12/—	DY86	6/—	EF37A	7/—	HN309	22/6	PCL83	10/3	T41	17/6	UY85	8/5
3S4	6/3	6E5	7/6	6SC7	7/—	12A7	6/9	30L12	19/—	7195	2/—	DY87	5/—	EF39	8/—	KT36	18/—	PCL84	8/8	TTD4	8/6	VMP4G	17/—
3V4	6/9	6F1	12/6	6SG7	6/—	12A7	6/9	30L14	15/6	7475	14/—	E88CC	12/—	EF41	12/—	KT61	17/6	PCL85	9/3	U10	7/6	VP4B	25/—
5R4GY	10/6	6F5G	8/—	6SH7	3/3	12AX7	5/3	30L15	17/—	A61	9/6	EA50	3/6	EF50	5/—	KT66	21/—	PCL86	9/3	U14	7/6	VB105/30	6/6
5U4G	5/6	6F6G	5/—	6S17	6/—	12BA6	6/—	30L17	17/—	ATP4	2/3	EABC80	6/6	EF80	4/3	KT81	35/—	PD500	29/—	U19	35/—	VR150/30	6/6
5V4G	8/—	6F8G	5/6	6SK7GT	4/9	12BE6	6/3	30P4	15/—	ATP5	12/—	EAF42	10/—	EF85	7/—	KT81 (7C5)	—	PEN44	20/—	U25	15/6	VT25	15/—
5Y3GT	6/—	6F11	6/6	6SL7GT	6/—	12C8GT	5/—	30P12	16/—	ATP7	8/6	EB41	10/—	EF86	6/6	—	—	PEN44	20/—	U26	15/6	VT31	80/—
5Z4G	7/—	6F13	6/6	6SN7GT	5/6	12E1	20/—	30P19	15/—	AU2	80/—	EB91	3/—	EF89	5/6	KT88	34/—	PEN45	7/—	U28	4/6	VT111	8/9
630L2	15/—	6F14	12/6	6SQ7	7/6	12J5GT	2/6	30PL1	16/—	AU5	8/9	EB33	8/6	EF91	2/9	KTW61	8/6	PEN46	4/—	U191	13/9	VU120	12/6
6A7	15/—	6F23	16/—	6U4GT	12/—	12J7GT	6/6	30PL13	18/6	AZ1	8/6	EB41	10/6	EF92	2/6	KTZ41	6/—	PL36	10/9	U251	16/3	VU508	35/—
6A8G	12/6	6F24	14/—	6USG	7/6	12K7GT	7/—	30PL14	15/—	AZ31	10/—	EB30	4/9	EF98	15/—	ML4	17/6	PL81	8/—	U301	12/6	WB1M	13/6
6AC7	4/—	6F25	15/—	6V6M	12/—	12K8GT	8/—	35A5	11/6	CBH31	16/—	EBF80	7/6	EF183	6/6	ML6	7/6	PL82	8/6	U40	6/6	XH1-5	5/—
6AK5	5/—	6F28	14/—	6V6G	4/6	12Q7GT	6/—	35L6	9/—	CCH35	15/—	EBF83	9/—	EF184	7/—	MSP4	10/6	PL83	7/6	U404	7/6	XP1-5	5/—
6AM5	4/6	6F32	2/9	6V6GT	6/6	12SA7	8/—	35W4	4/6	CL33	20/—	EBF89	6/6	EL32	3/6	MU14	7/6	PL84	7/—	U801	23/6	XSG1-5	110/0
6AM6	3/6	6G6	2/6	6X4	4/6	12SG7	6/—	35Z3	10/—	CV450	25/—	EBL1	14/—	EL33	12/6	MX40	12/6	PL500	14/6	UABC80	6/6	Y63	6/6
6AQ5	6/3	6H6	6/—	6XS5	4/6	12SH7	3/—	35Z4GT	8/6	CY30	12/6	EBL21	12/—	EL34	10/6	N78	19/—	PL508	29/—	UAF42	10/6	Y63	6/6
6AS7G	16/—	6J5M	6/—	6XS5GT	6/—	12S7	3/9	35Z5	6/—	CY31	8/6	EBL31	27/6	EL38	22/6	N108	25/—	PL509	29/—	UBC41	9/6	SEG1	65/—
6AT6	4/9	6J5G	4/—	7B6	11/6	12SK7	4/9	37	6/6	DAC32	7/—	EC90	5/—	EL41	10/6	NGT1	3/6	PL802	16/6	UBC81	9/3	3FP7	29/—
6AU6	5/—	6J5GT	5/6	7B7	7/6	12SR7	5/—	42	6/6	DAP91	4/6	ECC81	6/—	EL42	10/6	NGT7	55/—	PK4	14/—	UBF80	7/6	SCP1	55/—
6B4G	20/—	6J6	3/6	7C5	22/6	14H7	9/6	50B5	6/6	DAP96	7/6	ECC82	5/8	EL84	4/9	OA2	6/—	PY33	10/9	UBF89	7/6	CV1526	40/—
6BSG	2/—	6J7M	8/6	7C6	15/—	19AQ5	5/—	50C5	6/3	DCC90	10/6	ECC83	6/3	EL95	6/6	OC3	5/—	PY81	5/9	UCC84	8/6	ACR131	—
6BA6	5/—	6J7G	6/—	7D5	8/—	20D1	10/—	50CDG31	8/—	DF33	8/—	ECC84	5/6	ELL80	20/—	OZ4	4/6	PY82	4/9	UCC85	7/6	—	100/—
6BE6	5/—	6J7GT	7/6	7H7	6/6	20F2	14/—	50L6GT	8/—	DF79	9/—	ECC85	5/—	EM34	21/—	PC86	11/6	PY83	7/—	UCF80	8/6	VCR97	85/—
6BH6	9/—	6K6GT	5/—	7R7	13/—	20L1	20/—	75	9/8	DF91	4/—	ECC88	7/6	EM80	7/6	PC88	11/6	PY500	18/6	UCH42	10/6	VCR517B	—
6BJ6	9/—	6K7	1/9	7S7	45/—	20P4	20/—	78	5/—	DF92	3/6	ECC89	6/6	EM81	8/6	PC97	8/9	PY500	29/—	UCH81	7/6	—	46/—
6BQ7A	7/—	6K7M	6/6	7Y4	8/6	20P5	20/—	80	7/6	DF96	7/6	ECF82	6/6	EM84	7/6	PCC84	6/6	PY800	9/6	UCL82	8/9	VCR517C	—
6BR7	17/—	6K7G	2/—	9BW6	7/—	25A6	5/9	85A2	7/3	DFH7	4/9	ECH21	12/6	ESU150	20/—	PC89	10/9	PY801	9/6	UCL83	10/—	—	46/—

Manufacturers and Export Inquiries Welcome
OBSOLETE TYPES A SPECIALITY
QUOTATIONS FOR ANY VALVE NOT LISTED
Express postage 9d. per valve.
Ordinary postage 6d. per valve. C.W.O. No C.O.D.
Tube postage 7/6 each
Special Express Mail Order Service

TUBES

14 inch	..	£4 0 0
17 inch	..	£4 5 0
19 inch	..	£6 0 0
21 inch	..	£8 10 0
23 inch	..	£12 0 0
27 inch	..	£8 0 0

SETS OF VALVES

DAF91, DF91, DK91, DL92 or DL94 .. 19/- plus postage
DAF96, DF96, DK96, DL96 .. 27/6 plus postage

TRANSISTORS

AC127	5/—	OC25	7/6	OC71	3/—	OC81	4/—	OC82D	3/—
AF114	5/—	OC28	12/6	OC72	4/—	OC81D	3/—	OC83	4/6
AF115	5/—	OC35	6/3	OC75	4/6	OC81DM	—	OC170	5/6
AF116	4/6	OC44	4/6	OC76	3/—	OC76	3/—	OC171	6/—
AF117	4/6	OC45	2/6	OC77	4/—	OC82	3/—	OC200	5/6

SEND S.A.E. FOR LIST OF 3,000 TYPES

IF YOU HAVE IF YOU HAVEN'T...

a Home Radio Catalogue

Ordering components is easier and quicker with our

Credit Account Service



Our aim in life at Home Radio Components Ltd. is to make your life happier and less complicated! To this end we have recently introduced a Credit Account Service, one advantage of which is that you can order components by telephone any time, any day. If you phone out of shop hours a recording machine will take your message for us to deal with as soon as we open shop next day.

There are other advantages to the new Service—if you want to order by post we provide Order Forms and Prepaid Envelopes. You settle your account just once per month. We stipulate no minimum order value. Of course, for ordering your components you first need our Catalogue, and after you have been in the Service 12 months we regularly send you an up-to-date catalogue—FREE!

For full details of our Credit Account Service just drop us a line or phone 01-648 8422.



Whether or not you want to use the Credit Account Service described, you certainly need the Home Radio Components Catalogue if you construct or repair radio and electronic gadgets. The catalogue has 350 pages, lists 8,000 components and has over 1,500 illustrations. It contains 6 vouchers, each worth 1/- when used as indicated. Post the coupon with 12/- (8/6 plus 3/6 postage and packing) and we will send a catalogue by return of post. By the way, we supply free a 30-page Price Supplement and a Bookmark giving electronic abbreviations.

Please write Name and Address in block capitals

NAME

ADDRESS

Home Radio (Components) Ltd., Dept. PW, 234 London Road, Mitham, CR4 3HD.



EALING & DISTRICT AMATEUR RADIO SOCIETY G3UUP

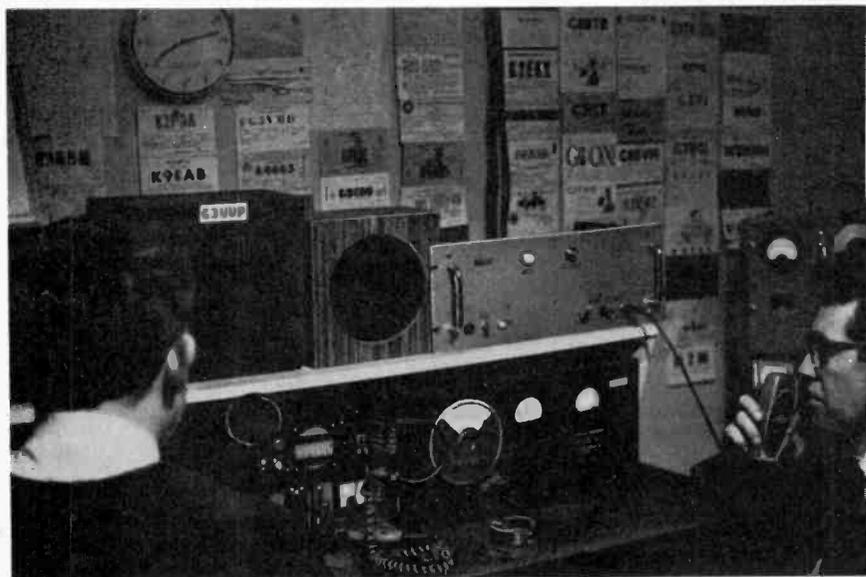
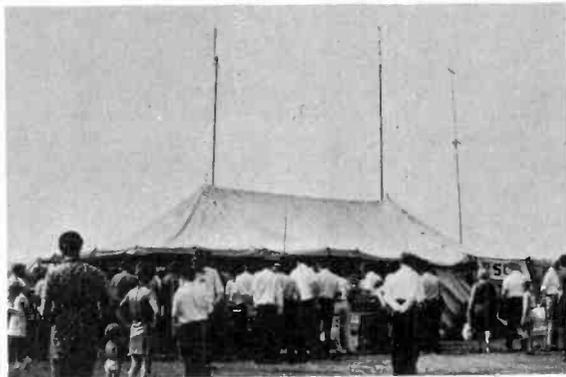
A LOT of water has flowed under the proverbial bridge since the Ealing and District Amateur Radio Society was formed over four years ago in September 1965. After pestering the life out of the local Council to help provide club rooms for eight very enthusiastic Hams, we obtained our present QTH. This is quite unique and a "Palace" when one thinks of some of the very poor conditions in which some Clubs have to operate!

One room, about the size of an average living room is the actual shack in which are housed the stores, benches, tools and equipment. A larger room about twice the size of the shack adjoins and is used for lectures, filmshows, etc. These rooms are the only ones upstairs in the building, which looks something like a sports pavilion with a flat roof which is a radio Amateur's delight for putting up an antenna farm for which there are no restrictions.

The Society started off with the usual Top Band rig with 132ft. end-fed wire which produced very fair results. Now most of the members are mobile on 4m. with a couple on 2 and 160m.

Whilst some of the SWL's have obtained their licences with the help of the Society, we have had two weddings amongst our celebrations, G3SGS and G3UDV. G3UDV married the daughter of G3TXB.

One side-line of the Society is putting on exhibition stations, three regulars being the Chiswick Town Exhibition for Adult Education, the Ealing Arts Council Hobbies Exhibition and the Brentford



The top picture shows the main tent at the RSGB Amateur Radio Mobile Rally 1969 held at Woburn Abbey.

The photograph above shows the Ealing and District Amateur Radio Society stand which was situated in the main tent. Here members sell donated components and gear to aid the Society funds.

The picture to the left shows the Society station with Bern., G3KLK, (left) and Bill, G3SGT, on the mic.



No, it's not the Ealing and District Amateur Radio Football Club with three reserves, it's a few of the members that we persuaded to say "cheese" when we went along to the Society QTH.

Evening Institute for the RAE and budding Hams.

The latest activity is attending mobile rallies around the London area and selling small components to raise funds for the Society which are still very healthy after buying a much-needed 230V 1kW petrol generator for our many field days.

We are a small Society but members are really keen. Over the four years membership has grown and more equipment has been acquired—much of this has been donated by members. With it, grew the Society's funds which started at £8—each founder-member donating £1 to get the Group under way. It would be grossly unfair to mention any names of dedicated members, because there have been so many that have made this Society the success that it is.

After the Ealing and District Amateur Radio Society was in full swing, with lectures and film-shows on anything from radio to old-time car racing, we began to think about weekend activities.

The Society went out on mad weekends (not dirty ones) everyone taking with them all types of equipment from the home QTH to operate /P. The Devil's Punch Bowl in Surrey was the first target which operated on 160, 80, 40 and 2m. with the YL's and XYL's cooking bangers and bacon and brewing the tea.

Many v.h.f. contests were and still are entered for, with excellent results. We have one prize award for

the first-ever recorded 13cm. contact at v.h.f. NFD by G3THQ.

There are about thirty members at Ealing who are active from the Society on 2, 4 and 160m. under the call sign G3UUP.

This year, the Society will be holding a Mobile Rally at the Hanwell Community Association on May 10th.

It is thought that this will be the first time a rally has been held in London. The Automobile Association will do the signposting and will have their own exhibition caravan at the site. The Rally address will be: Hanwell Community Association, Westcott Crescent, Hanwell, London, W.7.

Meetings of the Ealing and District Amateur Radio Society are held every Tuesday evening at the Community Centre, 71a Northcroft Road, London, W.13.

Further details about the Society and the Mobile Rally may be obtained by sending a s.a.e. to the Secretary, Bill Teale, G3SGT, 16 Whitestile Road, Brentford, Middlesex.

NOTE TO RADIO CLUB SECRETARIES

If you would like to see your Club featured in PRACTICAL WIRELESS, drop a line to Colin R. Riches, IPC Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4.

P.W. BINDERS

Preserve your copies of Practical Wireless. Don't let them become torn and dirty—buy a hard-cover binder for 14s. 6d. from:

**Binding Department,
IPC Magazines Limited,
Tower House,
Southampton Street,
London, W.C.2.**

Price includes post and packing

P.W. INDEX

The Index to Volume 44 (May 1968 to April 1969) is now available, price 1s. 6d. Copies may be obtained from:

**P.W. Index Department,
IPC Magazines Limited,
Carlton House,
Great Queen Street,
London, W.C.2.**

Price includes post and packing

COMET Hi-Fi DISCOUNT WAREHOUSE

- ALL ITEMS OFFERED ARE BRAND NEW, LATEST MODELS IN MANUFACTURERS SEALED CARTONS AND ARE FULLY GUARANTEED AND BACKED BY COMET.
- OPEN TO THE PUBLIC DAILY from 9 a.m. Closed Tues. 1 p.m. Mon. & Sat. 5.30 p.m. Open until 8 p.m. Weds., Thurs. & Fridays.
- COMPLETE FREE PRICE LIST CONTAINING OVER 600 ITEMS ON REQUEST.

	Rec. Price	Retail Price	Comet Price
AMPLIFIERS			
ARENA 210 Amplifier ..	£34 13 0	£28 0 0	
ARMSTRONG 521 25 watts per channel ..	£52 0 0	£42 19 6	
DULCI 207 Stereo Amplifier ..	£25 0 0	£17 0 0	
DULCI 207M Stereo Amplifier takes magnetic P/U ..	£30 0 0	£20 19 6	
GOODMANS Maxamp ..	£54 0 0	£41 19 6	
New LEAK Stereo 30 Plus chassis ..	£53 0 0	£42 19 6	
New LEAK Stereo 30 Plus in teak case ..	£59 10 0	£47 19 6	
New LEAK Stereo 70 ..	£63 0 0	£49 19 6	
LEAK Stereo 70 In teak case ..	£69 10 0	£56 4 6	
New LEAK Stereo 70 Plus in teak case ..	£69 10 0	£54 19 6	
LINEAR LT.66 Stereo Amplifier ..	£18 18 0	£13 19 6	
QUAD 33 Pre-amplifier ..	£43 0 0	£35 19 6	
QUAD 303 Stereo Main Amplifier ..	£55 0 0	£45 19 6	
ROGERS Ravensbourne 50 watt Stereo ..	£59 10 0	£48 19 6	
ROGERS Ravensbourne in teak case ..	£64 0 0	£52 13 6	
ROGERS Ravensbrook ..	£44 0 0	£36 19 6	
ROGERS Ravensbrook in Teak Case ..	£49 0 0	£38 19 6	
TELETON 203E ..	£28 7 6	£20 15 6	
TRUVOX TSA.200 ..	£54 12 0	£39 19 6	

	Rec. Price	Retail Price	Comet Price
TUNERS			
ARENA 211 Stereo with decoder ..	£39 10 0	£33 19 6	
ARMSTRONG 523 AM/FM ..	£52 9 0	£44 19 6	
ARMSTRONG 524 FM ..	£40 4 6	£34 19 6	
ARMSTRONG M8 Stereo decoder ..	£9 10 0	£7 19 6	
DULCI FMT.7 FM ..	£22 1 0	£17 19 6	
DULCI FMT.7S FM Stereo Tuner ..	£31 0 0	£25 5 0	
GOODMANS Stereomax AM/FM Stereo Tuner ..	£82 10 5	£71 19 6	
LEAK Troughline Tuner with multiplex ..	£51 10 6	£39 19 6	
LEAK Stereofetic Chassis form ..	£56 11 0	£45 19 0	
LEAK Stereofetic in teak case ..	£64 14 4	£52 19 6	
QUAD Stereo FM ..	£51 0 0	£43 19 6	
ROGERS Cadet Mark III Tuner ..	£20 12 6	£17 13 0	
ROGERS Ravensbourne Tuner with Decoder ..	£61 17 9	£52 12 6	
TRUVOX FM 200/1C with decoder ..	£60 11 10	£45 19 0	

	Rec. Price	Retail Price	Comet Price
TUNER/AMPLIFIERS			
ARENA 2400 with Decoder ..	£90 6 0	£69 19 6	
ARENA 2500 complete with Decoder ..	£97 0 0	£79 0 0	
ARENA T1500F AM/FM Stereo Tuner/Amplifier ..	£72 9 0	£59 19 6	
ARENA T900 AM/FM Stereo Tuner/Amplifier ..	£303 9 0	£258 0 0	
ARMSTRONG 525 25 watts per channel FM ..	£87 16 9	£74 19 6	
ARMSTRONG 526 25 watts per channel AM/FM ..	£98 15 6	£85 19 6	
ARMSTRONG 127 ..	£43 19 9	£37 19 6	
(Teak Case for 127) ..	£3 17 0	£3 10 0	
(NEW) GOODMANS Model 3000 with stereo decoder ..	£77 14 7	£66 19 6	

	Rec. Price	Retail Price	Comet Price
TANDBERG solv Super 10/71 Tuner/Amplifier AM/FM and 2 short wavebands ..			
	£75 18 0	£65 18 0	
TELETON F.2000 AM/FM Stereo Tuner/Amplifier 2 x 5 watts RMS with silicon transistors ..			
	£51 0 0	£37 19 6	
TELETON TATI Stereo Tuner/Amplifier AM/FM 50 watts RMS Stereo Decoder and F.E.T. ..			
	£133 0 0	£89 0 0	
COMPLETE HI-FI SYSTEMS			
TELETON MX.990 Stereo Tuner/Amplifier with AM/FM Multiplex Stereo Radio c/w two Speakers, each Speaker containing 8in. bass, 2in. tweeter ..			
	£64 13 2	£48 19 6	
TELETON R.8000 AM/FM Stereo Tuner/Amplifier 2 x 6 watts RMS, complete with 2 speaker boxes ..			
	£60 19 6	£49 19 6	
TELETON C.M.S. 300 with turntable and two speakers ..			
	£105 15 0	£79 19 6	
TELETON CMS.400 AM/FM Multiplex Tuner/Amplifier with 2 speaker boxes and turntable ..			
	£126 0 0	£89 0 0	

THE GOODMAN 3000 MUSIC AUDIO SUITE
A complete Audio Suite with Stereo Radio, complete with Speakers, Turntable and magnetic cartridge. All Wired and ready to go. Beautifully finished in Teak. Rec. Retail Price £140.9.0. **COMET PRICE £111.0.0.**

CARTRIDGES ALL MAKES STOCKED AT DISCOUNT PRICES

	Rec. Price	Retail Price	Comet Price
SPEAKERS			
ARENA HT 21 ..	£10 10 0	£9 5 0	
ARENA HT 7 ..	£19 19 0	£17 0 0	
ARENA HT 10 ..	£22 1 0	£18 19 6	
ARENA HT 20 ..	£32 11 0	£26 19 6	
ARENA HT 26 ..	£78 15 0	£65 19 6	
BOWERS & WILKINS DM 3A and W ..			
	£63 0 0	£53 6 0	
BOWERS & WILKINS DM 3M ..			
	£69 10 0	£58 16 0	
BOWERS & WILKINS P2H ..			
	£94 10 0	£81 5 6	
CELESTION Ditton 10 ..			
	£21 3 2	£17 5 0	
CELESTION Ditton 15 ..			
	£31 3 7	£25 19 6	
DULCI AS3 Speaker ..			
	£8 8 0	£6 19 6	
GOODMANS Majesta ..			
	£57 0 0	£48 19 6	
GOODMANS Maxim ..			
	£20 7 9	£15 19 6	
GOODMANS Mezzo II ..			
	£30 18 0	£24 19 6	
GOODMANS Magnum-K ..			
	£40 2 0	£32 19 6	
GOODMANS Mirimba ..			
	£24 0 1	£19 19 6	
GOODMANS Mambo ..			
	£22 5 6	£18 11 9	
GOODMANS Loudspeaker System Model 2005 (per pair) ..			
	£25 0 0	£21 0 0	
KEF Celeste ..			
	£29 0 0	£23 19 6	
KEF Concord ..			
	£43 10 0	£34 19 6	
LEAK Sandwich ..			
	£43 10 0	£34 19 6	
LEAK Mini-Sandwich ..			
	£29 15 0	£23 19 6	
QUAD Electrostatic ..			
	£66 0 0	£57 19 6	
TRUVOX LS200 ..			
	£22 7 3	£17 19 6	
WHARFEDALE New Alredale ..			
	£69 10 0	£57 14 0	
WHARFEDALE Denton ..			
	£18 0 0	£13 19 6	
WHARFEDALE Super Linton ..			
	£21 10 0	£17 19 6	
WHARFEDALE Melton ..			
	£29 10 0	£23 19 6	

	Rec. Price	Retail Price	Comet Price
WHARFEDALE New Dovedale 3 ..			
	£39 10 0	£31 19 6	
WHARFEDALE Rosedale ..			
	£55 0 0	£43 19 6	
WHARFEDALE UNIT 3 Speaker Kit ..			
	£10 19 6	£8 19 6	

Most types of chassis, speakers, cross-over networks, etc., available ex stock.

	Rec. Price	Retail Price	Comet Price
TURNTABLES			
ARENA SP.25 complete with base and cover ..			
	£30 19 0	£24 19 6	
GARRARD SP.25, Mark II ..			
	£15 11 4	£11 19 6	
GARRARD AP.75 ..			
	£23 16 0	£16 19 6	
GARRARD SL.55 ..			
	£13 17 9	£11 12 6	
GARRARD SL.65 ..			
	£19 6 5	£14 9 6	
GARRARD SL.75 ..			
	£35 12 5	£25 19 6	
GARRARD SL.95B ..			
	£45 9 1	£33 19 6	
GARRARD 401 ..			
	£31 14 2	£26 10 0	
GARRARD 3000 fitted with GKS 25/Cartridge ..			
	£13 18 3	£9 19 6	
GARRARD 3500 fitted with GKS 25/Cartridge ..			
	£15 15 0	£10 19 6	
GOLDRING GL69 ..			
	£25 1 6	£21 5 0	
GOLDRING 69P ..			
	£33 11 9	£28 19 6	
GOLDRING Lenco GL.75 ..			
	£36 8 2	£27 19 6	
GOLDRING 75P inc. cover ..			
	£46 18 8	£38 0 0	
GOODMANS Model 3025 complete with magnetic Cartridge ..			
	£37 14 9	£32 19 6	
THORENS TD.125 ..			
	£69 11 2	£53 19 6	
THORENS TD.150A Mark II ..			
	£41 14 9	£32 19 6	
THORENS TD.150AB Mark II ..			
	£45 10 7	£34 19 6	
THORENS TD.124/II ..			
	£46 15 10	£40 19 6	

	Rec. Price	Retail Price	Comet Price
HI-FI STEREO TAPE DECKS AND TAPE RECORDERS			
AKAI X-360 4-track ..			
	£339 0 0	£284 0 0	
AKAI X-360D deck 4-track ..			
	£290 0 0	£243 0 0	
AKAI 1710 4-track without accessories ..			
	£109 0 0	£89 19 6	
AKAI 1800 4-track ..			
	£158 0 0	£133 0 0	
AKAI 1800SD 4-track ..			
	£199 0 0	£167 0 0	
AKAI 4000D deck 4-track ..			
	£87 10 0	£75 10 0	
FERGUSON 3324 Twin Track ..			
	£33 14 0	£24 19 6	
FERGUSON 3226 Four Track ..			
	£46 6 0	£29 19 6	
GRUNDIG TK124 ..			
	£41 18 6	£36 19 6	
GRUNDIG TK144 ..			
	£47 13 1	£39 19 6	
GRUNDIG TK149 ..			
	£55 18 10	£47 19 6	
MARCONI 4218 Stereo Tape Recorder ..			
	£89 11 2	£69 19 6	
MARCONI 4238 4-track Tape Recorder ..			
	£58 11 0	£49 19 6	
TRUVOX R52 & R54 3-speed 2-track ..			
	£77 5 1	£52 2 0	
TRUVOX PD 102 Stereo Tape Deck ..			
	£114 15 3	£79 0 0	
PICKUP ARMS			
GOLDRING Lenco L75 ..			
	£12 6 6	£10 10 0	
GOLDRING Lenco G65 ..			
	£7 13 6	£6 10 0	
SME 3009 with S2 shell ..			
	£31 6 3	£24 19 6	
SME 3012 with S2 shell ..			
	£33 7 3	£26 19 6	

COMET DISCOUNT WAREHOUSE

Reservoir Road, Clough Road, Hull. Tel 407906
68a Armley Rd (Artist St) Leeds LS12 2EF Tel 32055

Customers are welcome to call personally.
Ample Car Parking facilities

Comet guarantee that all prices quoted are genuine. All items offered available at these prices at the time this issue closed for press.
Add 9/- for post and packing on all orders. Make cheques, Money Orders payable to "COMET".

TRANSISTOR RADIOS TO BUILD YOURSELF

Backed by after sales service

NEW! roamer eight mkl WITH VARIABLE TONE CONTROL

7 Tunable Wavebands: Medium Wave 1, Medium Wave 2, Long Wave, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for Medium and Long Waves. Five section 22in. chrome plated Telescopic aerial for Short Waves can be angled and rotated for maximum performance. Push pull output using 800 mW transistors. Socket for car aerial. Tape record socket. Selectivity switch. Switched earpiece socket complete with earpiece for private listening. Eight transistors plus 3 diodes. Famous make 7in. x 4in. speaker. Air spaced ganged tuning condenser. On/Off switch volume control. Wave change switch and tuning control. Attractive case in rich chestnut shade with gold blocking. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams make the Roamer Eight a pleasure to build.

Total Building Costs

£6.19.6

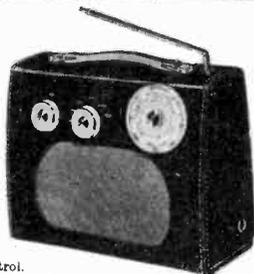
Parts Price List and Easy Build Plans 5/- (FREE with parts).

P & P 7/6.



roamer seven mklV

SEVEN FULLY TUNABLE WAVEBANDS—MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Extra Medium waveband provides easier tuning of Radio Luxembourg, etc. Built in ferrite rod aerial for Medium and Long Waves. Five Section 22in. chrome plated telescopic aerial for Short Waves—can be angled and rotated for peak B.W. listening. Socket for Car Aerial. Powerful push-pull output. Seven transistors and two diodes including Micro-Alloy B.F. Transistors. Famous make 7 x 4in. P.M. speaker. Air spaced ganged tuning condenser. Volume/on/off control, wave change switches and tuning control. Attractive case with carrying handle. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams make the Roamer 7 a pleasure to build. Parts price list and easy build plans 3/- (FREE with parts). Personal Earpiece with switched socket for private listening, 5/- extra.



Total building costs

£5.19.6

P. & P. 7/6

NEW! trans eight

SIX WAVEBAND
PORTABLE WITH
3in. SPEAKER

Attractive case in black with red grille and cream knobs and dial with polished brass inserts. Size 9 x 5 1/2 x 2 1/2 in. approx. Tunable on Medium and Long Waves, three Short Waves and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. Eight improved type transistors plus 3 diodes. Push pull output. Ample power to drive a larger speaker. Parts price list and easy build plans 5/- (FREE with parts). Earpiece with switched socket for private listening 5/- extra.

Total building costs
F & P 5/6

89'6



pocket five

MEDIUM WAVE, LONG WAVE
AND TRAWLER BAND PORTABLE
WITH SPEAKER AND EARPIECE

Attractive black and gold case. Size 5 1/2 x 1 1/2 x 3 1/2 in. Tunable over both Medium and Long Waves with extended M.W. band for easier tuning of Radio Luxembourg, etc. 7 stages—5 transistors and 2 diodes, supersensitive ferrite rod aerial, fine tone moving coil speaker, also Personal Earpiece with switched socket for private listening. Easy build plans and parts price list 1/6 (FREE with parts).



Total building costs

44'6

P. & P.
3/6

transona five

MEDIUM WAVE, LONG WAVE
AND TRAWLER BAND PORTABLE
WITH SPEAKER AND EARPIECE

Attractive case with red speaker grille. Size 6 1/2 x 4 1/2 x 1 1/2 in. 7 stage—5 transistors and 2 diodes, ferrite rod aerial, tuning condenser, volume control, fine tone moving coil speaker also Personal Earpiece with switched socket for private listening. Easy build plans and parts price list 1/6 (FREE with parts).



Total building costs

47'6

P. & P.
3/9

roamer six

SIX WAVEBAND PORTABLE
WITH 3in. SPEAKER

Attractive case with gilt fittings. Size 7 1/2 x 5 1/2 x 1 1/2 in. Tunable on Medium and Long waves, two short waves, Trawler Band Plus an extra M.W. band for easier tuning of Radio Luxembourg, etc. Sensitive ferrite rod aerial and telescopic aerial for Short waves. 8 stages—6 transistors and 2 diodes including Micro-Alloy B.F. Transistors etc. (Carrying strap 1/6 extra). Easy build plans and parts price list 2/- (FREE with parts).



Total building costs

79'6

P. & P.
4/6

RADIO EXCHANGE CO

61 HIGH STREET, BEDFORD. Tel. 0234 52367

I enclose £..... please send items marked

ROAMER EIGHT	<input type="checkbox"/>	ROAMER SEVEN	<input type="checkbox"/>
TRANSONA FIVE	<input type="checkbox"/>	TRANS EIGHT	<input type="checkbox"/>
POCKET FIVE	<input type="checkbox"/>	ROAMER SIX	<input type="checkbox"/>

Parts price list and plans for

Name

Address

PW.15

* Callers side entrance Stylo Shoe Shop

* Open 10-1, 2.30-4.30 Mon-Fri, 9-12 Sat

TAKE 20

JULIAN ANDERSON

A series of simple transistor projects, each using less than twenty components and costing less than twenty shillings to build.

THE multivibrator is one of the most widely used forms of oscillator and can be used for a variety of purposes. It is also one of the simplest forms and in this particular circuit we are making it operate small 0.75W bulbs, flashing these at a frequency of about 1Hz, the lights flashing alternately.

THE MULTIVIBRATOR

The multivibrator works as follows: one of the transistors, when a voltage is applied to the circuit, will pass slightly more current than the other; for the sake of explanation we will assume that this is Tr1 but of course it doesn't matter which. Since it is passing more current its collector voltage will drop. This change will be fed to the base of Tr2 causing it to pass less current and so its collector voltage will rise. This action will cause Tr1 to be further switched on and this will go on until Tr1 is completely switched on and Tr2 completely off. C1 then charges up through R2 until the base of Tr2 becomes positive enough to conduct, switching it on and in turn switching off Tr1—and so on.

As will be seen from the above, values of the resistors and capacitors affect the switching rate and by altering these it is an easy matter to choose your own flashing interval. To increase the rate decrease the values of R1, R2, C1 or C2 and to reduce the rate increase any of the values.

If we choose values so that the switching rate falls within the audio range and substitute resistors of 330Ω for the bulbs we could tap off the note from either collector via a capacitor. However in the form shown we are using the changing currents through the transistors to switch the bulbs on and off.

If only one flashing bulb is required a 330Ω resistor can substitute for the other bulb. The current consumption is fairly low using the specified bulbs—between 30 and 40mA and most layer batteries will provide this.

As for uses it is up to you, but flashing lights make the ideal warning device. If used as such one of the bulbs may be replaced by an 80Ω loudspeaker or a lower impedance type with matching transformer to provide audible plops as well as having one flashing light.

CONSTRUCTION

A suitable Veroboard layout is shown in Fig. 2 but of course the construction is uncritical; in the one shown none of the copper strips need be broken.

Make sure you use the specified bulbs as most types are unsuitable; these are a Radiospares product available from most component stockists and although they are rated at 14V they give a very bright emission from only 9V. ■

No. 11 NOVELTY LIGHT FLASHER

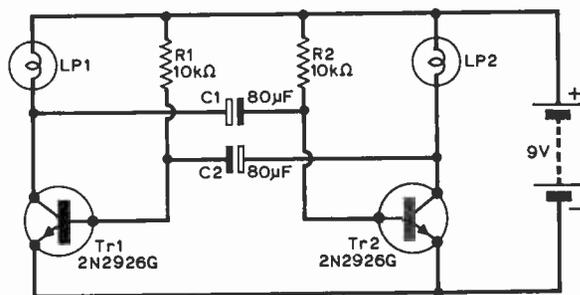


Fig. 1: The circuit of the light flasher.

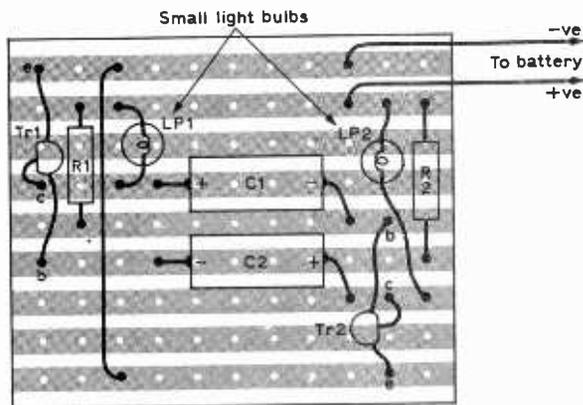


Fig. 2: The component layout on a small piece of Veroboard.

★ components list

R1, R2	10kΩ ¼ watt, 10%	6d.
C1, C2	80μF 12V	3s. 0d.
Tr1, Tr2	2N2926G	5s. 0d.
LP1, LP2	Radiospares 'Lilliput' bulbs, 14V, 0.75W	5s. 0d.
Veroboard, Battery, Battery clips, etc.		5s. 0d.

18s. 6d.

Next month's *Take 20* describes a simple lie detector which makes use of a multimeter. The circuit also is suitable for the measurement of very high resistance.

The length of the connecting tube or dowel is uncritical and will depend on usage, but in the prototype 12in. was found to be a convenient length.

USE WITH A TRANSISTOR RADIO

The circuit can be simplified by using a transistor superhet having an i.f. of between 450 and 470kHz, if this is used the second and third stages are unnecessary (that is the reference oscillator and the audio amplifier). Since the circuit works on approximately the i.f. frequency it is only necessary to make the search oscillator work and beat with the i.f. in the receiver by placing it close to it. It is necessary to tune into a station and listen to the heterodyne produced.

INITIAL SETTING UP

A transistor radio is all that is necessary for setting up. Place the radio near the soap box with it tuned to a station and adjust the core on the i.f. transformer until a beat note is heard. Then move

★ components list

Resistors

R1 1.5M Ω R3 1M Ω
R2 1M Ω R4 56k Ω

All resistors $\frac{1}{2}$ watt 10% types.
VR1 250k Ω log with switch.

Capacitors

C1 20pF C4 0.1 μ F
C2 See text C5 0.1 μ F
C3 20pF VC1 250pF trimmer
(Radiospares)

Semiconductors

Tr1, Tr2 and Tr3 2N2926G

Miscellaneous

L1, search coil, see text; IFT1, 465kHz i.f. transformer; J1, headphone jack socket; Veroboard 0.15in. matrix; Soap box; plastic tube, etc.

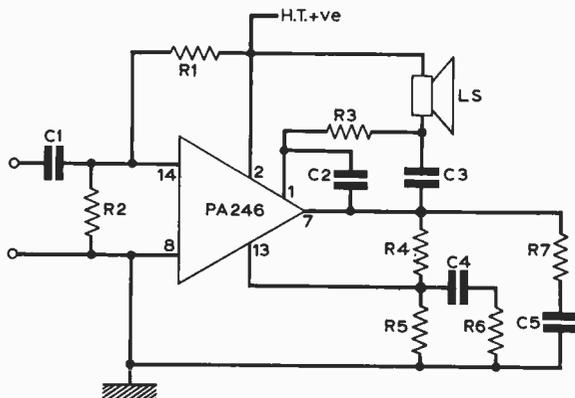


Fig. 2: Practical circuit for the PA246 with 5 watts audio output. Alternatively, the PA237 may be used but the audio output will be 2 watts. Capacitor C3 is an electrolytic—the plus side should be taken to the junction of R3 and the loudspeaker.

★ components list

Resistors:

R1 680k Ω R5 82k Ω
R2 75k Ω R6 6.8k Ω for max. freq. response.
R3 18k Ω 0 for max gain.
R4 330k Ω R7 22 Ω

Capacitors:

C1 0.33 μ F C4 4 μ F 25V
C2 0.001 μ F C5 0.05 μ F
C3 500 μ F 25V

Miscellaneous:

Loudspeaker, any 15 Ω impedance type.
I.C. PA246 (PA237); General Electric Co. (U.S.A.)

a suitable amplifier circuit for use with the PA246; it should be preceded by a conventional tone control and volume control circuit. The experienced constructor will find no difficulty in laying out a suitable printed circuit, or assembling a prototype on Veroboard with separate copper heat sinks. ■

the radio near the search coil and adjust VC1 until a beat note is also heard. When the phones are plugged in and VC1 is slightly adjusted the note will be heard in the phones.

The metal detector will now work as soon as the search coil is moved towards a metal object. It takes a little bit of getting used to before the necessary skills are acquired, but with practice operation is simple.

Just one small practical point in conclusion. Your ears are much more sensitive to a frequency change around 200Hz than below or above and it is best to set the beat note in that region before starting the search. If the two oscillators are exactly together no change will be heard until the audible range is reached and this is probably about 80Hz in the case of normal headphones. ■

BLUEPRINT SERVICE

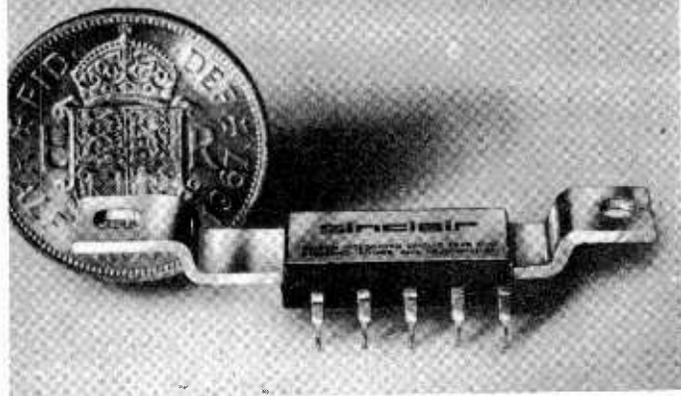
We would like to draw readers' attention to the fact that the BLUEPRINT SERVICE has been discontinued and therefore no further BLUEPRINTS are available.

QUERY COUPON

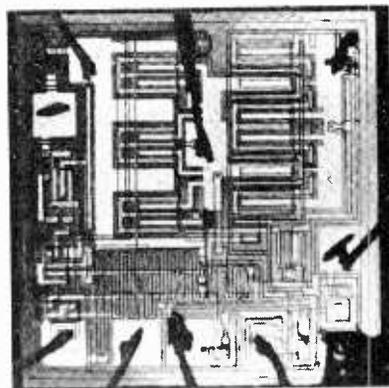
This coupon is available until 6th March 1970 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, MARCH 1970

SINCLAIR IC-10



MONOLITHIC INTEGRATED CIRCUIT HIGH FIDELITY AMPLIFIER AND PRE-AMP



the world's most advanced high fidelity amplifier

The Sinclair IC-10 is the world's first monolithic integrated circuit high fidelity power amplifier and pre-amplifier. The circuit itself, a chip of silicon only a twentieth of an inch square by a hundredth of an inch thick, has an output of 5 watts R.M.S. (10 watts peak). It contains 13 transistors (including two power types), 2 diodes, 1 Zener diode and 18 resistors, formed simultaneously in the silicon by a series of diffusions. The chip is encapsulated in a solid plastic package which holds the metal heat sink and connecting pins. This exciting device is not only more rugged and reliable than any previous amplifier, it also has considerable performance advantages. The most important are complete freedom from thermal runaway due to the close thermal coupling between the output transistors and the bias diodes and very low level of distortion.

The IC-10 is primarily intended as a full performance high fidelity power and pre-amplifier, for which application it only requires the addition of such components as tone and volume controls and a battery or mains power supply. However, it is so designed that it may be used simply in many other applications including car radios, electronic organs, servo amplifiers (it is d.c. coupled throughout) etc. The photographic masks required as part of the process of producing monolithic I.C.s are expensive but once made, the circuits can be produced with complete uniformity and at very low cost. This enables us to cover every IC-10 with the Sinclair guarantee of reliability.

■ SPECIFICATIONS

Output	10 Watts peak, 5 Watts R.M.S. continuous.
Frequency response	5 Hz to 100 KHz ±1dB.
Total harmonic distortion	Less than 1% at full output.
Load impedance	3 to 15 ohms.
Power gain	110dB (100,000,000,000 times) total.
Supply voltage	8 to 18 volts.
Size	1 × 0.4 × 0.2 inches.
Sensitivity	5mV.
Input impedance	Adjustable externally up to 2.5 M ohms.

■ CIRCUIT DESCRIPTION

The first three transistors are used in the pre-amp and the remaining 10 in the power amplifier. Class AB output is used with closely controlled quiescent current which is independent of temperature. Generous negative feedback is used round both sections and the amplifier is completely free from crossover distortion at all supply voltages, making battery operation eminently satisfactory.

■ APPLICATIONS

Each IC-10 is sold with a very comprehensive manual giving circuit and wiring diagrams for a large number of applications in addition to high fidelity. These include stabilised power supplies, oscillators, etc. The pre-amp section can be used as an R.F. or I.F. amplifier without any additional transistors.

SINCLAIR

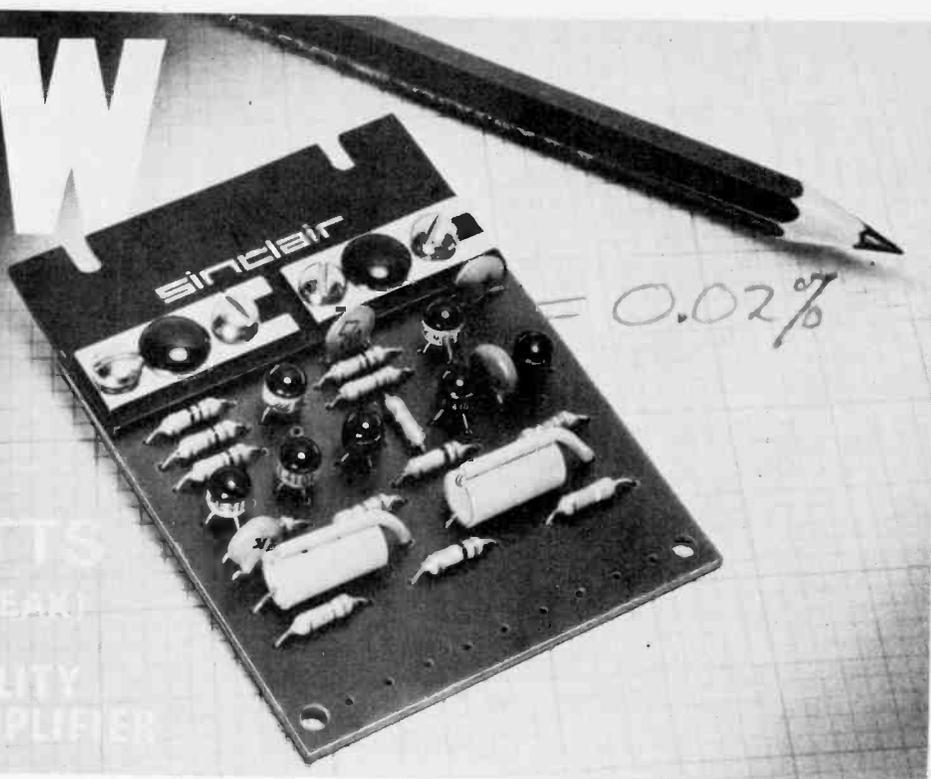
IC.10 with IC.10 manual **59/6**

POST FREE

sinclair

SINCLAIR RADIONICS LIMITED
22 NEWMARKET ROAD · CAMBRIDGE
Tel. 0233-52731

NEW



20 WATTS
(40 WATTS PEAK)

HIGH-FIDELITY
POWER AMPLIFIER

Z.30

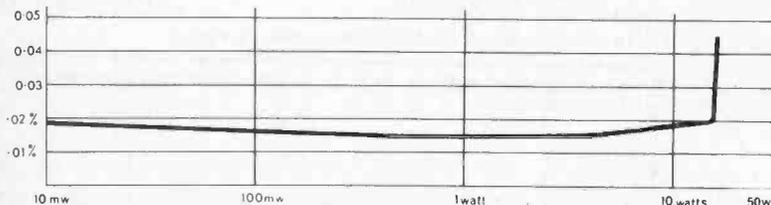
THE WORLD'S LOWEST DISTORTION HIGH FIDELITY AMPLIFIER.

For four years, the Sinclair Z.12 dominated the constructor world, being the best selling unit of its kind this side of the Atlantic. Excellent as it was, the new Sinclair Z.30 is still better. Half the size of the Z.12, it has more than twice the power, very much greater gain and a level of distortion 50 times lower. This incredible figure results from using over 60dB of negative feed back with a constant current load to the driver stage obtained by incorporating a two transistor circuit in place of the more usual boot-strapping. 9 silicon epitaxial planar transistors are used to provide enormous power (up to 20 watts RMS continuous sine wave, 40 watts peak). The circuitry of this marvellous amplifier allows it to be operated from any voltage from 8 to 35 to perfection.

At all output levels, distortion is only 0.02%. This puts true laboratory standards into the hands of every user of a Z.30. Two Z.30s and a new Stereo Sixty will make a stereo assembly of such perfection that it could not be bettered in its class no matter how much you spent. But the Z.30 has an enormous variety of applications, particularly where quality, precision and reliability are essential. Yet this brilliant new Sinclair design costs not a penny more than its famous predecessor.

APPLICATIONS

Hi-fi amplifier; car radio amplifier; record player amplifier fed directly from pick-up; intercom; electronic music and instruments; P.A.; laboratory work, etc. Full details for these and many other applications are given in the manual supplied with the Z.30.



SPECIFICATIONS

Power output: 15 watts R.M.S. into 8 ohms using a 35 volt supply; 20 watts R.M.S. into 3 ohms using a 30 volt supply.

Output: Class AB.

Frequency response: 30 to 300,000Hz \pm 1dB.

Distortion: 0.02% total harmonic distortion at full output into 8 ohms and at all lower output levels.

Signal-to-noise ratio: better than 70dB unweighted.

Input sensitivity: 250mV into 100 Kohms.

Damping factor: > 500.

Loudspeaker impedances: 3 to 15 ohms.

Power requirements: From 8 to 35V. d.c. (The Z.30 will operate ideally from batteries if required).

Size: 3½ x 2½ x ½ inches.

*Built, tested and guaranteed,
with circuits and instructions
manual*

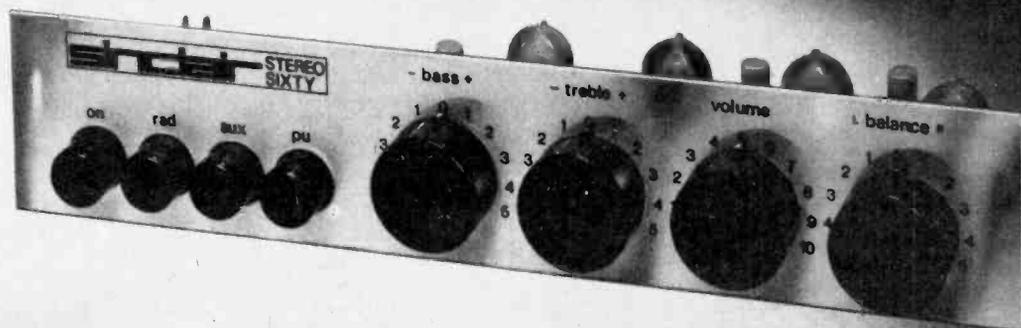
89/6

sinclair

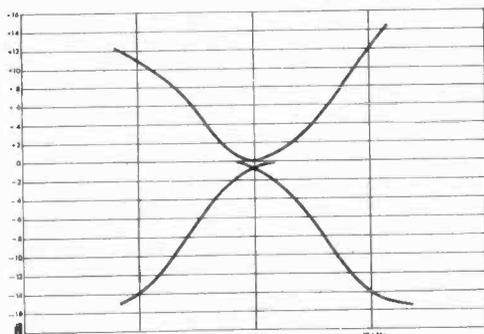
SINCLAIR RADIONICS LIMITED

22 NEWMARKET ROAD, CAMBRIDGE Tel: 0223 52731

NEW



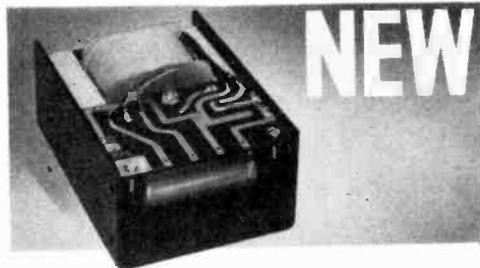
STEREO SIXTY PRE-AMP & TONE CONTROL UNIT



Curves to show bass and treble cut and boost

Ready built, tested and guaranteed with instructions

£9.19.6



sinclair

This attractive and completely new unit is intended for use with two new Z.30 amplifiers to provide the finest possible standards of stereo reproduction. Four press buttons and four rotary controls are used to provide on-off, three input selectors and Volume, Bass cut/boost, Treble cut/boost and Stereo balance. The on-off button also switches the power amplifiers. The front panel in brushed aluminium is flush mounted to the cabinet front, it being necessary only to drill holes to accommodate the controls. Rear adjustable brackets hold the chassis tight to the cabinet. The very latest ganged rotary controls are used to afford compactness and extra long working life free from noise.

The Stereo-60 may also be used with 2 IC-10's or any other high performance amplifiers.

SPECIFICATIONS

- Input sensitivities—Radio—up to 3mV
- Magnetic Pickup—3mV; correct to R.I.A.A. curve ± 1 dB; 20 to 25,000 Hz.
- Ceramic Pickup—up to 3mV; Auxiliary—up to 3mV.

- Output—250mV
- Signal-to-noise ratio—better than 70dB.

- Channel matching—within 1dB.
- Tone Controls—TREBLE +15 to -15dB at 10kHz. BASS +15 to -15dB at 100Hz.
- Power consumption 5mA.
- Front panel—brushed aluminium with black knobs and controls.
- Size $8\frac{1}{2} \times 1\frac{1}{2} \times 4$ ins.

PZ.5 POWER SUPPLY UNIT

A new heavy duty mains power supply unit designed specially to drive two Z.30s and a Stereo Sixty. New compact design. **£4.19.6**

For AC Mains, 200-240V/50Hz.

Q.16 Loudspeaker and Micromatic on next page.

To: SINCLAIR RADIONICS LTD., 22 NEWMARKET RD., CAMBRIDGE

Please send

NAME _____

ADDRESS _____

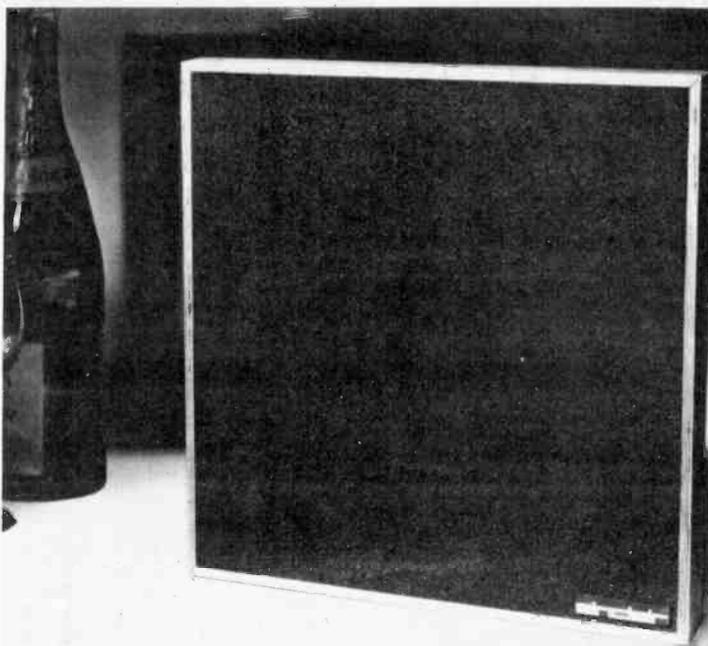
For which I enclose cash/cheque/money order

PW 370

SINCLAIR Q.16

new elegance in an
outstanding loudspeaker

All the superb features which went to make the Sinclair Q.14 have been incorporated in the new Q.16 which gives an exciting new opportunity for you to match your Sinclair equipment with modern decor. Employing the same well proven acoustic system in which materials, processing and styling are used in such a radical and successful departure from conventional design, the new Q.16 presents an entirely new appearance with its attractive teak surround and all-over special cellular foam front chosen as much for its appearance as for its ability to pass all audio frequencies without loss. The Q.16 is compact and slim. Its new styling makes it eminently suitable for shelf mounting, but it is no less versatile than its famous predecessor. Listen to a pair of Q.16s in stereo and marvel at the standards of quality and clarity they give.



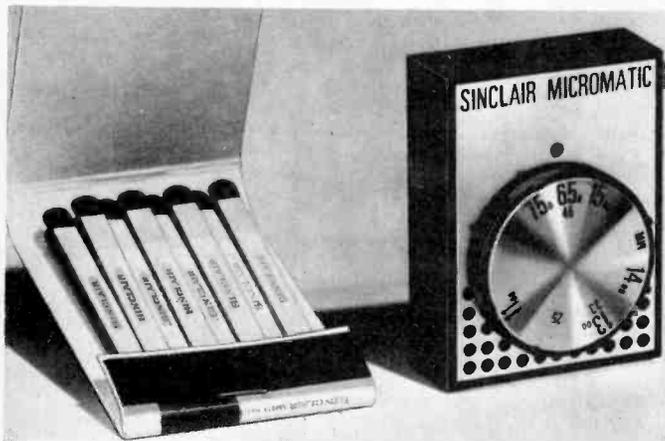
The Q.16 will handle loading up to 14 watts R.M.S. and presents an 8 ohm impedance to the amplifier output. Frequency response extends from 60 to 16,000Hz with exceptional smoothness. A specially designed driver system is used in a sealed and contoured pressure chamber to ensure good transient response at all frequencies. Size: 9 $\frac{3}{4}$ " square \times 4 $\frac{3}{4}$ " deep from front to back.

£8.19.6

POST FREE

SINCLAIR MICROMATIC

The world's most
successful miniature
radio



SPECIFICATIONS—Size: 1 $\frac{1}{2}$ " \times 1 $\frac{7}{8}$ " \times $\frac{1}{2}$ " (46 \times 33 \times 13mm). **Weight incl. batteries:** 1 oz. (28-35gm) approx. **Tuning:** Medium wave band with bandspread at higher frequency end. **Earpiece:** Magnetic type. **Case:** Black plastic with anodized aluminium front panel, spun aluminium dial.

Complete kit incl. earpiece, case, solder and instructions in fitted pack.

Ready built, tested and guaranteed, with earpiece.

Mallory Mercury Cell RM675 (2 req.) 2/9 each

49/6

59/6

Considerably smaller than an ordinary box of matches, this is a multi-stage A.M. receiver meticulously designed to provide remarkable standards of selectivity, power and quality. Powerful A.G.C. is incorporated to counteract fading from distant stations; bandspread at higher frequencies makes reception of Radio 1 easy at all times. Vernier type tuning plus the directional properties of the self-contained special ferrite rod aerial makes station separation much easier than with many larger sets. The plug-in magnetic earpiece which matches exactly with the output provides wonderful standards of reproduction.

Everything including the batteries is contained within the attractively designed case. Whether you build your Micromatic or buy it ready built and tested, you will find it as easy to take with you as your wrist-watch, and dependable under the severest listening conditions.

SINCLAIR GENERAL GUARANTEE

Should you not be completely satisfied with your purchase when you receive it from us, return the goods without delay and your money will be refunded in full, including cost of return postage, at once and without question. Full service facilities are available to all Sinclair customers.

sinclair

SINCLAIR RADIONICS LIMITED

22 NEWMARKET ROAD, CAMBRIDGE

Tel: 0223 52731

To: SINCLAIR RADIONICS LTD., 22 NEWMARKET RD., CAMBRIDGE

Please send

NAME

ADDRESS

For which I enclose cash/cheque/
money order

PW 370

TECHNICAL TRAINING

in radio television and electronics

Whether you are a newcomer to radio and electronics, or are engaged in the industry and wish to prepare for a recognized examination, ICS can further your technical knowledge and provide the specialized training so essential to success. ICS have helped thousands of ambitious men to move up into higher paid jobs—they can help you too! Why not fill in the coupon below and find out how?

Many diploma and examination courses available, including expert coaching for:

- C. & G. Telecommunication Techns'. Certs.
- C. & G. Electronic Servicing
- R.T.E.B. Radio/T.V. Servicing Certificate
- Radio Amateurs' Examination
- P.M.G. Certs. in Radiotelegraphy
- General Certificate of Education, etc.

Examination Students coached until successful

NEW SELF-BUILD RADIO COURSES

Learn as you build. You can learn both the theory and practice of valve and transistor circuits, and servicing work while building your own 5-valve receiver, transistor portable, and high-grade test instruments, incl. professional-type valve volt meter—all under expert tuition. Transistor Portable available as separate course.

POST THIS COUPON TODAY

for full details of ICS courses in Radio, T.V. and Electronics.

INTERNATIONAL CORRESPONDENCE SCHOOLS

EST. 1891

Dept. 171, Intertext House, Stewarts Road, London, S.W.8.
Please send me the ICS prospectus—free and without obligation.
(state Subject or Exam).....

NAME

ADDRESS.....

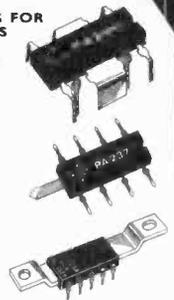
3/70

INTERNATIONAL CORRESPONDENCE SCHOOLS

Kinver for Components

LINEAR INTEGRATED CIRCUITS FOR ALL YOUR REQUIREMENTS

Sinclair type IC-10	59/6 net
Plessey SL403A 3 Watt Audio Amplifier	49/6
G.E. type PA230 Low Level Amplifier	21/-
G.E. type PA234 1 Watt Audio Amplifier	23/-
G.E. type PA237 2 Watt Audio Amplifier	34/-
G.E. type PA246 5 Watt Audio Amplifier	57/-
RCA type CA3000 D.C. Amplifier	54/9
RCA type CA3011 Wide Band Amplifier	20/-
RCA type CA3020 1 Watt Wide Band Amplifier	32/-
RCA type CA3028A Differential Cascade Amp. (120 MHz)	20/-
RCA type CA3029 Operational Amplifier	55/2
RCA type CA3035 Ultra High Gain Amplifier	30/-
Mullard type TAA293 General Purpose Amplifier	21/8
Mullard type TAA320 MOS L.F. Amplifier	13/5
G.E. type 2N5306 Darlington Pair	11/6
G.E. type D1311 Programmable Unijunction Transistor	10/8



ADD 1/- each to the above i.c.s. for data sheets if required. Data sheets may be purchased separately at 1/6d. each, post free. Issued free with SL403A & IC-10. Not available separately for IC-10.

1 WATT AMPLIFIER MODULE TYPE PCM 1

This amplifier unit is a printed circuit module incorporating the popular and well tried PA234 G.E. amplifier. The unit is a COMPLETE AUDIO AMPLIFIER and requires no external components, you simply connect an 18 volt power supply and a 15 or 16 ohm speaker or headphone, even the supply smoothing capacitor and the output capacitor are included! The overall dimensions, including capacitors, are 2 1/2" x 3" x 1 1/2". The input for 1 watt output at 1 kHz is typically 300mV into 100 kohms.

This unit is available at only 36/- net, complete with descriptive leaflet or 70/- net per pair. Send for free leaflet.

TRANSISTORS

ACY17	8/8	BC212L	3/9	OC26	9/-	2N1308	9/6
ACY18	4/5	BC213L	3/9	OC28	9/-	2N1309	9/6
ACY19	5/3	BC214L	4/-	OC35	9/-	2N2906	13/-
ACY20	4/6	BCY70	5/4	OC36	9/-	2N2924	4/4
ACY21	4/11	BCY71	10/4	OC71	3/-	2N2925	5/3
ACY22	2/10	BCY72	4/6	OC72	3/9	2N2926	3/-
ACY39	18/-	BD121	18/-	OC75	3/9	2N3053	6/8
ACY40	3/5	BF184	7/6	OC81D	3/-	2N3055	19/6
ACY41	4/4	BF194	7/7	OC170	3/9	2N3702	3/6
ACY44	8/-	BFY50	5/-	OC171	3/9	2N3703	3/3
ASY26	6/2	BFY51	4/6	2N696	4/9	2N3704	3/9
ASY27	8/-	BFY52	5/-	2N697	5/-	2N3705	3/4
ASY28	6/2	BSY95A	3/11	2N706	3/3	2N3707	4/-
ASY29	8/-	MJ481	27/3	2N1132	10/9	2N3708	2/5
BC107	3/3	MJ481	32/11	2N1302	3/11	2N3819	9/-
BC108	3/-	TIP31A	17/-	2N1303	3/11	2N3820	18/9
BC109	3/3	TIP32A	23/-	2N1304	5/-	2N3826	5/11
BC182L	3/2	TIS44	1/9	2N1305	5/-	2N4058	4/6
BC183L	2/5	TIS49	2/6	2N1306	6/5	2N4059	3/5
BC184L	3/2	TIS50	3/9	2N1307	6/5	40408	14/11

2N2160 Unijunction 14/11.

DIODES

AAU19	3/-	OA91	1/3	IN82A	9/6	IS134	5/3
AAV11	2/6	IN34A	2/3	IN87A	4/6	IS940	1/-
AAZ15	3/3	IN34B	4/-	IN914	2/-		
BAY38	3/9	IN60	4/-	IS44	1/8		
OA47	2/-	IN64	4/-	IS131	3/-		

VEROBOARD

2 1/2" x 5" in	0.1	0.15
2 1/2" x 5" in	4/9	4/2
2 1/2" x 3 1/2" in	4/2	3/5
3 1/2" x 5" in	5/6	5/6
3 1/2" x 3 1/2" in	4/9	3/11
1 7/8" x 2 1/2" in		10/6
1 7/8" x 3 1/2" in		14/8

PLAIN VEROBOARD

(Uncoppered)	
(0.15 in Matrix only)	
2 1/2" x 5" in	3/8
2 1/2" x 3 1/2" in	3/-
1 7/8" x 2 1/2" in	7/6
1 7/8" x 3 1/2" in	9/8
1 7/8" x 5" in	14/8
Cutter	7/3
Pin Insertion Tool (0.15)	9/6
Pin Insertion Tool (0.15)	9/6
Packet of 36 pins (0.15)	3/11
Packet of 36 pins (0.15)	3/11

EDGE CONNECTORS FOR USE WITH VEROBOARD

16 way, 0.15in pitch	4/6 each
24 way, 0.15in pitch	6/9 each
24 way, 0.10in pitch	6/9 each
36 way, 0.10in pitch	8/7 each

INTERNATIONAL RECTIFIERS HANDBOOKS

HB10 Rectifier Engineering Handbook	16/9
HB20 Zener Diode Handbook	16/9
HB30 Solar Cell and Photo-cell Handbook	16/9
HB40 SCR Handbook	20/-

PHOTOCELLS

IR CS-120	19/8
Mullard Type ORP12	9/-

ZENER DIODES

IS2030 Series (400mW 3.3V to 15V)	4/8
Z1100-C Series (1 Watt 3.9V to 27V)	7/11

CARBON VOLUME CONTROLS

(POTENTIOMETERS)

Linear or log function type are available in the following values 5k, 10k, 25k, 50k, 100k, 250k, 500k, 1M, 2M.
Available in the following types: Single Pots 3/- each
Single Pots with DP switch 5/3 each (log only).
Ganged pots 8/6d each.
Standard Skeleton pots, linear, Horizontal or Vertical mounting, available in the following values, 100, 220, 470, 1K, 2.2K ... to 4.7M 1/- each.

COMPONENTS CATALOGUE 2/- Post Free (Inland)

P & P 1/6 inland, overseas at cost (min. 10/-). Cash with order please, discounts may be deducted as follows: order over £5—10%, order over £10—15%, excluding net items. Trade orders—net 30 days. Please send SAE with enquiries. CALLERS WELCOME. Open 9.00 a.m.—12.50 p.m. 2.00 p.m.—5.00 p.m. Weekdays and Saturday Mornings 9.00 a.m.—12.50 p.m.

LECTRONICS LTD
Kinver

STONE LANE KINVER
STOURBRIDGE WORCS
Telephone: KINVER 2099

Now! A FAST EASY WAY TO LEARN BASIC RADIO AND ELECTRONICS



Build as you learn with the exciting new **TECHNATRON** Outfit! No mathematics.

No soldering—but you learn the *practical* way.

Now you can learn basic Radio and Electronics at home—the *fast*, modern way. You can give yourself the essential technical 'know-how' sooner than you would have thought possible—read circuits, assemble standard components, experiment, build . . . and enjoy every moment of it. B.I.E.T.'s Simplified Study Method and the remarkable new **TECHNATRON** Self-Build Outfit take the mystery out of the subject—make learning *easy and interesting*.

Even if you don't know the first thing about Radio now, you'll build your own Radio set within a month or so!

and what's more, **YOU'LL UNDERSTAND EXACTLY WHAT YOU ARE DOING.** The Technatron Outfit contains everything you need, from tools to transistors . . . even a versatile Multimeter which we teach you how to use. You need only a little of your spare time, the cost is surprisingly low and the fee may be paid by convenient monthly instalments. You can use the equipment again and again—and it remains your own property.

You **LEARN**—but it's as fascinating as a hobby.

Among many other interesting experiments, the Radio set you build—and it's a good one—is really a bonus; this is first and last a *teaching* Course. But the training is as rewarding and interesting as any hobby. It could be the springboard for a career in Radio and Electronics or provide a great new, spare-time interest.

A 14-year-old could understand and benefit from this Course—but it teaches the real thing. Bite-size lessons—wonderfully clear and easy to understand, practical projects from a burglar-alarm to a sophisticated Radio set . . . here's your chance to master basic Radio and Electronics, even if you think you're a 'non-technical' type. And, if you want to carry on to more advanced work, B.I.E.T. has a fine range of Courses up to A.M.I.E.R.E. and City and Guilds standards.

Send now for free 164-page book. Like to know more about this intriguing new way to learn Radio and Electronics? Fill in the coupon and post it today. We'll send you full details and a 164-page book—**'ENGINEERING OPPORTUNITIES'**—Free and without any obligation.



BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

Dept. 372B, Aldermaston Court, Aldermaston, Berkshire.

To: B.I.E.T., Dept. 372B, ALDERMASTON COURT, ALDERMASTON, BERKS.

I would like to know more about your Practical Radio & Electronics Course. Please send me full details and FREE 164-page book.

name.....

address.....

age.....

POST THIS COUPON NOW!

17in.—£11.10.0 **TWO-YEAR GUARANTEE**
19in. BBC 2
FERGUSON 39 Gns. EX-RENTAL TELEVISIONS

FREE ILLUSTRATED LIST OF TELEVISIONS
17"–19"–21"–23"

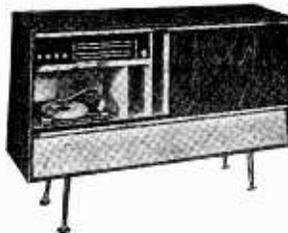
Wide range of models, sizes and prices
Carr. ins. on all sets 30/-
DEMONSTRATIONS DAILY

TWO-YEAR GUARANTEED REGUNNED TUBES

70° and 90° 14in.—£9/6, 17in.—£9/6, 21in.—£9/6, 110° 17in., 19in. and 21in.—£9/6, 23° (not bonded)—£19/6. Exchanged bowls. Carr. 10/6.



COCKTAIL/STEREOGRAM CABINET 15 gns.



Polished walnut veneer with elegant glass fronted cocktail compartment, padded. Position for two 10in. elliptical speakers. Record storage space. Height 35in., width 52in., depth 14in. Legs 1 1/2 in. extra.

Speakers 10/-: 3 1/2"–25Ω. 4"–10Ω. 7" x 4"–3Ω. Brand new. P. & P. 2/6
Asstd. Condensers: 10/- for 50. P. & P. 7/6. **Asstd. Resistors:** 10/- for 50. P. & P. 4/6. **Asstd. Controls:** 10/- for 25. P. & P. 7/6. **Transistors:** Mullard matched output kit 9/OC81D–2 OC81's. P. & P. FREE.

Ferrite Rods 3/8: 6", complete with LW/MW Colls. P. & P. FREE.

TRANSISTOR CASES 19/6. Cloth covered, many colours. Size 9 1/2" x 6 1/2" x 3 1/2" P. & P. 4/6. Similar cases in plastic 7/6.

RECORD PLAYER CABINETS 49/6. Cloth covered, size 16 1/2" x 14 1/2" x 8". Takes any modern autochanger. P. & P. 7/6.

SINGLE PLAYER CABINETS 19/6. P. & P. 7/6.

STRIP LIGHT TUBES 3/9 each. 11" (284 mm.) 230/240 volts, 30 watts. Ideal for cocktail cabinets, illuminating pictures, diffused lighting etc. 6 for £1. P. & P. free.

DUKE & CO. (LONDON) LTD.

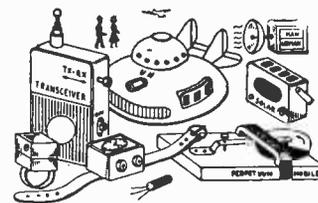
621/3 Romford Road, London, E12

Tel. 01–478 6001/2/3

PRINTED CIRCUIT KIT

BUILD 40 INTERESTING PROJECTS on a PRINTED CIRCUIT CHASSIS with PARTS and TRANSISTORS from your SPARES BOX

CONTENTS: (1) 2 Copper Laminate Boards 4 1/2" x 2 1/2". (2) 1 Board for Matchbox Radio. (3) 1 Board for Wristwatch Radio, etc. (4) Resist. (5) Resist Solvent. (6) Etchant. (7) Cleanser/Degreaser. (8) 16-page Booklet *Printed Circuits for Amateurs*. (9) 2 Miniature Radio Dials 8W/MW/LW. Also free with each kit. (10) Essential Design Data, Circuits, Chassis Plans, etc. for 40 TRANSISTORISED PROJECTS. A very comprehensive selection of circuits to suit everyone's requirements and constructional ability. Many recently developed very efficient designs published for the first time, including 10 new circuits.



EXPERIMENTER'S PRINTED CIRCUIT KIT

8/6

Postage & Pack. 1/6 (UK)

Commonwealth:
SURFACE MAIL 8/-
AIR MAIL 8/-
Australia, New Zealand
South Africa, Canada.

(1) Crystal Set with biased Detector. (2) Crystal Set with voltage-quadrupler detector. (3) Crystal Set with Dynamic Loudspeaker. (4) Crystal Tuner with Audio Amplifier. (5) Carrier Power Conversion Receiver. (6) Split-Load Neutralised Double Reflex. (7) Matchbox or Photocell Radio. (8) "TRI-FLEXON" Triple Reflex with self-adjusting regeneration (Patent Pending). (9) Solar Battery Loudspeaker Radio. The smallest 8 designs yet offered to the Home Constructor anywhere in the World. 3 Subminiature Radio Receivers based on the "Triflexon" circuit. Let us know if you know of a smaller design published anywhere. (10) Postage Stamp Radio. Size only 1-62" x .95" x .25". (11) Wristwatch Radio 1-15" x .80" x .65". (12) Ring Radio .70" x .70" x .55". (13) Bacteria-powered Radio. Runs on sugar or bread. (14) Radio Control Tone Receiver. (15) Transistor P/P Amplifier. (16) Intercom. (17) 1-valve Amplifier. (18) Reliable Burglar Alarm. (19) Light-Seeking Animal, Guided Missile. (20) Perpetual Motion Machine. (21) Metal Detector. (22) Transistor Tester. (23) Human Body Radiation Detector. (24) Man/Woman Discriminator. (25) Signal Injector. (26) Pocket Transceiver (Licence required). (27) Constant Volume Intercom. (28) Remote Control of Models by Induction. (29) Inductive-Loop Transmitter. (30) Pocket Triple Reflex Radio. (31) Wristwatch Transmitter/Wireless Microphone. (32) Wire-less Door Bell. (33) Ultrasonic Switch/Alarm. (34) Stereo Pre-amplifier. (35) Quality Stereo Push-Pull Amplifier. (36) Light-Beam Telephone "Photophone". (37) Light-Beam Transmitter. (38) Silent TV Sound Adaptor. (39) Ultrasonic Transmitter. (40) Thyristor Drill Speed Controller.

YORK ELECTRICS

333 YORK ROAD, LONDON, S.W.11

Send a S.A.E. for full details, a brief description and Photographs of all Kits and all 62 Radio, Electronic and Photoelectric Projects Assembled.

TAPE RECORDERS: A-Z

The only complete guide to what is available on the UK market for domestic, hi-fi, professional and VTR tape recording equipment

TAPE RECORDERS: A-Z is designed for the general reader, the dealer, and for those requiring a recording machine for professional purposes. It can be understood by the layman, yet carries sufficient detail to interest those with more advanced technical knowledge. Pictures appear with all but a few entries in the domestic, hi-fi, professional and VTR sections.

There are almost 250 entries in the domestic and hi-fi section alone; each listed separately with specifications, pictures, prices, etc. Some, such as the Saba, Pioneer, Ross, Philco and Bell & Howell Filmosound, being units hardly known in this country; together with many others not yet widely known here, such as the extensive Aiwa range; the new Sony introductions; recent Uher additions, etc. The Scientific and Industrial heading details the professional-type equipment, from such companies as Crown, Tape Record Developments, Studer, Rola, Ampex, Nagra, Leavers-Rich, Mincom, Scully, Telefunken, and the new British Unitrack series. There are VTR recorders from Ampex, RCA, National, Bell & Howell, General Video, Rediffusion, National, Sanyo, Loewe-Opta, Sony and Philips.

Other sections cover Tape, Headphones, Mixers and Accessories. These are profusely illustrated, and also carry extensive technical information and prices with each item.

TAPE RECORDERS: A-Z costs £1 (including postage and packaging).



Available from **APA PUBLISHING (CATALOGUES) LTD**
4th Floor, Quality House, Quality Court, Chancery Lane, London WC2
Telephone: 01-405 6863

Please send me..... copies of **TAPE RECORDERS: A-Z**

I enclose cheque/PO/cash to the value of £.....

NAME (Block Capitals Please)

ADDRESS

.....
.....

PW 1

WEYRAD

COILS & TRANSFORMERS FOR CONSTRUCTORS

Special versions of our P50 Series are now available for AF117 or OC45 Transistors. They can be used in the standard superhet circuit with slight changes in component values.

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

I.F. TRANSFORMERS FOR "PRACTICAL WIRELESS" CIRCUITS

Components for several receivers are available, including the following for the "Clubman".

T41/1E	1st I.F. Transformer	7/6
T41/2E	2nd I.F. Transformer	7/6
T41/3T	3rd I.F. Transformer	10/6
T41/3T	B.F.O. Coil	10/6

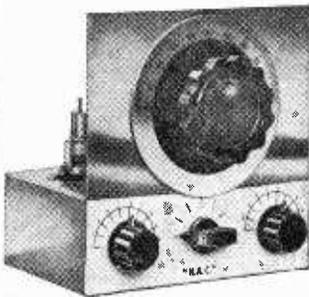
Details of these and our other components are given in an illustrated folder which will be supplied on request with 4d. postage please.

WEYRAD (ELECTRONICS) LIMITED

SCHOOL STREET, WEYMOUTH, DORSET

H.A.C. SHORT-WAVE KITS

WORLD-WIDE RECEPTION



Famous for over 35 years for Short-Wave Equipment of quality, "H.A.C." were the Original suppliers of Short-Wave Receiver Kits for the amateur constructor. Over 10,000 satisfied customers—including Technical Colleges, Hospitals, Public Schools, R.A.F., Army, Hams, etc.

IMPROVED 1970 RANGE

One-valve model "DX", complete kit—price 56/6 (Postage and packing 3/6).

Customer writes:—"Definitely the best one-valve S.W. Kit available at any price. America and Australia received clearly at good volume." This kit contains all genuine short-wave components, drilled chassis, valve accessories and full instructions. Ready to assemble, and of course, as all our products—fully guaranteed. Full range of other S.W. kits including the famous model "K" and "K plus" (illustrated above.) All orders despatched by return. (Mail order only.) Send now for a descriptive catalogue, order form.

"H.A.C." SHORT-WAVE PRODUCTS
29 Old Bond Street, London W.1

NEW RANGE U.H.F. TV AERIALS

All U.H.F. aerials now fitted with tilting bracket and 4 element grid reflectors.
Loft Mounting Arrays, 7 element, 40/-, 11 element, 47/6, 14 element, 55/-, 18 element, 62/6. Wall Mounting with Cranked Arm, 7 element, 60/-, 11 element, 67/-, 14 element, 75/-, 18 element, 82/6. Mast Mounting with 2in. clamp, 7 element, 42/6, 11 element, 55/-, 14 element, 62/-, 18 element, 70/-, Chimney Mounting Arrays, Complete, 7 element, 72/6, 11 element, 80/-, 14 element, 87/6, 18 element, 95/-. Complete assembly instructions with every unit. Low Loss Cable, 1/6 yd. U.H.F. Preamps from 75/-. State clearly channel number required on all orders.

BBC - ITV AERIALS



BBC (Band 1). Loft, 25/-, External S/D, 30/-. "H" £2.15.0. ITV (Band 3). 3 element loft array, 30/-. 5 element, 40/-. 7 element, 50/-. Wall mounting, 3 element, 50/-. 5 element, 55/-. Combined BBC/ITV. Loft 1 + 3, 40/-; 1 + 5, 50/-; 1 + 7, 60/-; Wall mounting 1 + 3, 60/-; 1 + 5, 70/-; Chimney 1 + 3, 70/-; 1 + 5, 80/-, VHF transistor pre-amps. 75/-.

COMBINED BBC1 - ITV - BBC2 AERIALS 1 + 3 + 9, 70/-, 1 + 5 + 9, 80/-, 1 + 5 + 14, 90/-, 1 + 7 + 14, 100/-. Loft mounting only.

F.M. (Band 2). Loft S/D, 17/6. "H", 35/-. 3 element, 57/6. External units available. Co-ax. cable 8d. yd. Co-ax. plugs, 1/6. Outlet boxes, 5/-, Diplexer Crossover Boxes, 17/6. C.W.O. or C.O.D. P. & P. 6/6. Send 6d. stamps for illustrated lists.

Callers welcomed - open all day Saturday

K.V.A. ELECTRONICS (Dept. P.W.)
40-41 MONARCH PARADE
LONDON ROAD, MITCHAM,
SURREY 01-648 4884

4-STATION INTERCOM



£7/15/0

Solve your communication problems with this 4-Station Transistor Intercom system (1 master and 3 Subs), in de-luxe plastic cabinets for desk or wall mounting. Call/talk/listen from Master to Subs and Subs to Master. Ideally suitable for Business, Surgery, Schools, Hospital, Office and Home. Operates on one 9V battery. On/off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 7/6.

MAINS INTERCOM

No batteries—no wires. Just plug in the mains for instant two-way, loud and clear communication. On/off switch and volume control. Price £10.19.6. P. & P. 8/6 extra.

INTERCOM/BABY ALARM



OUR PRICE ONLY 3 gns.

Same as 4-Station Intercom for two-way instant communication. Ideal as Baby Alarm and Door Phone. Complete with 66ft. connecting wire. Battery 2/6. P. & P. 4/6.

Transistor TELEPHONE AMPLIFIER



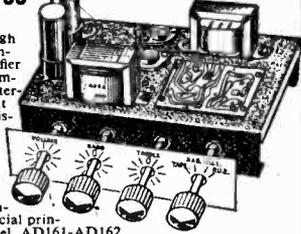
59/6

Why not boost business efficiency with this incredible De-luxe Telephone Amplifier. Take down long telephone messages or converse without holding the handset. A useful office aid. On/off switch. Volume Control. Battery 2/6 extra. P. & P. 3/6. Full price refunded if not satisfied in 7 days. WEST LONDON DIRECT SUPPLIES (P/W) 169 KENSINGTON HIGH STREET, LONDON, W.8.

MONO TRANSISTOR AMPLIFIER

HSL.700

A really high fidelity monaural amplifier with performance characteristics to suit the most discriminating listener.



6 transistor circuit with integrated pre-amplifier assembled on special printed sub panel. AD161-AD162 operating in symmetrical complementary pair. Output transformer coupled to 3 ohm and 15 ohm speaker sockets. Standard phono input sockets. Full wave bridge rectifier power supply for AC mains 200-240v. Controls: Bass, Treble, Volume/on/off. Function selector for PU1, PU2, Tape, Radio. The HSL.700 is strongly constructed on rigid steel chassis bronze hammer enamel finish, size 9 1/2 x 5 x 4 1/2 in.

Sensitivity: PU1-50mV, 56K input impedance. PU2-110mV, 1 meg input impedance. Tape-110mV, 1 meg input impedance. Radio-110mV, 1 meg input impedance. Output power measured at 1Kc-6.2 watts RMS into 3 ohms, 5.8 watts RMS into 15 ohm. Overall frequency response 30 c/s-18 Kc/s. Continuously variable tone controls: Bass +8db to -2 db at 100c/s. Treble +10 db to -10 db at 10 Kc/s. The HSL.700 has been designed for true high fidelity reproduction from Radio Tuner, Gramophone deck and Tape Recorder preamp. Supplied ready built and tested, complete with knobs, attractively anodised aluminium front escutcheon panel, full circuit diagram and operating instructions.

Our Special Price **£7.19.6** P. & P. 7/6.

LOUDSPEAKER BARGAINS

5in. 3 ohm 16/-, P. & P. 3/-, 7 x 4in. 3 ohm 21/-, P. & P. 4/-, 10 x 6in. 3 ohm 27/6, P. & P. 6/-, E.M.I. 8 x 5 in. 3 ohm with high flux magnet 21/-, P. & P. 4/-, E.M.I. 13 x 8 ohm with high flux ceramic magnet 42/- (15 ohm 45/-), P. & P. 6/-, E.M.I. 13 x 8 in. 3 or 15 ohm with two inbuilt tweeters and crossover network 4 gns. P. & P. 6/-.

BRAND NEW, 12in. 15w. H/D Speakers, 3 or 15 ohms. Current production by well-known British maker. Now with HiFlux ceramic ferrobar magnet assembly £5.10.0. P. & P. 7/6. GUITAR models: 25w. £6.00.0, 35w. £8.00.0, E.M.I. 3 1/2in. HEAVY DUTY TWEETERS. Powerful ceramic magnet. Available in 3 or 8 ohms 15/- each, 15 ohms 18/6 each, P. & P. 2/6.

35 OHM SPEAKERS

3 1/2in. 14/-, P. & P. 2/6; 7 x 4in. 21/-, P. & P. 4/-; 10 x 6in. 27/6, P. & P. 6/-; HIGH FLUX MAGNET. 2 1/2in. dia. 12/- each, P. & P. 1/6.

CRYSTAL MIKES. High imp. for desk or hand use. High sensitivity. 18/6, P. & P. 1/6. HIGH IMPEDANCE CRYSTAL STICK MIKES. OUR PRICE 25/6, P. & P. 2/6. HIGH IMPEDANCE DYNAMIC STICK MIKES. High sensitivity. 39/6, P. & P. 2/6.

PYE MICROSWITCHES S/P. C/O. Lever roll action Rating at 250v. AC at 5 amps. Size approx. 1 1/2 x 1/2 in. 4/- each, P. & P. 1/- (6 or more post free). HONEYWELL MICROSWITCHES. S/P. C/O. Push button action. Rating 250v. AC at 15 amps. Size approx. 1 1/2 x 1/2 in. 5/- each, P. & P. 1/- (6 or more post free).

TELESCOPIC AERIALS WITH SWIVEL JOINT. Can be angled and rotated in any direction. 12 section Heavy Chrome. Extends from 7in. to approx. 56 in. Maximum diameter 1/2 in. 10/- each, P. & P. 6/6. Lacquered Brass. Extends from 6in. to 22 1/2 in. approx. Maximum diameter 1/2 in. 5/- each, P. & P. 1/-.

TRANSFORMER BARGAINS!

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-210-240v. Secondary combinations 0-5-10-15-20-25-30-35-40-40v. half wave at 1 amp. or 10-10-10-20-20-30-30-30v. at 2 amps full wave. Size 3in. long x 3 1/2 in. wide x 3in. deep. Price 32/6, P. & P. 6/-. MAINS TRANSFORMER. For transistor power supplies. Pri. 200/240v. Sec. 9-0-9 at 500mA. 11/-, P. & P. 2/6. Pri. 200/240v. Sec. 12-0-12 at 1 amp. 14/6, P. & P. 2/6. Pri. 200/240v. Sec. 10-0-10 at 2 amp. 27/6, P. & P. 3/6. Tapped Primary 200-220-240v. Sec. 21.5v. at 500mA. 12/6, P. & P. 2/6.

BRAND NEW! PARMEKO MAINS TRANSFORMERS. Primary 110v-250v. Secondary 330-0-330v. 100mA and 6.3v. at 2 amps, 6.3v. at 2 amps and 6.3v. at 1 amp. Conservatively rated. Fully impregnated Electrostatic screen. Suitable for vertical or drop through mounting. Overall size 4 1/2 x 3 1/2 x 3 1/2 in. Weight 8lb. Limited number only at 37/6, P. & P. 8/-.
 VYNAIR AND REXINE SPEAKER AND CABINET FABRICS. Approx. 54in. wide. Usually 35/- yard. OUR PRICE 15/- per yard length. P. & P. 2/6 (min. one yd.). S.A.E. for samples.

SPECIAL OFFER!!

Your opportunity to acquire a first class HI-FI LOUDSPEAKER SYSTEM at an extremely moderate price!
 Beautifully made teak finish enclosure with most attractive Lygon front. Size 16 1/2" high x 10 1/2" wide x 6" deep. Fitted with E.M.I. Ceramic Magnet 13" x 8" bass unit, two H.F. tweeter units and crossover. Power handling 10 watts. Available 3 or 15 ohm impedance.

OUR PRICE WHILE LIMITED STOCKS LAST **8 GNS** Carriage 10/-

TRANSISTOR STEREO 8 + 8 MK II

Now using Silicon Transistors in first five stages on each channel resulting in even lower noise level with improved sensitivity. A really first-class HI-FI Stereo Amplifier Kit. Uses 14 transistors giving 8 watts push pull output per channel (16W. mono). Integrated pre-amp. with Bass, Treble and Volume controls. Suitable for use with Ceramic or Crystal cartridges. Output stage for any speakers from 3 to 15 ohms. Compact design, all parts supplied including drilled metal work, Cir-Kit board, attractive front panel, knobs, wire, solder, nuts, bolts - no extras to buy. Simple step by step instructions enable any constructor to build an amplifier to be proud of. Brief specification: Freq. response ± 3 dB. 20-20,000 c/s. Bass boost approx. 10 + 12dB. Treble cut approx. to -16dB. Negative feedback 18dB over main amp. Power requirements 15V at 6 wmp. **PRICES: AMPLIFIER KIT £10.10.0; POWER PACK KIT £3.0.0; CABINET £3.0.0. All Post Free.** Also available STEREO 10+10. As above but 10 watts per channel. **PRICES: AMPLIFIER KIT £12; POWER PACK KIT £3.10.0.** Circuit diagram, construction details and parts list (free with kit) 1/6 (S.A.E.).

Official stockists of all PEAK SOUND HI-FI EQUIPMENT

Including the P.W. DOUBLE 12 STEREO AMPLIFIER as featured in Practical Wireless April, May and June issues. Component pack as specified. Total cost £23.5.6 Plus P. & P. 11/-. (Excluding metalwork, knobs, plugs and sockets and fuses).

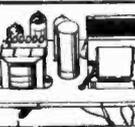
SPECIAL PURCHASE!

E.M.I. 4-SPEED PLAYER Heavy 8 1/2in. metal turntable. Low flutter performance 200/250v. shaded motor (30v. tap). Complete with latest type lightweight pick-up arm and mono cartridge with t/o stylus for LP/78. ONLY 63/-, P. & P. 6/6.



QUALITY RECORD PLAYER AMPLIFIER MKII A top quality record player amplifier employing heavy duty double wound mains transformer, ECC83, EL84, EZ80 valves. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7in. wide x 3in. deep x 6in. high. Ready built and tested. PRICE 75/-, P. & P. 6/-. ALSO AVAILABLE mounted on board with output transformer and speaker ready to fit into cabinet below. PRICE 97/6, P. & P. 7/6.

DELUXE QUALITY PORTABLE R/P CABINET MKII. Uncut motor board size 14 1/2 x 12in. clearance 2in. below. 5 1/2in. above. Will take above amplifier and any B.S.R. or GARRARD autochanger or Single Player Unit (except AT60 and SP25). Size 18 x 15 x 8in. PRICE 79/6, P. & P. 9/6.



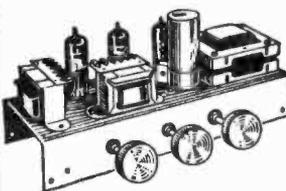
3-VALVE AUDIO AMPLIFIER HA34 MK II

Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis. Size 7 1/2" w. x 4" d. x 4 1/2" h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 41 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only £4.15.0. P. & P. 6/-. HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc. 79/6, P. & P. 6/-.
BRAND NEW TRANSISTOR BARGAINS. GET 15 (Matched Pair) 15/-; V15/10p 10/-; OC71 5/-; OC76 6/-; AF117 3/6; 2G339 (NPN) 3/-; Set of Mullard 6 transistors OC44, 2-OC45, AC128B matched pair AC128 25/-; ORP12 Cadmium Sulphide Cells 10/6. All post free.

VYNAIR AND REXINE SPEAKER AND CABINET FABRICS. Approx. 54in. wide. Usually 35/- yard. OUR PRICE 15/- per yard length. P. & P. 2/6 (min. one yd.). S.A.E. for samples.

POWERFUL COMPACT MOTOR for 6-9v. Battery operation approx. 25 mA. Made originally for "Sitar" and "Greencoat" record player decks. Built in constant speed device. Ideal for models etc. Overall size approx. 1 1/2 x 1 1/2 x 7/6 each, P. & P. 1/6 (3 or more Post Free)

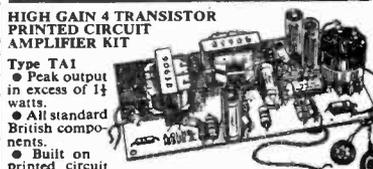
DE LUXE STEREO AMPLIFIER



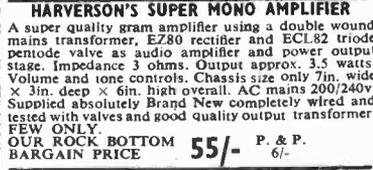
A.C. mains 200-240 v. U.S. 110 v. Heavy duty fully isolated mains transformer with full wave rectification giving adequate smoothing with negligible hum.

Valve line up:- 2 x ECL86 Triode Pentodes. 1 x EZ80 as full wave rectifier. Two Dual potentiometers are provided for bass and treble control, giving bass and treble boost and cut. A Dual volume control is used. Balance of the left and right hand channels can be adjusted by means of a separate 'Balance' control fitted at the rear of the chassis. Input sensitivity is approximately 300mV. for full peak output of 4 watts per channel (8 watts mono), into 3 ohm speakers. Full negative feedback in a carefully calculated circuit, allows high volume levels to be used with negligible distortion. Supplied complete with knobs. Chassis size 11" x 4 1/2". Overall height including valves 5". Ready built and tested to a high standard. PRICE 8 gns. P. & P. 8/-.
4-SPEED RECORD PLAYER BARGAINS
 Mains models. All brand new in maker's packing. B.S.R. UA25 with latest mono compatible cart. £6.19.6 All plus Carriage and Packing 6/6
LATEST GARRARD MODELS. All types available 1025, 3000, SP25, 3000, AT60 etc. Send S.A.E. for latest Prices!
PLINTH UNITS cut out for Garrard Models, 1025, 2025, 2000, 3000, AT60, SP25. With transparent plastic cover. OUR PRICE 5 gns. complete. P. & P. 8/6.
SONOTONE 9T4HC compatible Stereo Cartridge with diamond stylus 50/-, P. & P. 2/-.
LATEST RONETTE T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78. Only 32/6, P. & P. 2/-.
LATEST RONETTE T/O MONO COMPATIBLE CARTRIDGE for playing EP/LP/78 mono or stereo records on mono equipment. Only 30/-, P. & P. 2/-.
HIGH GAIN 4 TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT
 Type TAI
 ● Peak output in excess of 1 1/2 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 (GET114 or S1 Mullard AC128B and matched pair of AC128 o/p). ● 9 volt operation. ● Everything supplied, wire, battery clips, solder, etc. ● Comprehensive easy to follow instructions and circuit diagram 2/6 (Free with Kit). All parts sold separately.
SPECIAL PRICE 45/-, P. & P. 3/-.
 Also ready built and tested. 52/6, P. & P. 3/-.

HARVERSON'S SUPER MONO AMPLIFIER
 A super quality gram amplifier using a double wound mains transformer, EZ80 rectifier and ECL82 triode pentode valve as audio amplifier and power output stage. Impedance 3 ohms. Output approx. 3.5 watts. Volume and tone controls. Chassis size only 7in. wide x 3in. deep x 6in. high overall. A.C. mains 200/240v. Supplied absolutely Brand New completely wired and tested with valves and good quality output transformer. FEW ONLY.
OUR ROCK BOTTOM BARGAIN PRICE 55/-, P. & P. 6/-.



10/14 WATT HI-FI AMPLIFIER KIT
 A stylishly finished monaural amplifier with an output of 14 watts from 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 3-15 ohm speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, ECL82 and EZ80 rectifier. Simple instruction booklet 2/6 (Free with parts). All parts sold separately. ONLY 79.6. P. & P. 8/6. Also available ready built and tested complete with std. input sockets, £9.5.0. P. & P. 8/6.



10/14 WATT HI-FI AMPLIFIER KIT
 A stylishly finished monaural amplifier with an output of 14 watts from 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 3-15 ohm speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, ECL82 and EZ80 rectifier. Simple instruction booklet 2/6 (Free with parts). All parts sold separately. ONLY 79.6. P. & P. 8/6. Also available ready built and tested complete with std. input sockets, £9.5.0. P. & P. 8/6.

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

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, LONDON, S.W.19 Tel.: 01-540 3985

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

A few minutes from South Wimbledon Tube Station.

ELECTROVALUE

Everything brand new and to specification • Large stocks • Good service

RESISTORS:

Code	Power	Tolerance	Range	Values available	1 to 9	10 to 99	100 up
C	1/20W	5%	82Ω-220KΩ	E12	18	16	15
C	1/8W	5%	4.7Ω-830KΩ	E24	2.5	2	1.75
C	1/4W	10%	4.7Ω-10MΩ	E12	2.5	2	1.75
C	1/2W	5%	4.7Ω-10MΩ	E24	3	2.5	2.25
MO	1/2W	2%	10Ω-1MΩ	E24	9	8	7
C	1W	10%	4.2Ω-10MΩ	E12	6	5	4.5
WW	1W	10% +1/20Ω	0.22Ω-3.3Ω	E12	15d all quantities		
WW	3W	5%	12Ω-10KΩ	E12	15d all quantities		
WW	7W	5%	12Ω-10KΩ	E12	18d all quantities		

Codes: C = carbon film, high stability, low noise.
MO = manganite oxide, Electrofil TR5, ultra low noise.
WW = wire wound, Plessey.

Values: E12 denotes series: 1, 1.2, 1.5, 1.8, 2.2, 2.7, 3.3, 3.9, 4.7, 5.6, 6.8, 8.2 and their decades.
E24 denotes series: as E12 plus 1.1, 1.3, 1.6, 2, 2.4, 3, 3.6, 4.3, 5.1, 6.2, 7.5, 9.1 and their decades.
Prices are in pence each for quantities of the same ohmic value and power value. (Ignore fractions of one penny on total resistor order.)

COLVERN 3 WATT WIRE-WOUND POTENTIOMETERS:

10Ω, 15Ω, 25Ω, 50Ω, 100Ω, 150Ω, 250Ω, 500Ω, 1KΩ, 1.5KΩ, 2.5KΩ, 5KΩ, 10KΩ, 15KΩ, 25KΩ, 50KΩ. Price only 5/6 each.

CARBON TRACK POTENTIOMETERS: Double wiper ensures minimum noise level.

Long plastic spindles, each
Single gang linear: 220Ω, 470Ω, 1K etc. to 2.2MΩ 2/6 Log/Anti-log: 10K, 47K, 1MΩ only each
Dual anti-log: 10K only 8/6
Dual gang linear: 4K7, 10K, 22K etc. to 1MΩ 8/6 Any type with 1/2 amp. double pole mains 8/6
Dual gang log: 4K7, 10K, 22K etc. to 2MΩ 8/6 switch extra 2/3

FETS n-channel low cost general purpose 2N5163, 25 volt, only 5/- each. Audio/r.f. Texas 2N3819 8/6. Motorola 2N5459 (MPF105) 9/9 each.

NEW PLESSEY INTEGRATED CIRCUIT POWER AMPLIFIER TYPE SL403A. Only 48/6 each. Operates with 18V power supply. Sensitivity 20mV into 20MΩ, 3 watts into 7.5Ω. Applications data with two or more. PE Nov. 69 Stereo Amplifier kit less metal work £11/18/- NET complete.

30 WATT BAILEY AMPLIFIER COMPONENTS:

Transistors for one channel £7/5/6 list, with 10% discount only £6/11/0.
Transistors for two channels £14/11/0 list, with 15% discount only £12/7/5.
Capacitors and resistors for one channel list £2.
Printed circuit board free with each transistor set.
Complete unregulated power supply kit £4/17/6 mono or stereo, subject to discount.
Complete regulated power supply kit £9/5/- subject to discount. Further details on application.

SINCLAIR IC.10 Integrated Circuit Amplifier and Pre-amplifier. This remarkable monolithic integrated circuit amplifier and pre-amp now available from stock. The equivalent of 13 transistor, 18 resistor circuit plus 3 diodes and the first of its kind ever. It is d.c. coupled and applicable to an unusually wide range of uses as detailed in the manual provided with it. As advertised, post free 59/6 NET.

CARBON SKELETON PRE-SETS. Small high quality, type PR: Linear only, 100Ω, 220Ω, 470Ω, 1KΩ, 2K2, 4K7, 10K, 22K, 47K, 100K, 220K, 470K, 1MΩ, 2M2, 5M, 10MΩ vertical or horizontal mounting, 1/- each.

S-DeCs put an end to "birdsnesting". Components just plug in. Saves valuable time. Use components again and again. S-DeC only 30/6 post free. Compact T-DeC, increased capacity, may be temperature-cycled T DeC only 51/- post free. Full range available.

CAPACITORS: All new stock

High ripple current types:
2000μF 25V 7/4; 2000μF 50V 11/4; 5000μF 25V 12/6; 5000μF 50V 21/11; 1000μF 100V 16/3; 2000μF 100V 28/9; 5000μF 70V 36/-;
5000μF 100V 58/3; 1000μF 50V 8/2;
2500μF 64V 15/5; 2500μF 70V 19/6.

Medium electrolytics

Axial leads: Values (μF/V):
50/50 2/-; 100/25 2/-; 100/50 2/6;
250/25 2/6; 250/50 3/9;
500/25 3/9; 1000/10 3/-; 500/50 4/6;
1000/25 4/-; 1000/50 6/-;
2000/25 6/-.

Small electrolytics

Axial leads: 5/10, 10/10, 25/10, 50/10 1/- each, 25/25, 47/25, 100/10, 220/10 1/3 each.

PEAK SOUND ENGLEFIELD KITS

Brilliant new styling and available in two forms:
Stereo 15 watts per channel in kit form with complete amplifier and pre-amplifier modules and power supply. Build it 12 + 12 or 25 + 25
Output per channel into 15Ω 12 watts R.M.S. Price £38/9/- net



25 WATTS PER CHANNEL. As above but Output per channel into 15Ω 25 watts R.M.S. Price £58/15/- Net
Brief specification: Total harmonic distortion 0.1%.
Inputs: Magnetic, Ceramic, Tape, Radio. Signal to noise ratios: Better than 60dB all inputs. O/load factor 28dB all channels.

ENGLEFIELD CABINET to house either above assemblies (as illustrated) £6 Net. OTHER PEAK SOUND PRODUCTS AS ADVERTISED.

MULLARD Sub-min electrolytic C426

range: Price 1/3 each. Axial leads, Values (μF/V): 0.64/64; 1/40; 1.6/25; 2.5/16; 2.5/64; 4/10; 4/40; 5/64; 6.4/6.4; 6.4/25; 8.4/8.40; 10/2.5; 10/16; 10/64; 12.5/25; 16/40; 20/16; 20/64; 25/6.4; 25/25; 32/4; 32/10; 32/40; 32/64; 40/16; 40/2.5; 50/6.4; 50/25; 50/40; 64/4; 64/10; 80/2.5; 80/16; 80/25; 100/6.4; 125/4; 125/10; 125/16; 160/2.5; 200/6.4; 200/10; 250/4; 320/2.5; 320/6.4; 400/4; 500/2.5μF/V.

Wavechange switches: 1P 12W; 2P 6W; 3P 4W; 4P 3W long spindles, 4/9 each.

Slider switches, double pole double throw, 3/- each.

BARGAINS IN NEW TRANSISTORS

All power types supplied with free insulating sets

2N696	5/6	2N5192	25/-
2N697	5/6	2N5195	28/3
2N706	2/9	4036	12/6
2N1132	9/9	40362	16/-
2N1302	4/-	AC126	6/6
2N1303	4/-	AC127	6/-
2N1304	4/6	AC128	6/-
2N1305	4/6	AC176	11/-
2N1306	6/9	ACY22	3/9
2N1307	6/9	ACY40	4/-
2N1308	8/9	AD140	19/-
2N1309	8/9	AD149	17/6
2N1613	6/-	AD161	16/-
2N1711	7/-	AD162	comp. pr.
2N2218	9/3	AF118	16/6
2N2147	18/9	AF124	7/6
2N2369A	5/3	AF127	7/-
2N2646	10/9	BA102	9/-
2N2924	4/-	BC107	2/9
2N2925	4/6	BC108	2/6
2N2926R	2/3	BC109	2/9
2N2926O	2/3	BC147	3/6
2N2926Y	2/3	BC148	3/3
2N2926G	2/3	BC149	3/6
2N3053	5/6	BC153	10/-
2N3054	14/3	BC154	11/-
2N3055	16/-	BC157	3/9
2N3391A	6/3	BC158	3/6
2N3702	3/6	BC159	3/9
2N3703	3/3	BC167	2/6
2N3704	3/9	BV168	2/3
2N3705	3/5	BC169	2/6
2N3706	3/3	BC177	6/3
2N3703	4/-	BC178	5/8
2N3708	3/-	BC179	6/-
2N3709	3/-	BD121	18/-
2N3710	3/6	BD123	24/3
2N3711	3/11	BF178	10/6
2N3904	7/6	BFX29	10/9
2N3906	7/6	BFX85	8/3
2N3731	24/-	BFX88	6/9
2N3820	25/6	BFY50	4/6
2N3325	10/9	BFY51	4/3
2N3794	3/3	BSX20	3/9
2N4058	5/3	MJ480	21/-
2N4284	3/3	MJ481	27/-
2N4286	3/3	MJ491	30/-
2N4289	3/3	P346A	4/6
2N4291	3/3	V405A	7/9
2N4292	3/3	IN4001	4/2
2N4410	4/9	IN4005	8/-

MAIN LINE AMPLIFIER KITS as advertised. Prices Net. Authorised dealer.

COMPONENT DISCOUNTS:
10% on orders for components for £5 or more.
15% on orders for components for £15 or more.
(No discount on net items.)

POSTAGE AND PACKING:
Free on orders over £2.
Please add 1/6 if order is under £2.
Overseas orders welcome; carriage charged at cost.

ELECTROVALUE

(Dept. PW. 3) 28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY.

Telephone: Egham 5533 (STD 0784-3)

Open 9-5.30 Sats. 1 p.m.

PADGETTS RADIO STORE
OLD TOWN HALL, LIVERSEDGE, YORKS
 Telephone: Cleckheaton 2866

Indicator Unit Type 26. Size 12x9x9in. with outer case, fitted with 2 1/2in. C.R.T. type CV1526, 9 B7G valves, clean condition, but not tested. 32/6, P/p 10/-.

New 12in. Speakers with built-in Tweeter, 3 ohm or 15 ohm—6 watt max, 28/6. Post paid.

Tube Unit 116A. Complete with VCR97 tube Mumetal, screen and EF50 valves good condition but not tested 22/6, Carriage 10/-.

Perspex Implosion Screens. Removed from TV sets 14in. and 17in., 6 for 12/- Post paid.

Speaker output. Transformer removed from TV. 3 ohm. Secondary 6 for 10/- Post paid.

Reclaimed TV Tubes with six months' guarantee 17in. types AW43/88, AW43/80, 40/- MW 43/69 30/- 14in. types, 17/- All tubes 12/- carriage.

Speakers removed from TV Sets. All PM and 3 ohms and 8x5in., 6/6. Post and packing 3/6.

6in Round, 3/-, P/p 3/- 6 for 24/-, post paid.

6x4in, 3/-, P/p 3/- 6 for 24/- post paid.

7x4in, 5/-, P/p 3/- 6 for 34/- post paid.

5in Round, 3/-, P/p 3/- 6 for 24/- post paid.

Slot Speakers, 8x2 1/2in., 5/-, P/p 3/- 6 for 30/- post paid.

24 Way Plug and Socket. Ex units 1/6, P/p 1/- 12 for 14/- post paid.

Untested. Pye K.B., R.G.D. Ekco 17in. TV sets. Bush 17in. TV sets, 50/- each, carriage 15/- Passenger train, double rate.

VALVE LIST

Ex. Equipment, 3 months' guarantee

Single Valves Post 7d., over 3 Valves p. & p. paid.

AR112	1/6	PCL83	5/-	6K7	1/0
EB91	9d.	PL36	5/-	6U4	5/-
EP85	3/-	PL81	4/-	6V6	1/0
EBF80	3/-	PY33	5/-	6P98	5/-
ECC81	3/-	PY81	1/6	10P13	2/6
ECC82	3/-	PY82	1/6	186BT	8/6
ECC83	4/-	PZ30	5/-	20D1	3/-
EP80	1/-	U191	5/-	20P1	5/-
EP91	9d.	U251	5/-	20P2	5/-
EY51	2/6	U281	5/-	20P3	2/6
EY86	5/-	U282	5/-	30PL1	5/-
KT36	5/-	U301	5/-	30P12	5/-
PC84	3/-	U329	5/-	30P5	2/6
PCF80	3/-	6B8	1/8	30FL1	2/6
PCL82	4/-	6BW7	2/6	6J30L2	5/-

VALVES

SAME DAY SERVICE
NEW! TESTED! GUARANTEED

SETS

1R5, 1R5, IT4, 384, 3V4, DAF91, DF91, DK91, DL92, DL94.
 Set of 4 for 18/6, DAF96, DF96, DK96, DL96, 4 FOR 27/-

OZ4	4/6	12K8GT	7/3	DK32	7/6	EF183	5/9	PCF808	14/9	UBC41	9/-
1A7GT	7/6	12N97GT		DK91	5/9	EF184	5/9	PCL81	8/9	UBF80	5/9
1H5GT	7/3			DK92	9/-	EH90	6/3	PCL82	7/-	UBF89	6/9
1NSGT	7/9	19B8G6G	6/6	DY87	5/9	EM80	7/6	PL36	9/9	UC72	7/-
1R5	5/9	20F2	13/6	DL35	5/-	EL34	9/6	PCL84	7/6	UC84	7/-
1R5	4/3	20P3	11/9	DL92	5/9	EL41	11/-	PCL85	9/-	UC85	7/3
IT4	2/9	20P4	18/6	DL94	6/6	EL84	4/9	PCL86	8/3	UCF80	7/3
384	5/9	25L6GT	3/-	DL96	7/3	EL90	4/6	PEN44	12/6	UCH42	12/-
3V4	6/6	25U4GT	11/6	EY86	5/9	EL500	12/6	PFL200	11/9	UCH81	6/3
5Y3GT	5/9	30C1	6/6	NY87	5/9	EM80	7/6	PL36	9/9	UCL82	7/-
5Z4G	7/6	30C15	13/-	EABC80	6/6	EM81	7/6	PL81	7/9	UCL83	11/6
6/30L2	12/-	30C17	16/-	EAF42	10/-	EM84	6/9	PL82	6/6	UF41	10/6
6AL5	2/3	30C18	14/-	EB91	2/3	EM87	7/6	PL83	6/6	UF80	7/6
6AM6	2/9	30F5	16/-	EBC33	8/-	EY51	7/6	PL84	6/6	UF85	6/9
6A05	4/6	30FL1	13/9	EBC41	9/6	EY86	6/6	PL500	13/6	UF89	6/9
6AT6	4/-	30FL12	14/6	EBF80	6/9	EZ40	8/-	PL504	13/6	UL41	10/9
6AU6	4/6	30FL14	14/9	EBF89	6/3	EZ41	8/-	PL508	23/6	UL44	20/-
6BA6	4/6	30L1	6/6	ECC81	3/9	EZ80	4/6	PM84	7/6	UL84	7/-
6BE6	4/9	30L15	14/-	ECC82	4/9	EZ81	4/9	PX25	10/6	UM84	6/6
6B16	8/6	30L17	15/6	ECC83	7/-	GZ32	8/9	PY32	10/-	UY41	7/6
6BW6	13/-	30P4	12/-	ECC85	5/-	GZ34	9/9	PY33	10/-	UY85	5/9
6F13	3/6	30P12	13/9	ECC91	3/-	KT61	8/9	PY81	5/3	VP48	10/6
6F14	9/-	30P19	12/-	ECC804	12/-	KT66	16/-	PY82	5/3	W119	7/-
6F23	14/3	30PL1	13/9	ECC80	4/6	N78	17/6	PY83	5/9	Z77	2/9
6F25	13/-	30PL13	15/6	ECF82	5/9	PABC80	7/-	PY88	6/9	Translators	
6J6	3/-	30PL14	16/6	ECH35	6/-	PC86	10/3	PY800	7/6	AC107	3/6
6K7G	2/6	35L6GT	8/6	ECH42	13/6	PC88	10/3	PY801	6/9	AC127	2/6
6K8G	2/9	35V4	4/6	ECH81	5/9	PC96	8/6	R19	6/6	AD140	7/6
6L18	6/-	35Z4GT	5/-	ECH83	8/3	PC97	8/6	R20	12/6	AF115	3/-
6SN7GT	4/3	6063	12/6	ECH84	7/6	PC900	7/6	U25	13/6	AF116	3/3
6V6G	3/3	AC/VP2	10/-	ECL80	7/-	PCC84	6/6	U26	12/-	AF117	3/3
6V6GT	6/6	AZ31	9/6	ECL82	6/9	PCC85	6/-	U47	13/6	AF125	3/6
6X4	4/3	B729	12/6	ECL83	8/6	PCC88	9/-	U49	13/6	AF127	3/6
6X5GT	5/9	CCH35	13/6	ECL86	8/-	PCC89	10/6	U78	4/3	OC44	2/3
6Y7	7/-	CL33	18/6	EF37A	6/6	PCC189	11/6	U191	12/6	OC45	2/3
7C6	6/9	CY31	6/9	EF39	4/9	PCF80	6/6	U193	8/6	OC71	2/6
10F1	14/-	DAC32	7/3	EF41	10/9	PCF82	6/6	U251	14/6	OC72	2/6
10F18	7/-	DAF91	4/3	EF80	4/6	PCF86	13/6	U301	10/6	OC75	2/6
10P13	15/6	DAF96	7/3	EF85	3/3	PCF200	13/6	U329	14/6	OC81	2/3
12AT7	3/9	DF33	7/9	EF86	6/3	PCF800	13/6	U801	19/6	OC81D	2/3
12AU6	4/9	DF91	12/6	EF89	5/3	PCF801	6/9	UABC80	6/6	OC82	2/3
12AU7	4/9	DF96	7/3	EF91	2/9	PCF802	9/-	UAF42	10/3	OC82D	2/6
12AX7	4/9	DH77	4/-	EF94	4/6	PCF805	14/-	UB41	6/6	OC170	2/6

READERS RADIO

85 TORQUAY GARDENS, REDBRIDGE, ILFORD, ESSEX. Tel. 01-550 7441

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

There is scope, variety and responsibility as a

RADIO TECHNICIAN
 in Air Traffic Control

Join the National Air Traffic Control Service of the Board of Trade as a Radio Technician and you have the prospect of a steadily developing career in a demanding and ever-expanding field.

Entrance qualifications: you should be 19 or over with at least one year's practical experience in telecommunications. Preference will be given to those having ONC or qualifications in telecommunications.

Once appointed and given familiarisation training, you will be doing varied and vital work on some of the world's most advanced equipment including computers, radar and data extraction, automatic landing systems, communications and closed-circuit television. Work is based on Civil Airports, Air Traffic Control Centres, Radar Stations and specialist establishments. Vacancies exist in various parts of the United Kingdom.

Salary: £985 (at 19) to £1,295 (at 25 or over); scale maximum £1,500 (higher rates at Heathrow). Some posts attract shift-duty payments.

Promotion prospects are excellent and ample opportunity and assistance is given to study for higher qualifications. The annual leave allowance is good and there is a non-contributory pension scheme for established staff.

Send this coupon for full details and application form
 To: A. J. Edwards, C.Eng., M.I.E.E., M.I.E.R.E., Room 705,
 The Adelphi, John Adam Street, London WC2
 marking your envelope 'Recruitment'.

Name.....
 Address.....
 Not applicable to residents outside the United Kingdom. PW/A3

NATCS National Air Traffic Control Service

Practical Wireless Classified Advertisements

The pre-paid rate for classified advertisements is 1/8d. per word (minimum order 20/-), box number 1/6d. extra. Semi-displayed setting £5 10s. 0d. per single column inch. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd." Treasury notes should always be sent *registered post*. Advertisements, together with remittance, should be sent to the Classified Advertisement Manager, PRACTICAL WIRELESS, IPC Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4 for insertion in the next available issue.

MISCELLANEOUS

Be well-equipped

You need not worry about the painful and lingering minor burns that occur from time to time in leisure pursuits if you keep BURNEZE close to hand. This unique new scientific aerosol cools and anaesthetizes. BURNEZE takes the heat out of a burn in just 8 seconds, then controls the blistering and pain that steal skill from nimble fingers. Be well-equipped - buy BURNEZE, from chemists.

Potter & Clarke Ltd Croydon
CR9 8LP



TOP TRANSISTORS

High Stability, 5%, 1/4 watt Resistors, 12/6 for 50, 100 to 1MΩ your selection.

ACY22 1/9 OC45 1/9 ZTX300 1/9
BC108 1/9 OC71 1/9 2N2926 1/9
BFY51 1/9 OC202 1/9 2N3708 1/9

All the above types are available at 16 for £1. Brand new. Individually tested.

MONEY BACK GUARANTEE.
P & P 1/-.

J. M. KING (C),
14 ACTON ST, LONDON, W.C.1

ANDOR ELECTRONICS LTD., 178 Higher Hillgate, Stockport, for I.C.s., Mullard Transistors, Speaker Cabinets, etc. Open Saturdays for retail sales.

SPEAKER CABINET BARGAIN



Beautifully finished in Teak veneer. Size 16 x 8 x 6 in. Great value at ONLY 67/6 each, p.p. 7/6, or two at 62/6 each, p.p. 10/6 pair.

NEW RELEASE. Bass Guitar Speakers, 12 in., 25 watt, Heavy Duty cast chassis. Suitable for

all High Power applications. Only 5 Gns. p.p. 7/6d.

FAL 'PHASE 50' PA Amplifier, supplied with two of above, only 35 Gns. p.p. £1. SEND for free lists of Amplifiers, Cables, Speakers, Tuners Tape and other equipment.

ALBION ELECTRONICS SUPPLIES (Dept. 3), 16 ALBION RD., BIRCHINGTON, KENT

BUILD IT in a DEWBOX quality cabinet. 2in. x 2 1/2in. x any length. D.E.W. Ltd., Ringwood Road, FERNDOWN, Dorset. S.A.E. for leaflet. Write now—Right now.

THE NEW ELECTRONIC MUSIC FOR YOU

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing. Write NOW for free leaflet and further details to C. & S., 20 Maude Street, Darlington, Durham. Send 4d. stamp.

MISCELLANEOUS (continued)

6 OR 12 VOLT FLUORESCENT LIGHTS

12 in. 8 Watt tube ample light for caravan, tent etc. Fully transistorised, low battery drain. Unbeatable at **£2.19.6** post paid.

or in kit form **50/-**

4 WATT GRAM AMPS.

Volume and tone controls, mains operation, 3Ω output, new and boxed **65/-** POST PAID

SALOP ELECTRONICS Callers welcome
23 Wyle Cop, Shrewsbury, Shropshire S.A.E. for list

SERVICE MANUALS for Pre 1958 H.M.V. and E.M.I. MODELS. Radio and Record Player Manuals 5/- each. Television Manuals 7/6 each. Send C.W.O. stating model required. Also limited range of components and spares. Send details of your requirements. R.D.I. Ltd., Chilton Works, Garden Road, Richmond, Surrey.

EXPRESS ROTARY SWITCHES. Switches for Mullard audio circuits, also switches made to customers own specifications. For details and price list, write or phone to 189 Edgware Road., London W.2. Tel. 01-723 4455.

MUSICAL MIRACLES. Send S.A.E. for details of Rhythm Modules, versatile bass-pedal unit, self-contained with unique effects, kits for waa-waa pedals. Also new 50μA meters, 25/- post paid. HURRY. D.E.W. Ltd., 254 Ringwood Road, Ferndown, Dorset.

A CORNUCOPIA OF COMPONENTS! Scarce valves, selected TV components, Educational and Projects Kits, speakers and cabinets, transistors. Resistors all values 1/4 watt 3d. each. State your requirements. S.A.E. for details. MAIL-MART, 6 Eastbourne Road, Pevensey Bay, Sussex.

JOURNAL OF PARAPHYSICS Russian experiments: telekinesis ("mind-over-matter"); brainwaves actuate electronic relays; transistor UFO detectors; finger-vision; hyperspace; time-reversal; tachyons ("faster than light") etc. S.A.E. for list. 20s. for back issues. Paraphysical Laboratory, Downton, Wilts.

FOR SALE

MORSE MADE EASY !!

FACT NOT FICTION. If you start RIGHT you will be reading amateur and commercial Morse within a month. (Normal progress to be expected.)

Using scientifically prepared 3-speed records you automatically learn to recognise the code RHYTHM without translating. You can't help it, it's easy as learning a tune. 18 W.P.M. in 4 weeks guaranteed.

For details and course C.O.D. ring, a.t.d. 01-660 2898 send 8d. stamp for explanatory booklet to: 680HS (BOX 11), 46 GREEN LANE, PURLEY, SURREY

SONY 'VIDEOCODER', Model CV2000. Complete outfit includes 9in Video Monitor-TV, 19in Monitor, Video Camera with Zoom Lens, Mikes, Mixer, 12 Video Tapes, etc. Cost £850. (As new.) Bargain. £360. Phone Newington 500 (Kent) after 6 p.m.

FOR SALE (continued)

P.W. VOL. 41, 42 and odds, reasonable offers. send s.a.e.—BARR, 37 Woodcock Avenue, Naphill, Bucks.

SEEN MY CAT? 5,000 items. Mechanical & Electrical Gear, and materials. S.A.E. K. R. WHISTON, Dept. PW, NEW MILLS, Stockport.

YUKAN SELF-SPRAY 300 PROFESSIONAL TONE
Get these air-drying **GREY HAMMER**
NOW! OR **BLACK WRINKLE**
(CRACKLE) finishes

Yukan Aerosol spraykit contains 16 ozs. fine quality durable easy instant spray. No stove baking required. Hammers available in grey, blue, gold, bronze. Modern Eggshell Black Wrinkle (Crackle) all at 15/6 at our counter or 16/6 carriage paid, per push-button self-spray can. Also Durable, heat and water resistant Black Mast finish (12 ozs. self-spray cans only) 13/6 carriage paid.
SPECIAL OFFER: 1 can plus optional transferable snap-on trigger handle (value 5/-) for 18/6 carriage paid. Choice of 13 self-spray plain colours and primer (motor car quality) also available. Please enclose cheque or crossed P.O. for total amount direct to:
Dept: Mr YUKAN, 307A, EDGWARE ROAD, LONDON, W.2.
We supply many Government Departments, Municipal Authorities, Institutes and Leading Industrial Organisations—We can supply you too.
Open all day Saturday. Closed Thursday afternoons.

Other Yukan Air Drying Aerosols: 16 ozs. at 16/6 carriage paid. include: Zinc Chromate Clear Lacquer Metallics: Grey, Blue, Bronze and Gold.

WANTED

WE BUY New Valves and Transistors. State price. A.D.A. MANUFACTURING CO., 116 Alfreton Road, Nottingham.

WANTED NEW VALVES, televisions, radiograms, transistors, etc. STAN WILL-ETTS, 37 High Street, West Bromwich, Staffs. Tel.: WES 0186.

WANTED NEW VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD.
103 North Street, Leeds 7

WE BUY New Valves, Transistors and clean new components, large or small quantities. all details, quotation by return. WALTON'S WIRELESS STORES, 55 Worcester Street, Wolverhampton.

SERVICE SHEETS

SERVICE SHEETS. RADIO, TV, 5,000 Models. List 1/6. S.A.E. Enquiries. TEL-RAY, 11 Maudland Bank, Preston, Lancs.

SERVICE SHEETS (1925-1969) for TELEVISIONS, RADIOS, TRANSISTORS, TAPE RECORDERS, RECORD PLAYERS, etc.. by return post, with free fault-finding guide. Prices from 1/- Over 8,000 models available. Please send S.A.E. with all orders/enquiries. HAMILTON RADIO, 54 London Road, Bexhill, Sussex.

SERVICE SHEETS
(continued)

**LARGE SUPPLIER
OF
SERVICE SHEETS**

(T.V., RADIO, TAPE RECORDERS,
RECORD PLAYERS, TRANSISTORS,
STEREOGRAMS, RADIOGRAMS,
CAR RADIOS)

Only 10/- each, plus large S.A.E.

(Uncrossed P.O.'s please, original
returned if service sheets not available.)

C. CARANNA
71 BEAUFORT PARK
LONDON, N.W.11

We have the largest supplies of
Service Sheets (strictly by return of post).
Please state make and model number
alternative.

Free TV fault tracing chart or TV list on
request.

Mail order only.

SERVICE SHEETS (75,000) 5/- each: please
add loose 4d. stamp: callers welcome;
always open. THOMAS BOWER, 5 South
Street, Oakenshaw, Bradford.

RADIO, TELEVISION over 3,000 models.
JOHN GILBERT TELEVISION, 1b Shep-
herds Bush Rd., London W.6. SHE 8441.

SITUATIONS VACANT

**Radio
Operators**

There will be a number of vacancies in the
Composite Signals Organisation for experi-
enced Radio Operators in 1970 and in subse-
quent years.

Specialist training courses lasting approxi-
mately nine months, according to the
trainee's progress, are held at intervals.
Applications are now invited for the course
starting in September 1970.

During training a salary will be paid on
the following scale:—

Age 21	£ 800 per annum
22	855
23	890
24	925
25 and over	965

Free accommodation will be provided at
the Training School.

After successful completion of the course,
operators will be paid on the Grade 1 scale:—

Age 21	£ 965 per annum
22	1025
23	1085
24	1145
25 (highest age point)	1215

then by six annual increases to a maximum
of £1,650 per annum.

Excellent conditions and good prospects of
promotion. Opportunities for service abroad.

Applicants must normally be under 30
years of age at start of training course and
must have at least two years' operating
experience. Preference given to those who
also have GCE or PMG qualifications.

Interviews will be arranged throughout
1970.
Application forms and further particulars
from:—

**RECRUITMENT OFFICER,
Government Communications
Headquarters,
Oakley, Priors Road,
CHELTENHAM, Glos. GL52 5AJ
Tel: No. Cheltenham 21491 Ext 2270**

SITUATIONS VACANT
(continued)

Technicians

The United Kingdom Atomic Energy Authority offer
opportunities at Aldermaston for Technicians to work on
the inspection, test to specification, fault diagnosis and
calibration of electronic equipment. A wide variety of
equipment is involved including general test purpose
equipment and data handling and control systems.

Applicants must have served a recognised apprentice-
ship or have had equivalent experience in the field of
electronics. Diagnostic experience in digital circuitry or
semiconductor techniques would be an advantage.

Candidates must possess an ONC, a City and Guilds
Technicians Certificate or equivalent qualification.

Salary: £1,105—£1,660 a year.

Housing or Hostel Accommodation will be available.

For application forms write to Chief Personnel Officer:—
UKAEA, Aldermaston, Reading RG7 4PR quoting reference 3707/507

**Trainee
Radio
Technicians**

A Progressive Career in the
Field of Radio and Electronics

Applicants are now invited for an intensi-
ve training course of two years, leading to
appointment as a fully qualified RADIO
TECHNICIAN, with further prospects of
progression to the Telecommunication Tech-
nical Officer Class.

Generous Pay and Conditions while under
training.

Candidates must be over 16 and under 21
years of age as at 7 September, 1970, on
which date training commences.

Minimum educational qualifications re-
quired are passes at GCE 'O' Level in
English Language, Mathematics and Physics
(already held or expected to be obtained in
the Summer, 1970). Equivalent passes in
Scottish or Northern Ireland Certificates
and CSE Grade I passes are also acceptable.

Closing date for receipt of applications:
27 February, 1970.

Apply for full details and application form
to:—

**The Recruitment Officer (TRT/37),
Government Communications
Headquarters,
Oakley, Priors Road,
Cheltenham, Glos.
GL52 5AJ**

**ENGINEERS, A TECHNICAL CERTIFI-
CATE** or qualification will bring you
security and much better pay. Elem. and
adv. private postal courses for C.Eng. and
A.M.E.R.E., A.M.S.E. (Mech. & Elec.),
City & Guilds, A.M.I.M.I., A.I.O.B., and
G.C.E. Exams. Diploma courses in all
branches of Engineering—Mech., Elec.,
Auto., Electronics, Radio, Computers,
Draughts., Building, etc. For full details
write for FREE 132 page guide: BRITISH
INSTITUTE OF ENGINEERING TECH-
NOLOGY, (Dept. 169K), Aldermaston
Court, Aldermaston, Berks.

TV and Radio, A.M.I.E.R.E., City &
Guilds, R.T.E.B. Certs., etc on 'Satisfac-
tion or Refund of Fee' terms. Thousands of
passes. For full details of exams and home
training Courses (including practical equip-
ment) in all branches of Radio, TV, Elec-
tronics, etc. Write for 132 page Handbook
—FREE. Please state subject. BRITISH
INSTITUTE OF ENGINEERING TECH-
NOLOGY (Dept 137K), Aldermaston Court,
Aldermaston, Berks.

HENRY'S RADIO LTD.

363 EDGWARE ROAD, LONDON, W.2

HAVE THE FOLLOWING VACANCIES IN
THEIR ORGANISATION.

Sales Assistants

Young man with good general knowledge
of electronic components required for our
retail sales dept. Please Phone 723 1008/9
Extn. 1.

Sales Assistants Hi-Fi Dept.

Young man with a good general knowledge
of HIGH FIDELITY EQUIPMENT required
for our retail HI-FI SALES DEPT. Please
contact Mr. STEVENS, Telephone 723 6963.



Hacker Radio Limited, manufacturers of
supreme quality radio and audio equip-
ment, invites applications from ambitious
young men for the following posts:

Production Testers

Fault Finders

Bench Service Engineers

Every opportunity given for advancement
and further education with a view to
promotion to the Development Group.

**Write or telephone: Personnel
Manager, Hacker Radio Limited,
Norrays Drive, Cox Green, Maiden-
head, Berks. Tel: Maidenhead 22261**

SERVICE ENGINEERS—we are an old
established electronics company, but headed
by a young management team and we need
you to help us. Age is no barrier to a high
salary as you will find out when you join
us. If you have experience in T.V., Radio
Hi-Fi Service and want a job that looks
ahead phone Michael Adler at 01-636 9606.

EDUCATIONAL

RADIO OFFICERS see the world! Seagoing and shore appointments. Trainee vacancies during 1970. Grants available. Day and Boarding students. Stamp for prospectus, Wireless College, Colwyn Bay.

BECOME "Technically qualified" in your spare time, guaranteed diploma and exam-home-study courses in radio, TV servicing and maintenance. T.T.E.B., City and Guilds, etc.: highly informative 120-page Guide-free. **CHAMBERS COLLEGE** (Dept. 857K), 148 Holborn, London, E.C.1.

CITY & GUILDS (electrical, etc.) on "Satisfaction or Refund of Fee" terms. Thousands of passes. For details of modern courses in all branches of electrical engineering, electronics, radio, TV, automation, etc., send for 132-page Handbook—FREE. B.I.E.T. (Dept. 168K), Aldermaston Court, Aldermaston, Berks.

RADIO OFFICER training courses. Write: Principal, Newport and Monmouthshire College of Technology, Newport, Mon.

TRAIN FOR SUCCESS WITH ICS

Study at home for a progressive post in Radio, TV and Electronics. Expert tuition for City & Guilds (Telecoms Techn's Cert. and Radio Amateurs) R.T.E.B., etc. Many non-exam courses incl. Closed circuit TV, Numerical control & Computers. Also self-build kit courses—valve and transistor.

Write for FREE prospectus and find out how ICS can help you in your career.

ICS, DEPT. 541 INTERTEXT HOUSE,
STEWARTS ROAD, LONDON. SW8

BOOKS & PUBLICATIONS

SURPLUS HANDBOOKS

19 set Circuit and Notes .. 6/6 p/p 6d.
1155 set Circuit and Notes .. 6/6 p/p 6d.
H.R.O. Technical Instructions .. 5/6 p/p 6d.
38 set Technical Instructions .. 5/6 p/p 6d.
46 set Working Instructions .. 5/6 p/p 6d.
88 set Technical Instructions .. 7/- p/p 6d.
BC.221 Circuit and Notes .. 5/6 p/p 6d.
Wavemeter Class D Tech. Instr. .. 5/6 p/p 6d.
18 set Circuit and Notes .. 5/6 p/p 6d.
BC.1000 (31 set) Circuit and Notes .. 5/6 p/p 6d.
CR.100/B.28 Circuit and Notes .. 10/- p/p 9d.
R.107 Circuit and Notes .. 7/- p/p 6d.
AR.88D Instruction Manual .. 18/- p/p 6d.
62 set Circuit and Notes .. 6/6 p/p 6d.
Circuit Diagram 5/- each post free, R.1116/A, R.1224/A, R.1355, R.F. 24, 25 and 26, A.1134, T.1154, CR.300, BC.312, BC.342, BC.348J, BC.348 (E.M.P.), BC.624, 22 set.
52 set Sender and Receiver circuits 7/6 post free

Colour code indicator 2/6 p/p 6d.

S.A.E. with all enquiries please.

Postage rates apply to U.K. only.

Mail order only to:

INSTRUCTIONAL HANDBOOK SUPPLIES

DEPT. PW, TALBOT HOUSE,
28 TALBOT GARDENS, LEEDS 8

METAL WORK

METAL WORK: All types cabinets, chassis, racks etc., to your specifications. **PHILPOTTS METAL WORKS LTD.**, Chapman Street, Loughborough.

ELECTRICAL

240 VOLT ELECTRICITY ANYWHERE



BEST EVER 200/240 VOLTS "MAINS" SUPPLY FROM 12 VOLT CAR BATTERY
Exclusive World Scoop Purchase. The fabulous Mk. 2D American Heavy Duty Dynamo Unit with a Massive 220 watt output and giving the most brilliant 200/240 Volt performance of all time. Marvellous for Television, Drills, Power Tools, Mains Lighting, AC Fluorescent Lighting and all 200/240 volt Universal AC/DC mains equipment. Made at tremendous cost for U.S.A. Govt. by Delco-Remy. This magnificent machine is unobtainable elsewhere.
Brand New and Fully Tested, only £24.19.6, plus 10/6 postage. C.O.D. with pleasure. Money back if not delighted. Please send s.a.e. for interesting illus. details.
Dept. PW STANFORD ELECTRONICS,
Rear Derby Road, North Promenade,
Blackpool, Lancashire.

RECEIVERS & COMPONENTS

NEW FULL SPECIFICATION DEVICES. Integrated Circuits complete with data: GE PA230 Audio Preamplifier 18/6 each; GE PA234 1W Audio Amplifier 17/6 each; GE PA237 2W Audio Amplifier 32/6 each; Plessey SL402A Pre-amp and 2W Amp 42/- each; MEL 11 Photo-Darlington Amp 9/6 each. High quality low cost plastic transistors: GE 2N5172 NPN 200mW Transistor 1/9 each; ME 0412 PNP 200mW Transistor 3/9 each; TI 2N4059 PNP 250mW Transistor 3/6 each. Westinghouse guaranteed plastic rectifier: IN4820 1.5 A 400V Si Rectifier 2/6 each; GI W005 1A 50V Full Wave Bridge Si Rectifier 7/6 each. C.W.O. P & P. 1/- per order.—JEF ELECTRONICS, York House, 12 York Drive, Grappenhall, Warrington, Lancs. Mail Order only.

Stella Nine Range Cases

Manufactured in Black, Grey, Lagoon or Blue Stelvetite and finished in Plastic-coated Steel, Morocco Finish with Aluminium end plates. Rubber feet are attached and there is a removable back plate. There is also a removable front panel in 18 s.w.g. Alloy.

Now all Aluminium surfaces are coated with a strippable plastic for protection during manufacture and transit. All edges are polished.

LIST OF PRICES AND SIZES which are made to fit Standard Alloy Chassis

Width	Depth	4" Height £ s. d.	6" Height £ s. d.	7 1/2" Height £ s. d.
6 1/2"	3 1/2"	12 6	15 0	18 0
6 1/2"	4 1/2"	13 6	18 0	1 0 0
8 1/2"	3 1/2"	15 0	1 0 0	1 1 0
8 1/2"	6 1/2"	1 1 0	1 6 6	1 11 3
10 1/2"	7 1/2"	1 8 6	1 16 6	1 18 9
12 1/2"	3 1/2"	1 1 0	1 6 6	1 11 0
12 1/2"	6 1/2"	1 8 0	1 14 0	1 17 6
12 1/2"	8 1/2"	1 16 0	2 3 0	2 7 3
14 1/2"	3 1/2"	1 5 0	1 11 6	1 14 0
14 1/2"	6 1/2"	2 3 0	2 18 9	2 18 6
16 1/2"	6 1/2"	1 18 6	2 6 3	2 11 6
16 1/2"	10 1/2"	2 10 0	3 5 0	3 11 9

Cases—Post 4s. 6d. per order.
Discounts available on quantities.

CHASSIS in Aluminium, Standard Sizes, with Gusset Plates

Sizes to fit Cases. All 2 1/2" Walls

W x D	W x D	W x D	W x D
6" x 3"	5 6	10" x 7"	8 8
6" x 4"	5 9	12" x 3"	6 9
8" x 3"	6 6	12" x 5"	7 6
8" x 6"	7 9	12" x 8"	10 9
		16" x 6"	10 6
		16" x 10"	16 0

Chassis—Post 3s. 0d. per order.
Discounts available on quantities.

E. R. NICHOLLS

Manufacturer of Electronic Instrument Cases

46 LOWFIELD ROAD
STOCKPORT - CHESHIRE

Tel: 061-480 2179

RECEIVERS & COMPONENTS

(continued)

EMSA FOR ANTENNA SYSTEMS AND CONVERTERS. Please send s.a.e. for details of 2 metre converters, antennas and transmatchers for receiving and transmitting. **ELECTRONIC & MECHANICAL SUB-ASSEMBLY CO. LTD.**, Highfield House, West Kingsdown, Kent. Tel. W.K. 2344.

WE ARE BREAKING UP COMPUTERS

EX COMPUTER PRINTED CIRCUIT PANELS 2in x 4in. packed with semi-conductors and top quality resistors, capacitors, diodes, etc. Our price, 10 boards 10/-, P. & P. 2/-. With a guaranteed minimum of 35 transistors.

SPECIAL BARGAIN PACK. 25 boards for £1. P. & P. 3/8. With a guaranteed minimum of 85 transistors. 100 boards 55/-, P. & P. 7/6. With a guaranteed minimum of 350 transistors.

GIANT PANELS. 5 1/2in x 4 1/2in., min. 20 transistors. 9 x 56 µH inductors, resistors, diodes, etc. 3 for £1. P. & P. 2/-.

As above, only 21 transistors, 70 diodes, 62 min. 1/2 W resistors. 3 for 25/-, P. & P. 2/-.

PANELS with 2 power transistors sim. to OC28 on each board + components. 2 boards (4 x OC28) 10/-, P. & P. 2/-.

TRIM POTS. On 2in x 4in boards + Ta caps and other components. Ideal for organ keyboard tuning etc. 100Ω, 500Ω, 15K, 20K. State requirements. 5 boards 10/-, P. & P. 2/-.

NPN GERMANIUM TOS 1 WATT POWER TRANSISTORS. On small heat sink, on 2in x 4in. panel. 5 for 10/-, P. & P. 2/-.

POWER TRANSISTORS. Sim. to 2N174 ex-eqt. On Finned Heat Sink (10D). 4 for £1. P. & P. 5/-.

DIODES. Ex eqpt., Silicon, 150 PIV, 10 amp. 4 for 10/-, 150 PIV, 20 amp. 4 for £1. Post free.

MINIATURE GLASS NEONS, 13/6 doz.

PAPST FANS. Powerful Extractor/Blower fans. 4 1/2in x 4 1/2in x 2in. 230/250V. 100 c.f.m., 2,800 r.p.m. Weight 2 1/2 lb. 12 oz. 50/- post free.

SPRAGUE POLYESTER. 0.22µF 250V small capacitors. 5/- doz. P. & P. 1/-.

SPRAGUE ELECTROLYTICS. 4µF 150V. 5/- doz. P. & P. 1/-.

TANTALUM CAPS. 2.2µF 50V. 8/- per doz P. & P. 1/-.

NEW MIXED COMPONENTS

150 High stab. resistors 5% and better. 12/6. P. & P. 1/-.

250 mixed resistors 1W + 1/2W. 12/6. P. & P. 1/-.

Large handful of mixed capacitors. 12/6. P. & P. 1/-.

LARGE CAPACITY ELECTROLYTICS 4 1/2in., 2in. diam. Screw terminals. 7/6 each post free.

4,000µF 72V d.c. wkg.

4 1/2in. x 2in. Plessey 1,500µF 150V d.c. wkg.
8/- each. 3in. x 1in. Plessey 2,000µF 25V d.c. wkg.
6/- each.

KEYTRONICS, 52 Earls Court Road
London, W.8. Mail order only

Tel. 01-478 8499

BARGAIN PARCELS

Any 5, 9/-; 10, 14/-; 100, £5.10.0 from the following:
ECC82, ECL80, EF80, EF85, EF183, EF89, EB91, EY86, PCC84, PCC89, PCF80, PCL82, PCL83, PCL84, PL36, PL81, PY33, PY81, PY82, U191, 6-30L2, 30FL1, 30F5.

U.H.F. AERIAL BOOSTER

Transistorised, cavity tuned, high-gain. All uhf channels. Complete with battery and lead, 69/-, p. & p. 1/-, **VELCO ELECTRONICS**, 62 Bridge Street, Ramsbottom, Bury, Lancs.

RECEIVERS & COMPONENTS (continued)

ELECTRONIC MULTIMETERS

Type CT38 for 200/250 mains, 97 range unit for AC/DC volts and current, Resistance, Power O/P, R.F. probe to 250 Mc/s with leads and circ good condition.

Price £18 plus £1 carr.

AERIAL COUPLING UNITS

Range 2 to 5.7 Mc/s contain 2 variable inductors with counter dials, 2 R.F. ammeters 0 to 3 and 0 to 6a 100 and 50Pf fixed Tx type conds, dummy load. These are intended to match an 80 ohm O/P to a long wire Ae, fitted in wood case. Supplied in fair condition some damage to outer case.

Price 35/- plus 10/- carr.

CONTROL UNIT 595

Contains 2 500 Ua meters 2" scale 0 to 2.5 Ma and 50,000Ft, 3 xley swts 4p 4w, 2p 4w, 2p 2w, 4 x pots, 12 misc res, Small Variac 1600c/s can be used on 6.3v 50c/s to make L.V. var O/P P.U. complete in case modern unit, new boxed.

Price 50/- plus 10/- carr.

TEST SET 276.

1/P 200/250v contains P.U. O/P 300v at 100 Ma with 524 2 chokes, smooth conds, 2x micro swts, larger 100K ohm pot, 10 valves, 14 pots, Fuse hold, swts and a large number of other parts. Complete in transit case, good condition.

Price £23-5 plus 10/- carr.

IND UNITS 152

These are a small special purpose Ind unit with tube 3DP1S valves 6AG5X3, 2X2 controls focus, brill etc supplied in used condition.

Price 25/- plus 7/6 post.

or new Condition 3/5-

MAINS TRANSFORMER

Pria 200/250v Sec 50v at 1a, 6.3v .3a, 10v 60 Ma potted C core

Price 25/- plus 4/6 post.

.25h Matching choke 12/6

METERS

4 1/2" Dia front 3" scale 100-0-100 Ua scale 150-0-150 internal resistance 1500 ohm, mirror backed scale ex modern equip.

Price 22/6 plus 2/6 post.

HELICAL POTS

Available in the following sizes.

500 ohm, 2.5 K, 50 K ohm ex equip.

Price 15/- ea plus 1/6 post.

Miniature dials for use with 50K above. 15/- ea.

SELECTOR UNIT

As 2 coils of 700 ohm operating via a ratchet device to turn o/p shaft with dials clockwise or anticlock direction, new.

Price 6/- plus 3/- post.

A. H. SUPPLIES 57 Main Road SHEFFIELD, S95HL

Shop closed Tues. and Thurs.
Carriage applies to U.K. mainland only.

NEW VHF KIT

Receives Television Sound, Ambulances, Aircraft, Radio 2, 3 and 4 on VHF, etc. This novel little set will give you endless hours of pleasure and can be built in one evening. The Kit comes with easy to follow instructions and circuit. Powered by 9v Battery. Complete with built-in Jack Plug Socket for use with Earphones or Amplifier.

ONLY 57/- P. & P. FREE U.K. ONLY.

Postal Orders, Cheques to:

Dept. P.W.7.

Galleon Trading Co., 298A Lodge Lane, Romford, Essex.

150 NEW ASSORTED Capacitors, Resistors, Silvered Mica, Ceramic, etc. Carbon, Hy-stab, Vitreous, 1-20 watt, 15/- Post Free. WHITSAM ELECTRICAL, 33 Drayton Green Road, West Ealing, W.13.

HI-FI loudspeaker systems for the home constructor, cabinet kits, the new range of Peerless speakers, speaker kit systems and cross-over networks. BAF wadding, speaker fabric (samples on request) and all other necessary components. Send 9d in stamps to: AUDIOSCAN, Dept. PW, 4 Princes Square, Harrogate, Yorks.

RECEIVERS & COMPONENTS (continued)

COMPLETE RANGE of Amateur Aircraft, Communications receivers. Chassis, panels, meters, cabinets, microphones, etc. Stephens-James Ltd., 70 Priory Road, Liverpool 4. Tel. 051-263-7829.

BRAND NEW ELECTROLYTICS, 15/16 volt 0.5, 1, 2, 5, 8, 10, 20, 30, 40, 50, 100, 200 mfd. 8s per dozen, postage 1s. The C.R. Supply Co., 127 Chesterfield Road, Sheffield 8.

TO HELP THE HOME CONSTRUCTOR, Heathkit now make available our surplus Resistors, Capacitors, etc. at Bargain prices. Send for lists. E. Moyle, Daystrom Ltd., Gloucester.

AERIALS

BAKER AND BAINES

All aerials available—Engineered to a high standard. Specials and DX made to order. BBC dipole 30/-, H 42/-, 3 ele 89/-, 4 ele 120/-, ITA 3 ele 26/-, 5 ele 34/-, 8 ele 47/5, 11 ele 57/6, 13 ele 71/-, ITA double 8 112/-, 11 ele 140/-, 13 ele 159/-, Combined BBC/ITA D+5 45/-, D+8 52/-, H+5 69/-, X+5 75/-, BBC2—ITV2 8 ele 29/-, 14 ele 37/-, 18 ele 54/-, 22 ele 63/-, double 22 ele 142/-, FM dipole 21/-, H 38/-, 3 ele 65/-, All aerials suitable loft mounting where space permits. Special high-gain loft BBC/ITA for confined space with pole, joist bracket and swivel joint 37/-.

Co-ax low loss 1/3 per yard—Ultra low loss 2/3 per yard. Co-ax plunger 1/4. Band I/III dippers 8/3, I/II/III triplexers 13/6. Feed BBC1—ITA—BBC2 all under the same co-ax using pair matched UHF/VHF dippers, 21/3 pair. Chimney lashings 15/-, 19/-, 5ft. cranked arm pole 10/4. 3ft. arm 6/3. 16ft. x 2in. poles 59/-, Clamps, couplers, etc. Signal boosters BBC2 97/6. Combined BBC/ITA 75/6.

All cathode Ray Tubes Brand New not rejuvenated (full 2 years guarantee) at sensible prices 14in. £6, 17in. £6, 19in. £7.15.0, 21in. £7.15.0, 23in. £9. Twin Panel 19in. £12, 23in. £15.7.6. Ringuard 19in. £10.9.0, 23in. £13.14.0. SAE for full details please.

Most Television Valves available Brand New for extra performance 3 months guarantee, 15% off standard price. SAE will bring full lists.

Carriage: Aerials paid. Accessories—according to weight. TV Tubes 12/6. Insurance 5/- extra. Valves 9d.

11 Dale Crescent, Tupton, Chesterfield.

Est. 1943 **JOHNSONS** Tel: 24864

New! CV2—a unique triple-purpose VHF kit for the Amateur enthusiast. Integrated converter, receiver, and tuner-feeder. Fantastic single transistor performance! Comprehensive kit of high grade parts with three coils covering 80-178MHz, 9v battery, etc., together with simplified diagrams and instructions. Price complete, £4, post, packing and insurance paid, direct from makers. S.A.E. for literature.

JOHNSON'S (RADIO)
St. Martin's Gate, Worcester

Please mention
**PRACTICAL
WIRELESS**
when replying to
advertisements

AUDIO EFFECTS

5 SHAW LANE, HALIFAX YORKS

Buy with confidence and obtain the right results. Refunds without question if any of our products fail to give 100% satisfaction.

OUR LATEST DESIGN BREAKTHROUGH AMATEUR BAND ALL TRANSISTOR SUPERHERT RECEIVER KIT. Designed to cover 500kHz, 30MHz in 4 ranges using plug in coils. AGC loop on IF strip. Vernier dial slow motion tuning. Will drive your 8 ohm speaker. Kit supplied with coils for range of your choice. Comes complete with our normal high quality components, PC board, attractive blue crackle finish chassis, black perspex panel and easy step by step instructions.

Additional sets of coils may be purchased separately if required. In kit form at only £8.19.6 plus 5/6 P. P. & Ins. POWER CONTROLLER. Power at your finger tips. Not merely half wave control but full wave. A single variable control gives zero to full power. Uses latest 15 amp 3kW triac and special triggering device. Ideal for all types of lighting, fires, motors, drills, etc. Complete with box, power socket, cables, etc. In kit form with easy to follow instructions £6.9.6. Ready built £9.4.6 plus 5/6 P. P. & Ins.

REVERBERATION AMPLIFIER. Self contained transistorised, battery operated. An entirely different approach to sound reproduction. Normally, sound reproduction from a single source, has a flat one dimensional effect. With this unit, proper sound delay through reverberation, tones, are created with a truly three dimension for concert hall originality. Two controls adjust volume and reverberation. Simply plug microphone, guitar, etc., in, and the output into your amplifier. Supplied in a beautiful walnut cabinet 7 1/2in x 3in x 4 1/2in. P. P. & Ins. 6/-.

VOX SWITCH. This sound operated switch is ideal for mobile TX work, tape recorder switching, etc. You speak, it switches. High and medium imp. inputs. A.E. off point. Drives your 12 volt relay. In kit form with full instructions 42/6. Ready built, tested and guaranteed. 62/6, plus 2/6 P. P.

METRONOME UNIT. Variable beat. Listen while you play and keep in time. Easily built, pocket size with personal mini earphone. In kit form 27/6, post paid. Ready built in an attractive black and white polythene case, 37/6 post paid.

MORSE OSCILLATOR. PC board, transistors, high stab. components, battery carrier, ear piece. Adjustable tone. Just attach your key. Drives phones or speaker. In kit form 17/6, post paid. Ready built in similar case as above 25/-, post paid.

STRAIGHT FROM THE PRESS. Latest Mullard manual: Audio Amps, FM tuners, Stereo decoder, Receiver circuits, Hi Fi Tape, etc. etc. 32/6 post paid.

JUST ARRIVED IN STOCK. Texas transistors. Complementary symmetry. Driver, NPN, PNP output. The set of three ONLY 6/6 post paid.

Free lists with every order. For lists only send 1/6 (deductible from first order).

NEW VALVES!

Guaranteed and Tested

24-HOUR SERVICE

1R5	5/6	DL96	7/-	EY51	6/9	PL504	13/3
1S5	4/3	DY86	4/9	EY86	6/3	PY32	10/-
1T4	2/9	DY87	4/9	EZ80	3/9	PY33	10/-
354	5/9	EABC80	5/9	EZ81	4/6	PY81	5/6
3V4	6/3	EBC33	7/9	KT61	8/3	PY82	5/6
6A05	4/3	EBF80	6/-	KT66	15/9	PY83	5/6
6V6G	3/-	EBF89	5/9	N78	14/6	PY88	6/6
25L6GT	4/6	ECC81	3/6	PABC80	6/9	PY800	6/3
30FL1	13/6	ECC82	4/-	PC86	10/3	PY801	6/3
30FL12	14/3	ECC83	4/9	PC97	8/3	R19	6/9
30P4	11/6	ECC85	5/-	PC90	7/6	U25	12/9
30P19	11/6	ECH35	5/6	PC84	6/3	U191	12/-
30PL1	13/6	ECH81	5/9	PC89	8/11	U193	8/6
30PL13	14/9	ECL80	6/6	PCF80	5/11	U251	14/-
CC835	13/-	ECL82	6/3	PCF801	6/6	U301	10/-
CL33	17/6	ECL83	8/-	PCF802	8/9	U329	14/-
DAC32	6/9	ECL86	7/6	PC82	6/6	UABC80	6/6
DAF91	4/3	EF37A	4/-	PCL83	9/9	UBC41	8/3
DAF96	6/9	EF39	4/6	PCL84	7/-	UBF89	6/3
DF33	7/6	EF80	4/6	PCL85	8/6	UCC85	7/3
DF91	2/9	EF85	4/9	PCL86	8/-	UCH81	6/-
DF96	6/9	EF86	6/3	PFL200	11/-	UCL82	6/9
DK32	6/9	EF89	4/9	PL36	9/3	UF41	10/6
DK91	5/6	EF183	5/6	PL81	7/6	UF89	6/6
DK96	7/3	EF184	5/3	PL82	5/9	UL41	10/3
DL35	4/9	EH90	6/-	PL83	6/3	UL84	6/3
DL92	5/9	EL33	8/3	PL84	6/-	UY41	7/-
DL94	6/3	EL84	4/9	PL500	12/9	UY85	5/3

Postage on 1 valve 9d. extra. On 2 valves or more, postage 6d. per valve extra. Any parcel insured against damage in transit 6d. extra. Office address, no callers.

GERALD BERNARD
83 OSBALDESTON ROAD
STOKE NEWINGTON
LONDON, N.16



2 1/2 kW FAN HEATER
Three position switching to suit changes in the weather. Switch up for full heater (2 1/2 kW), switch down for half heat (1 1/4 kW), switch central blower cold for summer cooling—adjustable thermostat acts as auto control and safety cut-out. Complete kit £3.15.0 Post and ins. 7/6.

AC FAN

Small but very powerful mains motor with 5 1/2 in. blades. Ideal for cooling equipment or as an extractor. Silent but very efficient. 17/6. post 4/6. Mounts from back or front with 4BA screws.



SPRING COIL LEADS
as fitted to telephones. 4 core 2/6 each. 3 core 2/- each.

QUICK CUPPA

Mini Immersion Heater. 350w. 200/240v. Boils full cup in about two minutes. Use any socket or lamp holder. Have at bedside for tea, baby's food, etc. 19/6. post and insurance 1/6. 12v. car model also available.



Be first this year!
SEED AND PLANT RAISING

Soil heating wire and transformer. Suitable for standard size garden frame. 19/6 Post and ins. 3/6.

Dynamic microphone 500 ohm, operates speaker or microphone, so useful in intercom or similar circuits. 6/6 ea., £3.10.0 doz.

Acos crystal microphone. Adjustable stand converts this from hand mic. to desk mic. 19/6 ea.

ERGOTROL UNITS

These units made by the Mullard Group are for operating and controlling d.c. Motors and equipment from A.C. mains.

Thyristors are used and these supply a variable d.c. resulting in motor speed control and operating efficiency far superior to most other methods.

The units are contained in wall mounting cabinets with front control panel on which are fuses—push buttons for on/off and the variable thyristor firing control.

4 models are available—all are brand new in makers cases:

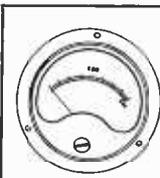
Model 2410 for up to 5 amps	£17.10.0
Model 2411 for up to 10 amps	£27.10.0
Model 2413 for up to 45 amps	£47.10.0
Model 2415 for up to 80 amps	£95. 0.0

Note: 2415 is a floor mounting unit.



16 RPM GEARED MOTOR

Made by Smith's Electrics, these are almost silent running, but are very powerful. They operate from normal to 240V. mains and the final shaft speed is 16 r.p.m. 9/6. post & ins. 2/9.

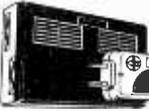


2 1/2" MOVING COIL METER

Meters are always being needed and they are jolly costly when you have to buy them in a hurry. So it's sensible to take advantage of this offer: 2 1/2 in. (3" o.d.) flush mounting moving coil meters 0-300/0-500 or 0-1 amp scaled but once the internal shunt is removed the f.s.d. is usually about 10mA so you can make it into almost anything by adding shunts or series resistors. These are Ex. W.D. of course but are unused and any not perfect would be exchanged. Price only 8/6 each plus 2/6 post. 12 or more post free.

DON'T BUY ANOTHER BATTERY

Nickel Cadmium cells are rechargeable from the mains so if these replace the normal batteries in your radio and if you fit a battery charger to it—the radio will still remain portable but will in fact be mains operated. Our outfit comprises (1) full wave battery charger with high/low switch; (2) 9 volt (approx.) 120mA hour Battery stack; (3) full instructions for fitting. Price is 29/6 (less than regular price of battery stack) 2/6 post and insurance.



Where postage is not stated then orders over £3 are post free. Below £3 add 2/9. Semi-conductors add 1/- post. Over £1 post free. S.A.E. with enquiries please.

TRANSISTOR SET CASE

Very modern cream cabinet, size 5 1/2 x 3 x 1 1/2 in. with chrome handle, tuning knob and scale. Price 6/6 plus 2/0 postage. Printed circuit board for this case 2/9.



5in. x 5in. Printed Circuit Board ideal for dozens of projects. Heavy copper on 3/32in. sheet, 1/6 each or 15/- per dozen.

FLEX CABLE BARGAIN

23/0076 triple core P.V.C. covered, circular, normally sold at 1/6 yd. Our price, 100 yd. coil £3.19.6. Post and insurance 6/6.

INDICATOR LAMP

Panel mounting, consists of neon lamp in red plastic lens with resistor in leads for mains operation. 2/6 each. 24/- dozen.



HIGH CAPACITY ELECTROLYTICS

Brand new, not ex equipment.
100 mfd 25v. 1/3 each. 12/- doz.
200 mfd 25v. 1/6 each. 15/- doz.
500 mfd 12v. 2/- each. £1.1.0 doz.
1,000 mfd 12v. 3/- each. £1.10.0 doz.
5,000 mfd 12v. 4/9 each. £2.8.0 doz.
10,000 mfd 6v. 5/9 each. £3.0.0 doz.
10,000 mfd 15v. 8/6 each. £4.10.0 doz.
15,000 mfd 10v. 10/6 each. £5.0.0 doz.
60,000 mfd 8v. 2/- each. £10.0.0 doz.
70,000 mfd 15v. 40/- each. £20.0.0 doz.

ELLIOT SEALED CONTACT REED RELAY

Three circuits closed by 3V or 100MA. 9/6 each.

3-CORE WATERPROOF FLEX

6A. 23/0076 circular PVC covered as fitted to electric drills and most portable appliances, ideal extension lead. Regular price 1/6 per yard, our price 79/6 for 100 yard coil. Post 6/6.

ELECTRONICS (CROYDON) LTD

Dept PW 266 London Road, Croydon CRO-2TH
Also 102/3 Tamworth Road, Croydon

MAINS UNITS for all types of TRANSISTOR EQUIPMENT

The ideal, economical and safe way of running Transistor Radios, Record Players, Tape Recorders, Amplifiers etc. from A.C. Mains. All units are completely isolated from mains by double wound transformer ensuring 100% safety.

PLUS-3

MAINS UNIT

Provides three separate switched output voltages 6v., 7 1/2v. and 9v. DC. attractive case with Indicator light, mains lead output socket, plug and lead.



57/6 P. & P. 2/6

(Extra lead with DIN plug for Cassette Recorders 7/6)

POWER PLUS

MAINS UNIT

for Cassette Tape Recorders using 7 1/2v. Complete with DIN plug for recorder power socket. Can also be supplied for a 6-volt output complete with suitable plug. (Please state make, model and voltage required.)



45/- P. & P. 2/6

Also available—Unit to run your Cassette Recorder from 12v. Car Battery 32/6. P. & P. 2/6.

MAINS UNIT FOR FI-CORD 202A TAPE RECORDER

£4.15.0

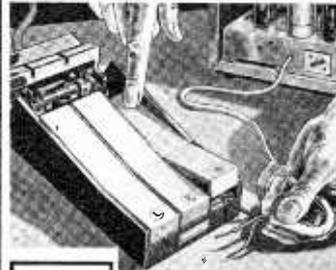
MAJOR POWER PLUS MAINS UNITS

For single outputs, 6v. 9v. 12v. 18v. 30/6. For two separate outputs, 4 1/2v & 4 1/2v, 6v & 6v., 9v & 9v. 42/6. P. & P. 2/6 per unit. (Please state outputs reqd.)

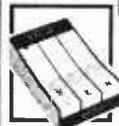


R.C.S. PRODUCTS (RADIO) LTD.
(Dept. P.W.), 31 Oliver Road, London, E.17

MAINS Keynector cuts out plugs
A REVOLUTIONARY PRODUCT



SAFEST & QUICKEST WAY TO CONNECT ELECTRICAL EQUIPMENT TO THE MAINS

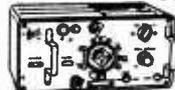


No plugs—no sockets—no risk of bare wires. To connect anything electrical, from an oscilloscope to an electric drill, simply open the fuse housing, depress the keys, insert the wires and close the housing. A neon light on the front of the Keynector glows to indicate proper connection. Multi-parallel connections can be made up to 13 amps. Keys are colour coded and lettered LEN for quick identification. The Keynector casing is in two-tone plastic and measures 5 x 3 x 1 1/2 in. Full details on request.

E. B. INSTRUMENTS

DIVISION OF ELECTRONIC BROKERS LTD.
49-53 PANCRAS ROAD, LONDON, N.W.1.
Telephone: 01-837 7781

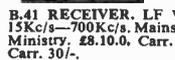
SURPLUS EX GOVT. BARGAINS



AMPLIFIER RF NO. 2
MK III. Increases output of 19 set to 25 watts. Brand New. 12v operation. 75/- Carr. 15/-.
No. 19 Set £4.5.0. Carr. 17/6. All Ancillary Equipment available. 12v D.C. Power Units 50/- Carr. 10/-.
12/24v D.C. Power Units with Vibrator MK II No. 2. 70/- Carr. 10/-.
H/MIC SETS. Used 15/-, New 22/6. P. & P. 5/-.
Mains P.S.U.'s for 19 TM/RC £6.15.0. Carr. 10/-.
R.F. Antenna Tuner (ATU) 25/-, P. & P. 5/-.



COLLINS TCS RECEIVER
7 valve Int. Octal Covers 1.5—12 Mc/s Tuneable R.F.A.F. BFO. Power required 240v D.C. 80 MA 12v 1.25A. £8.10.0. Carr. 15/-.



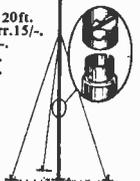
B.41 RECEIVER, LF Version of B.40. Coverage 15Kc/s—700Kc/s. Mains Operation. As received from Ministry. £8.10.0. Carr. 30/-, Tested, working £15, Carr. 30/-.



R.209 MK II COMMUNICATION RECEIVERS, 11 valve. Covers 1-20 Mc/s. 4 bands. AM/FM. CW. BFO. 12v DC. Internal Power Supply. Tested. £13.10.0. Carr. 15/-.

TELESCOPE MASTS, 20ft. Closes to 5ft. 9in. 70/- Carr. 15/-.

34ft. Derial 80/- Carr. 15/-.
35FT. AERIAL MASTS. Seven 2in. dia. sections. Interlock 8in. Complete with base, Nylon Guys. £12.10.0. Carr. 30/-.
TELEPHONE FIELD TELEPHONES. Communication up to 10 miles. Tested with batteries. £5.15.0 pair. Carr. 20/-.
LIVINGSTONE LAB TRANSISTOR AMPLIFIER. 50 watts R.M.S. Size 14 1/2 x 9 x 4in. With mains d.s.v. Size 16 x 9 1/2 x 6 1/2 in. 22 Gns., Carr. 20/-.



A.J. THOMPSON (Dept PW)

"Eiling Lodge," Codicote, Hitchin, Herts.
Phone: Codicote 242

C.W.O. Carriage charges apply to mainland only

VALUE ALL THE WAY

QUALITY-TESTED PAKS

6 Matched Trans. OC44/45/81/81D	10/-
20 Red Spot AF Trans. PNP	10/-
16 White Spot RF Trans. PNP	10/-
5 Silicon Rects. 3 A 100-400 PIV	10/-
2 10 A Silicon Rects. 100 PIV	10/-
2 OC1 140 Trans. NPN Switching	10/-
1 12 A SCR 100 V	10/-
3 Sil. Trans. 2S13 PNP	10/-
3 200 Mc/s Sil. Trans. NPN BSY26/27/10	10/-
3 Zener Diodes 1W 33V 5% Tol.	10/-
4 High Current Trans. OC42 Evt.	10/-
2 Power Transistors 1 OC26 1 OC35	10/-
5 Silicon Rects. 400 PIV 250mA	10/-
4 OC75 Transistors	10/-
1 Power Trans. OC20 100V	10/-
10 OA202 Sil. Diodes Sub-min.	10/-
2 Low Noise Trans. NPN 2N929/30	10/-
1 Sil. Trans. NPN VCB 100 ZT86	10/-
8 OA81 Diodes	10/-
4 OC72 Transistors	10/-
4 OC77 Transistors	10/-
4 Sil. Rects. 400 PIV 500mA	10/-
4 GET884 Trans. Evt. OC44	10/-
5 GET883 Trans. Evt. OC45	10/-
2 2N708 Sil. Trans. 300Mc/s NPN	10/-
3 GT31 LF Low Noise Germ. Trans.	10/-
6 IN914 Sil. Diodes 75 PIV 75mA	10/-
8 OA95 Germ. Diodes Sub-min. IN69	10/-
1 NPN Germ. Trans. NKT773 Evt.	10/-
3 OC22 Power Trans. Germ.	10/-
2 OC25 Power Trans. Germ.	10/-
4 AC128 Trans. PNP High Gain	10/-
4 AC127/128 Comp. pair PNP/NPN	10/-
3 2N1307 PNP Switching Trans.	10/-
7 CG62H Germ. Diodes Evt. OA71	10/-
3 AF116 Type Trans.	10/-
12 Assorted Germ. Diodes Marked	10/-
4 AC126 Germ. PNP Trans.	10/-
4 Silicon Rects. 100 PIV 750mA	10/-
3 AF117 Trans.	10/-
7 OC81 Type Trans.	10/-
3 OC71 Trans.	10/-
2 2N2926 Sil. Epoxy Trans.	10/-
7 OC71 Type Trans.	10/-
2 2S701 Sil. Trans. Texas	10/-
2 10 A 600 PIV Sil. Rects. 1S45R	10/-
3 BC108 Sil. NPN High Gain Trans.	10/-
1 2N910 NPN Sil. Trans. VCB 100	10/-
2 1000 PIV Sil. Rect. 1-5A R53310AF	10/-
3 BSY95A Sil. Trans. NPN 200Mc/s	10/-
3 OC200 Sil. Trans.	10/-
2 GET880 Low Noise Germ. Trans.	10/-
1 AF139 PNP High Freq. Trans.	10/-
3 NPN Trans. 1 ST141 & 2ST140	10/-
4 Madt's 2 MAT100 & 2MAT120	10/-
3 Madt's 2 MAT101 & MAT121	10/-
4 OC44 Germ. Trans. AF	10/-
3 AC127 NPN Germ. Trans.	10/-
1 2N3906 Sil. PNP Trans. Motorola	10/-
2 Sil. Power Rects. BYZ13	15/-
1 Sil. Power Trans. NPN 100Mc/s	15/-
TK201A	15/-
2 2N1132 PNP Epitaxial Planar Sil.	10/-
3 2N697 Epitaxial Planar Trans. Sil.	15/-
4 Germ. Power Trans. Evt. OC16	15/-
1 Unijunction Trans. 2N2646	15/-
2 Sil. Trans. 200Mc/s 60Vcb ZT83/84	15/-
2 Semitron ZIM Noise Diodes	15/-
2 2N2712 Sil. Epoxy Planar HFE225	15/-
8 BY100 Type Sil. Rects.	20/-
25 Sil. and Germ. Trans. Mixed, all marked. New	30/-

KING OF THE PAKS Unequalled Value and Quality

SUPER PAKS

NEW BI-PAK UNTESTED SEMICONDUCTORS

Satisfaction GUARANTEED in Every Pak, or money back.

Pak No.	
U1	120 Glass Sub-min. General Purpose Germanium Diodes 10/-
U2	60 Mixed Germanium Transistors AF/RF 10/-
U3	75 Germanium Gold Bonded Diodes sim. OA5, OA47 10/-
U4	40 Germanium Transistors like OC81, AC128 10/-
U5	60 200mA Sub-min. Sil. Diodes 10/-
U6	40 Silicon Planar Transistors NPN sim. BSY95A, 2N706 10/-
U7	16 Silicon Rectifiers Top-Hat 750mA up to 1,000V 10/-
U8	50 Sil. Planar Diodes 250mA OA/200/202 10/-
U9	20 Mixed Volts 1 watt Zener Diodes 10/-
U10	30 PNP Silicon Planar Transistors TO-5 sim. 2N1132 10/-
U11	30 PNP-NPN Sil. Transistors OC200 & 2S104 10/-
U12	150 Mixed Silicon and Germanium Diodes 10/-
U13	30 NPN Silicon Planar Transistors TO-5 sim. 2N697 10/-
U14	10 3-Amp Silicon Rectifiers Stud Type up to 1000 PIV 10/-
U15	30 Germanium PNP AF Transistors TO-5 like ACY17-22 10/-
U16	8 6-Amp Silicon Rectifiers BYZ13 Type up to 600 PIV 10/-
U17	30 Silicon NPN Transistors like BC108 10/-
U18	12 1.5 amp Silicon Rectifiers Top-Hat up to 1,000 PIV 10/-
U19	30 AF Germanium alloy Transistors 2G300 Ser. & OC71 10/-
U20	30 Madt's like MAT Series PNP Transistors 10/-
U21	20 Germanium 1-amp Rectifiers GJM up to 300 PIV 10/-
U22	25 300Mc/s NPN Silicon Transistors 2N708, BSY27 10/-
U23	30 Fast Switching Silicon Diodes like IN914 Micro-min. 10/-
U24	20 Experimenters' Assortment of Integrated Circuits, untested. Gates, Flip-Flops, Registers, etc. 8 Assorted Pieces 20/-
U25	10 1-amp SCR's TO-5 can up to 600 PIV CRS1/25-600 20/-
U26	30 Sil. Planar NPN Trans. low noise AMP 2N3707 10/-
U27	25 Zener diodes 400mW D07 case mixed Volts, 3-18 10/-
U28	15 Plastic case 1 amp Silicon Rectifiers IN4000 series 10/-
U29	30 Sil. PNP alloy trans. TO-5 BCY26, 2S302/4 10/-
U30	25 Sil. Planar trans. PNP TO-18 2N2906 10/-
U31	25 Sil. Planar NPN trans. TO-5 BFY 50/51/52 10/-
U32	30 Sil. alloy trans. SO-2 PNP, OC200 2S322 10/-
U33	20 Fast Switching Sil. Trans. NPN, 400 Mc/s 2N3011 10/-
U34	30 RF Germ. PNP Trans. 2N1303/5 TO-5 10/-
U35	10 Dual trans. 6 lead TO-5 2N2060 10/-
U36	30 RF Germ. trans. TO-1 OC45 NKT72 10/-
U37	10 VHF Germ. PNP Trans. TO-18 OC1 667 AF117 10/-

Code Nos. mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked.

NEW LOW PRICE TESTED S.C.R.'s.

TO-5	3 A	7 A	16 A	30 A
1-5	(TO-66)	(TO-48)	(TO-48)	
PIV	each	each	each	each
50	4/6	5/-	9/6	10/6
100	5/-	6/6	10/6	12/6
200	7/-	7/6	11/6	15/-
400	8/6	9/6	13/6	18/6
600	10/6	11/6	15/6	25/-
800	12/6	14/-	18/-	30/-

SIL. RECTS. TESTED

PIV 750mA	3A	10A	30A
50	1/-	2/9	4/3
100	1/3	3/3	4/6
200	1/9	4/4	4/9
300	2/3	4/6	6/6
400	2/6	5/6	7/6
500	3/-	6/-	8/6
600	3/3	6/9	9/3
800	3/6	7/6	11/-
1000	5/-	9/3	12/6
1200	6/6	11/6	15/-

TRIACS

V80M 2A	6A	10A
(TO-1) (TO-66)	(TO-8)	
100	14/-	15/-
200	17/6	20/-
400	20/-	25/-
V80M=Blocking voltage in either direction.		

LUCAS 35A SIL. RECTS.

Branded 400 PIV. Special Price, stud type, flying lead, 22/6 each.

SILICON HIGH VOLTAGE RECTIFIERS

10 Amp, 3KV (3000 PIV) Stud Type with Flying Leads. 16/- each

UNIUNJUNCTION

UT46.	Evt. 2N2646.
Evt.	TIS43. BEN3000
5/6 EACH	
25-99 5/-	100 UP 4/-

NPN SILICON PLANAR BC107/8/9, 2/- each, 1/10 100 up, 1/8 each, 1,000 off, 1/6 each. Fully tested and coded TO-18 case.

PNP Sil. Plastic Trans. Similar to 2N3702, untested but fully tested, 1/6 each, 25-99, 1/3 each, 100 up, 1/2 each.

INTEGRATED CIRCUITS

BI-PAK MONOLITHIC AMPLIFIERS (TO-5 8 lead)

BP709C. Operational amplifier, 15/- each.
 BP701C. Operational amplifier (with Zener output), 12/6 each.
 BP702C. Operational amplifier (with direct output), 12/6 each.
 BP501. Wide band amplifier, 18/- each.
 BP521C. Logarithmic wide band amp, 14/- each.
 BP20/C. General purpose amplifier, (TO-5 8lead). (voltage or current amp), 12/6 each.
 IC. Operational Amplifier with Zener output. Type 701C. Ideal for P.E. Projects. 8 lead TO-5 case. Full data.
 Our price 12/6 each 5 off 11/- each. Large Qty. Prices quoted for.

AMPLIFIER AS USED IN 'P.E.' PROJECTS



Identical encapsulation and pin configuration to the following: SL402-3, IC10 and IC403. Each circuit incorporates a pre-amplifier class A.B. Power amp stage capable of delivering up to 3 watts RMS. Fully tested and guaranteed. Supplied complete with circuit details and data. CODED BP1010 OUR LOWEST PRICE 30/- each. 10 up 25/- each.

OTHER MONOLITHIC DEVICES

BP424. Zero voltage switch, 8/6 each.
 This device is a monolithic IC that acts as combined threshold detector and trigger circuit for controlling a triac. It is designed to pulse the gate of a thyristor at the point of zero supply voltage, and therefore eliminates radio frequency interference when used with resistive loads.
 D13D1 Silicon Unilateral switch, 10/- each.

A Silicon Planar, monolithic integrated circuit having thyristor electrical characteristics, but with an anode gate and a built-in "Zener" diode between gate and cathode. Full data and application circuit available on request.
FAIRCHILD (U.S.A.) RTUL MICROLOGIC INTEGRATED CIRCUITS

Epoxy case T8-5 lead temp. range 15°C to 55°C.
 UL900. Buffer, 9/9 each.
 UL914. Dual two-input gate, 9/9 each.
 UL923 J-K-flip-flop, 13/- each.

Complete data and circuit diagrams from the Fairchild I.C.'s available in booklet form priced 1/6.

MULLARD I.C. AMPLIFIERS

TAA243. Operational amplifier, 70/- each.
 TAA263. Linear & F amplifier, 15/9 each.
 TAA 293. General purpose amplifier, 21/- ea.

CADMIUM CELLS

ORP12, 8/6
 ORP60, ORP61, 8/- each.

PHOTO TRANS.

OCPT1 Type, 8/6

ADI61 NPN

ADI62 PNP

MATCHED COMPLEMENTARY PAIRS OF GERM. POWER TRANSISTORS. For mains driven output stages of Amplifiers and Radio receivers.
 OUR LOWEST PRICE OF 12/6 PER PAIR.

HIGH POWER SILICON PLANAR TRANSISTORS TO-3
 TEXAS 25034 NPN VCB 100 1c4A FT. 15M/cs
 VCE100 Post. 40W
 VE88 hFE(min.) 60
 15/- each.

2N3055 IIS WATT SIL. POWER NPN. OUR PRICE 12/6 EACH.

FULL RANGE OF ZENER DIODES VOLTAGE RANGE 2-16V. 400mW (DO-7 Case) 2/6 ea. 1-5W (Top-Hat) 3/6 ea. 10W (SO-10 Stud) 5/- ea. All fully tested 5% tol. and marked. State voltage required.

BRAND NEW TEXAS GERM. TRANSISTORS Coded and Guaranteed.

Pak No.	EQVT
T1	8 2G371A OC71
T2	8 2G374A OC75
T3	8 2G374A OC81D
T4	8 2G381A OC81
T5	8 2G382T OC82
T6	8 2G344A OC44
T7	8 2G345A OC45
T8	8 2G378 OC78
T9	8 2G399A 2N1302
T10	8 2G417 AF117

All 10/- each pak
 2N2060 NPN SIL. DUAL TRANS. CODE D1699 TEXAS. Our price 5/- ea.

120VCB NIXIE DRIVER TRANSISTOR. Sim. BSX21 & C407. 2N1893 FULLY TESTED AND CODED ND120, 1-24, 3/6 each. TO-5 NPN 25 up 3/- each.

Sil. Trans. suitable for P.E. Organ. metal TO-18 Evt. ZK300 1/- each. Any Qty.

FREE One 10/- Pak of your own choice free with orders valued £4 or over

NPN DIFFUSED SILICON PHOTO-DUODIODE TYPE 1S701 (2N2175) or Tape Readout, high switching and measurement indicators, 50V, 25mW. OUR PRICE 10/- EACH. 50 OR OVER 8/6. EACH. FULL DETAILS.

FET'S

2N 3819	8/-
2N 3820	25/-
MPF105	8/-

LOW COST F.E.T.'s Fully Tested, Guaranteed Parameters equit. to 2N3819, MPF102, 2N5459, 1-24, 7/6 each; 25-99, 6/3 each; 100 up, 5/6 each. Coded FE19. Full data sent. TO-72 case.

BI-PAK MONOLITHIC CIRCUITS (10 lead TO-5)

BP305A. 6-input AND gate, 9/6 each.
 BP314A. 7-input NOR gate, 9/6 each.
 BP315A. Dual 3-input NOR gate, 9/6 each.
 BP316A. Dual 2-input NOR gate (expandable), 9/6 ea.
 BP320A. J-K-Binary element, 11/6 ea.
 BP32A. Du 3-input OR gate, 9/6 each.

GIRO No. 338-7006

BI-PAK



500, Chesham House,
 150 Regent Street,
 LONDON, W.1.

2 Amp POTTED BRIDGE RECTIFIERS
 200 V. 10/- | 600 V. 15/- | 800 V. 20/-

TRANSISTOR EQVT. & SPECIFICATION BOOK (German publication). A complete cross reference and equivalent book for European, American and Japanese Transistors. Exclusive to BI-PAK. 15/- ea.

PRINTED CIRCUITS EX-COMPUTER

Packed with semiconductors and components, 10 boards give a guaranteed 30 trans. and 30 diodes. Our price 10 boards 10/-, Plus 2/- p. & p.

PLEASE NOTE. To avoid any further increased Postal Charges to our Customers and enable us to keep our "By Return Postal service" which is second to none, we have re-organized and streamlined our Dispatch Order Department and we now request you to send all your orders together with your remittances direct to our Warehouse and Dispatch Department, postal address: BI-PAK SEMICONDUCTORS, Dispatch Dept., P.O. BOX 6, WARE, HERTS. Postage and packing still 1/- per order. Minimum order 10/-.

KING OF THE PAKS BI-PAK GUARANTEE SATISFACTION OR MONEY BACK

Head Office and Warehouse
44A WESTBOURNE GROVE
LONDON W2
Tel. PARK 5641/2/3

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail-Orders to the Head Office
When sending cash with order, please include 2/6 in £ for postage and handling
MINIMUM CHARGE 2/6. No C.O.D. orders accepted

Retail Shop
85 TOTTENHAM COURT ROAD
LONDON W1
Tel. LANGHAM 8403
Open all day Saturday

OA2	6/6	6AT6	5/-	6DQ6B	12/-	6Y6G	12/-
OA3	9/-	6AU4GT4	6/-	6DS4	15/-	6Z4	7/6
OB2	6/6	6AU5GT	9/-	6EA8	11/-	6B7	5/6
OB3	10/-	6AU5GT	9/-	6E17	7/-	9BW6	6/-
OC3	7/-	6AU6	22/6	6E17	7/-	10C2	8/6
OD3	6/6	6AU6	5/-	6E17	12/-	10D1	8/6
1B3GT	7/6	6AV5GT4	6/-	6F1	14/-	10D2	8/6
1L4	3/6	6AV5GT4	13/-	6F6G	5/-	10F1	10/-
1NSGT	6/6	6AV6	6/-	6F11	6/6	10F9	10/-
1Q5GT	10/-	6AW8A	11/-	6F12	4/6	10F18	8/6
1R4	6/6	6AX5GT	6/6	6F3	7/-	10I1	8/6
1R5	7/-	6AX5GT	6/6	6F14	12/-	10LD1	11/-
1R4	5/6	6BA6	4/6	6F15	11/-	10P13	11/-
1R5	5/6	6BE6	5/-	6F18	8/-	10P14	20/-
1T4	4/6	6BF5	16/-	6F22	6/6	12AB5	10/-
1U4	6/6	6BF6	9/-	6F23	15/6	12AC6	7/6
1U5	9/6	6BF6	12/-	6F24	13/6	20P4	20/-
1V2	9/6	6BH6	8/6	6F25	15/-	12AH7GT	7/6
1X2B	7/6	6BJ6	6/6	6F26	7/-	25C5	9/6
2CW4	12/-	6BK4	21/-	6F28	14/-	25LAGT	7/6
2D21	6/6	6BK7A	10/-	6F29	6/6	90C2	25/-
3A4	4/6	6BL7GT4	6/6	6F30	7/-	25Z6GT	12/-
3A5	18/6	6BL7GT4	12/-	6F31	7/6	30A5	8/6
3ARGT	10/-	6BL8	12/-	6F32	9/6	30AE3	8/6
3Q4	8/6	6BN4	13/-	6F35GT	6/6	30C1	6/6
3Q5GT	8/6	6BN5	8/6	6F36	12/-	30C15	15/-
3S4	7/-	6BN6	8/6	6K6GT	10/-	30C17	16/-
3V4	8/6	6BQ5	5/-	6K7	6/6	30C18	15/-
5R4GY	11/6	6BQ6GT8	13/-	6K8G	6/6	30F5	17/-
6U4G	6/6	6BQ6GT8	13/-	6K23	10/-	30FL1	15/-
5U4GB	7/6	6BQ7A	7/6	6L6GT	9/6	30FL12	16/6
5V4G	8/6	6BR7	17/-	6L7	6/6	30FL13	10/-
5Y3GT	6/6	6BR8	13/-	6L8	6/6	30FL14	15/6
5Z3	9/6	6BS7	26/-	6L18	6/6	30L1	7/6
5Z4G	7/6	6BW6	16/-	6LD20	6/6	30L15	17/6
5Z4GT	8/6	6BW7	13/6	6N7GT	7/6	30L17	17/6
630L2	15/-	6BX6	5/-	6P1	12/-	30P12	16/6
6A8G	6/6	6C26	6/6	6P28	12/6	30P19	15/-
6A8A	6/6	6C4	6/-	6Q7	7/6	30R11	15/6
6AC7	4/6	6C3GT	7/6	6R7G	7/6	30P13	17/6
6AF4A	9/6	6C4	17/3	6S2	8/-	30P14	17/6
6AG7	7/6	6CA4	8/6	6S4	11/-	30P14	17/6
6AH6	10/-	6CA7	10/6	6S7	6/6	35A3	10/-
6AJ8	5/6	6CB6	5/6	6S7	7/6	35B5	13/6
6AK5	6/6	6CD6GA	6/6	6SK7	6/6	35C5	7/6
6AK6	11/6	6CD6GA	6/6	6SL7GT	6/6	35D5	13/6
6AL3	6/6	6CG7	23/-	6SN7GT	6/6	35L6GT	9/6
6AL5	3/6	6CH6	11/-	6S07	8/6	35W4	5/6
6AM5	5/6	6CL6	10/6	6SR7	7/6	35Z3	11/6
6AM6	4/6	6CU6	13/6	6T8	6/6	35Z4G	5/6
6A05	6/6	6AW4	12/6	6U4GT	12/6	35Z5GT	7/6
6A06	10/-	6CV5	8/-	6U8	7/6	50A5	13/6
6A8	6/6	6C7	12/-	6V6GT	6/6	50B5	7/6
6A8E	6/6	6D3	6/6	6X4	5/-	50C5	7/6
6A55	7/6	6DC6	13/6	6XS2GT	5/6	60C6GT	8/6
6A57G	16/6	6DK6	8/6	6X8	11/6	20L1	20/-

First Quality Fully Guaranteed



ELECTRONIC VALVES

20P1	10/-	83A1	14/-	DL95	8/-	ECF804	30/-
20P3	12/-	85A1	25/-	DL96	7/9	ECF842	13/-
20P4	20/-	85A2	7/6	DM70	6/6	ECM81	5/6
20P6	20/-	90AG	48/-	DY70	12/-	ECM83	8/6
25C5	9/6	90A6	48/-	DY87	12/-	ECM84	9/6
25LAGT	7/6	90C2	25/-	DY87	12/-	ECL80	9/6
25Z6GT	12/-	90C9	25/-	EY802	10/-	ECL81	8/6
30A5	8/6	807	9/6	E55L	55/-	ECL82	6/6
30AE3	8/6	811A	30/-	E130L	90/-	ECL83	12/6
30C1	6/6	812A	65/-	E180F	19/-	ECL84	11/-
30C15	15/-	866A	14/-	E280F	42/-	ECL85	10/6
30C17	16/-	6080	27/6	EABCO	6/6	ECL86	8/6
30C18	15/-	6146	30/-	EAF42	10/-	ECL87	8/6
30F5	17/-	6146B	47/6	EAF80	9/6	EF39	8/6
30FL1	15/-	6267	6/6	EBC33	9/6	EF40	10/-
30FL12	16/6	6360	25/-	EBC41	10/6	EF41	12/6
30FL13	10/-	6939	42/-	EBC80	5/6	EF42	14/-
30FL14	15/6	7199	15/-	EBC90	5/6	EF55	13/-
30L1	7/6	7360	36/-	EBC91	6/6	EF80	5/6
30L15	17/6	7586	25/-	EBF80	8/6	EF81	10/-
30L17	17/6	9002	6/6	EBF83	8/6	EF85	7/6
30P18	7/6	9003	12/6	EBF89	6/6	EF86	6/6
30P19	15/-	AZ30	10/-	EEL31	25/-	EF89	5/6
30R11	15/6	CB11	16/-	EC34	8/6	EF91	4/6
30P13	17/6	CB31	17/6	EC86	5/6	EF92	7/6
30P14	17/6	CL33	17/6	EC88	12/-	EF93	4/6
35A3	10/-	CY31	7/6	EC90	6/6	EF94	5/6
35B5	13/6	DAF41	11/-	EC92	6/6	EF95	6/6
35C5	7/6	DAF92	9/6	EC93	9/6	EF96	4/6
35D5	13/6	DAF96	7/6	EC94	8/6	EF97	10/-
35L6GT	9/6	DC90	9/6	EC95	11/-	EF183	6/6
35W4	5/6	DF96	7/6	EC82	6/6	EF184	7/6
35Z3	11/6	DK40	10/-	EC83	6/6	EF800	20/-
35Z4G	5/6	DK91	9/6	EC84	6/6	EF804	20/-
35Z5GT	7/6	DK92	9/6	EC85	5/6	EF811	25/-
50A5	13/6	DK96	8/6	EC86	9/6	EF812	15/6
50B5	7/6	DLY1	5/6	EC87	11/6	EF814	13/6
50C5	7/6	DL92	7/6	EC88	9/6	EK90	9/6
60C6GT	8/6	DL93	4/6	EC89	7/6	EL34	10/6
20L1	20/-	DL94	8/6	EC90	7/6	EL36	9/6
				EC F82	15/-	EL38	27/6
				EC F83	15/-	EL41	11/-
				EC F86	12/6	EL42	11/6

EL81	10/-	N78	21/-	PL500	15/-	U403	10/-
EL83	8/3	PABCO	8/6	PL504	16/6	U404	7/6
EL84	5/6	PC86	11/6	PL508	17/6	U801	20/-
EL85	8/6	PC88	13/-	PL509	30/-	UABC80	6/6
EL86	8/6	PC97	8/6	PV33	12/6	UAF41	10/-
EL89	6/6	PC900	9/6	PL802	14/-	UAF42	10/6
EL91	5/6	PCC84	7/6	PL801	11/-	UB41	11/-
EL95	7/6	PCC85	8/6	PL802	11/-	UBC41	9/6
EL360	23/-	PCC88	12/-	PX4	30/-	UBC81	7/6
EL803	17/-	PCC89	10/6	PX25	30/-	UBF80	8/3
EL821	11/-	PCC189	11/-	PV31	5/6	UBF89	7/6
EL822	10/-	PCC805	17/-	PV32	11/6	UBL1	10/-
EL806	15/-	PCC806	17/-	PV33	12/6	UBL21	12/-
EM34	16/-	PCC800	15/-	PY80	6/6	UC92	6/6
EM71	12/6	PCF80	6/6	PY81	6/6	UC85	8/6
EM80	8/6	PCF82	6/6	PY82	6/6	UC80	10/6
EM81	8/6	PCF84	9/6	PY83	7/6	UCH21	11/-
EM84	7/6	PCF87	10/-	PY88	8/6	UCH42	13/-
EM87	11/-	PCF800	15/-	PY900	20/-	UCH43	12/-
EN91	6/6	PCF801	10/-	PY800	10/-	UCH81	6/6
EY80	9/6	PCF802	10/-	PY801	10/-	UCL11	11/-
EY80	9/6	PCF805	15/-	PZ30	7/6	UCL82	7/6
EY81	8/6	PCF806	13/6	QQV02	6/6	UCL83	12/-
EY83	11/6	PCF808	15/6	UF9	11/6	UF9	11/6
EY84	10/6	PCF200	14/-	QQV03	10/6	UF11	10/-
EY86	8/6	PCL81	19/-	PV33	25/-	UF41	10/6
EY87	8/6	PCL82	20/-	QQV03	20/-	UF42	12/6
EY88	8/6	PCL83	13/6	UF43	10/6	UF43	11/6
EZ35	5/6	PCL84	8/6	QQV06	40/6	UF80	7/6
EZ40	9/6	PCL85	9/6	UF85	8/6	UF85	8/6
EZ41	9/6	PCL86	9/6	UF89	7/6	UF89	7/6
EZ80	5/6	PCL88	17/6	UL41	12/6	UL41	12/6
EZ81	5/6	PCL800	18/-	SP41	7/6	UL84	6/6
EZ90	5/6	PCL801	15/6	SP42	12/6	UM4	8/6
FW4500136	6/6	PD500	30/-	SP61	7/6	UM84	4/6
G547X	55/-	SU2150A	15/-	UY1N	10/-	UY1N	10/-
GY501	16/6	PEN36C	13/6	UY11	11/6	UY11	11/6
GZ30	7/6	PEN45	7/6	TT21	48/-	UY21	11/6
GZ31	6/6	PEN45DD	7/6	TT22	50/-	UY41	8/6
GZ32	9/6	U17	10/6	UY82	10/6	UY82	10/6
GZ33	16/6	PEN46	7/6	UH20	13/6	UY85	6/6
GZ34	11/6	PEN383	10/-	U20	13/6	VP23	6/6
HABCO	8/6	PEN384	8/6	U25	15/6	YP41	7/6
HBC90	5/6	PEN45DD	7/6	U26	15/6	YP133	10/6
HBC91	6/6	U31	9/6	U31	9/6	VR750	9/6
HFP93	6/6	PEN44	8/6	U37	30/-	VR105	30/6
HF94	5/6	PF86	11/6	U30	6/6	VR150	30/6
HK90	6/6	PF818	17/6	U32	6/6	VU33	6/6
HZ32	7/6	PL7200	14/6	U36	5/6	VU39A	10/6
HL94	8/6	PL33	7/6	U78	5/6	U111	10/6
KT66	27/6	PL36	11/6	U81	13/6	U120	15/6
KT88	33/-	PL81	9/6	U191	15/6	U133	10/6
MPSENT	10/-	PL82	9/6	U201	7/6	W729	12/6
MU12/14	10/-	PL83	8/6	U281	8/6	Z309	10/6
		PL84	7/6	U282	8/6	Z329	17/6
		PL302	15/6	U301	11/6	Z803U	17/6

INTEGRATED CIRCUIT AMPLIFIERS

CA3005 RF Amplifier with 100mc/s bandwidth. Max. dissipation 26mW. For use as RF amplifier, balanced mixer, product detector or self-oscillating mixer 27/-

CA3012 wide Band Amplifier (up to 20mc/s), suitable as IF amplifier for VHF/FM receivers 22/-

CA3020 General Purpose Audio Amplifier of 550mW output 30/-

CA3036 Buffer amplifier consisting of two 'super-alpha' pair of transistors suitable for stereo pick-up systems 19/-

The above four I.C.'s are in TO5 encapsulation.

PA222 Audio Amplifier providing a max. output of 1.2 watts 65/-

PA234 Audio Amplifier providing a max. output of 1 watt 27/6

PA237 2 watts Audio Amplifier 40/-

The above three I.C.'s are in epoxy moulded double four-line package.

MC1709CG General Purpose operational amplifier in TO-99 case 40/-

TAA263 3-stage direct coupled amplifier for use from DC to 600kc/s; 70mW dissipation. Output 10mW into 150Ω load 15/-

TAA293 3-stage amplifier with connection brought out to the individual leads. Bandwidth 600kc/s. 160mW dissipation. Output 10mW into 150Ω load 20/-

TAA320 MOST input stage followed by a bi-polar transistor stage. 200mW dissipation 13/-

TAD100 Integrated AM receiver circuit containing all active components, except output stage, required to build a complete receiver 45/-

SL403A 3 watts Audio Amplifier into 7.5Ω Loudspeaker. Operating voltage 18V. Overvoltage protection 49/6

Data sheets are available for all the above I.C.'s.

OUR NEW CATALOGUE 1969/1970 IS NOW READY. IT INCLUDES PRICES OF SOME 4,000 TYPES OF VALVES AND TUBES AND SEMICONDUCTORS. ESSENTIAL CHARACTERISTICS OF KLYSTRONS, MAGNETRONS, CATHODE RAY TUBES AND SEMICONDUCTORS ARE GIVEN. THIS IS A REAL REFERENCE BOOKLET AND IS AVAILABLE FREE OF CHARGE. PLEASE ENCLOSE QUARTO S.A.E.

SEMICONDUCTORS FOR PRACTICAL WIRELESS "BEGINNER PORTABLE RECEIVER".
3 off AF17, 1 off AC113, 1 off AC15

VALUABLE NEW HANDBOOK FREE TO AMBITIOUS ENGINEERS

Have you had your copy of "Engineering Opportunities"?

The new edition of "ENGINEERING OPPORTUNITIES" is now available—without charge—to all who are anxious for a worthwhile post in Engineering. Frank, informative and completely up to date, the new "ENGINEERING OPPORTUNITIES" should be in the hands of every person engaged in any branch of the Engineering industry, irrespective of age, experience or training.

On 'SATISFACTION or
REFUND of FEE' terms

This remarkable book gives details of examinations and courses in every branch of Engineering, Building, etc., outlines the openings available and describes our Special Appointments Department.

WHICH OF THESE IS
YOUR PET SUBJECT?

RADIO ENGINEERING
Advanced Radio — Gen. Radio — Radio & TV Servicing — TV Eng. — Telecommunications — Sound Recording — Automation — Practical Radio — Radio Amateurs' Exam.

ELECTRICAL ENG.
Advanced Electrical Eng. — Gen. Electrical Eng. — Installations — Draughtsmanship — Illuminating Eng. — Refrigeration — Elem. Electrical Science — Electrical Supply — Mining Elec. Engineering.

CIVIL ENGINEERING
Advanced Civil Eng. — Gen. Civil Eng. — Municipal Eng. — Structural Eng. — Sanitary Eng. — Road Eng. — Hydraulics — Mining — Water Supply — Petrol Tech.

ELECTRONIC ENG.
Advanced Electronic Eng. — Gen. Electronic Eng. — Applied Electronics — Prac. Electronics — Radar Tech. — Frequency Modulation — Transistors.

MECHANICAL ENG.
Advanced Mechanical Eng. — Gen. Mechanical Eng. — Maintenance Eng. — Diesel Eng. — Press Tool Design — Sheet Metal Work — Welding — Eng. Pattern Making — Inspection — Draughtsmanship — Metallurgy — Production Eng.

AUTOMOBILE ENG.
Advanced Automobile Eng. — Gen. Automobile Eng. — Automobile Maintenance — Repair — Automobile Diesel Maintenance — Automobile Elec. Equipment — Garage Management.

WE HAVE A WIDE RANGE OF COURSES IN OTHER SUBJECTS INCLUDING CHEMICAL ENG., AERO ENG., MANAGEMENT, INSTRUMENT TECHNOLOGY, WORKS STUDY, MATHEMATICS, ETC.

Which qualification would increase your earning power?
B.Sc. (Eng.), A.M.S.E., C.Eng., A.M.I.E.R.E., R.T.E.B., A.M.I.P.E., A.M.I.M.I., A.R.I.B.A., A.I.O.B., P.M.G., A.R.I.C.S.E., M.R.S.H., A.M.I.E.D., A.M.I.Mun.E., CITY & GUILDS, GEN. CERT. OF EDUCATION, ETC.

British Institute of Engineering Technology
453A ALDERMASTON COURT, ALDERMASTON, BERKSHIRE

THIS BOOK TELLS YOU

- ★ HOW to get a better paid, more interesting job.
- ★ HOW to qualify for rapid promotion.
- ★ HOW to put some letters after your name and become a key man . . . quickly and easily.
- ★ HOW to benefit from our free Advisory and Appointment Depts.
- ★ HOW you can take advantage of the chances you are now missing.
- ★ HOW, irrespective of your age, education or experience, YOU can succeed in any branch of Engineering.

164 PAGES OF EXPERT
CAREER - GUIDANCE

PRACTICAL
EQUIPMENT

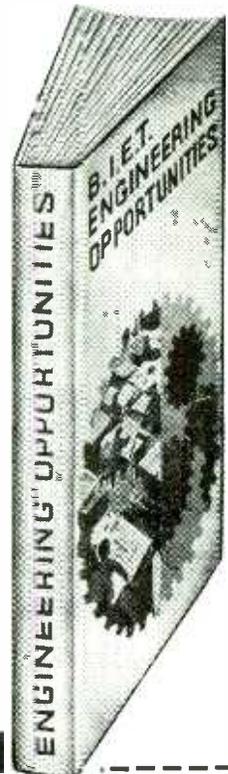
INCLUDING
TOOLS

Basic Practical and Theoretical Course for beginners in Radio, T.V., Electronics, Etc. A.M.I.E.R.E. City & Guilds Radio Amateurs' Exam. R.T.E.B. Certificate P.M.G. Certificate Practical Radio Radio & Television Servicing Practical Electronics Electronics Engineering Automation

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

B.I.E.T.

You are bound to benefit from reading "ENGINEERING OPPORTUNITIES", and you should send for your copy now—FREE and without obligation.



POST NOW!

TO B.I.E.T., 453A, ALDERMASTON COURT,
ALDERMASTON, BERKSHIRE.

Please send me a FREE copy of "ENGINEERING OPPORTUNITIES." I am interested in (state subject, exam., or career).

NAME

ADDRESS

WRITE IF YOU PREFER NOT TO CUT THIS PAGE

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

HENRY'S RADIO LTD.

ENGLAND'S LEADING COMPONENT AND EQUIPMENT CENTRES

TO BUILD YOURSELF

- * PW Stereo Decoder (Reprint 45A 1/6d). £5 15 0 pp. 3/6
OR with optional power supply £7 7 0
- * PE Spring Line Reverberation Unit (Reprint 46A 1/6d). £11 5 0 pp. 6/6
- * Repaco 15 watt Inverter Kit £3 7 6 pp. 5/-
- * Repaco 40 watt Inverter Kit £4 17 6 pp. 7/-
- * Tiny Tone Radio Control Receiver (Reprint 18A 1/6d). £2 15 0 pp. 3/-
- * Henry's MW/LW Tuner (Brochure No. 5 FREE) £3 19 6 pp. 3/6
- * PW Switched FM (Reprint 1/-). £3 17 6 pp. 3/6

MOST PARTS IN STOCK FOR PRACTICAL WIRELESS AND ELECTRONICS PUBLISHED CIRCUITS. ALL INTEGRATED CIRCUITS IN STOCK—LEAFLET 36A OR LATEST CATALOGUE FOR COMPLETE LIST.

HENRY'S RADIO Fully Illustrated CATALOGUES

- A** ALL TYPES OF ELECTRONIC COMPONENTS
TEST EQUIPMENT
KITS
BUILT UNITS
- B** HIGH FIDELITY & GENERAL AUDIO EQUIPMENT CATALOGUE



COMPREHENSIVE CLEAR CONCISE CATALOGUES

A. Over 300 pages fully detailed and illustrated with more than 6,000 stock items. Everything for amateur and professional use. Complete with 5 vouchers: 10/- value, for use with purchases.

ORDER AS CATALOGUE A PRICE 7/6 pp.2/-
B. New audio and high fidelity catalogue. 120 pages containing ideas and equipment for every application. Special low prices for all leading makes. Plus 12/6 extra discount voucher. Over 40 recommended Stereo Systems.

WHY NOT SEND AWAY TODAY!

ORDER AS CATALOGUE B PRICE 5/- pp.1/-
CONTINUALLY IMPROVED AND REVISED

INTEGRATED CIRCUITS



BP1010	3 watt Amp	25/-	SL702C	Amplifier	29/6
MC1304	Stereo Decoder	55/-	μL900	Buffer	10/-
TAD100	AM Radio	47/6	7L914	4in. Gate	11/-
PA237	2 watt Amp	37/6	μ910	Amplifier	10/-
PA234	1 watt Amp	20/-	1C10	AM/FM Radio	59/6
PA230	Preamp	22/6	CA3028	Osc/Mixer	24/6
MC1303	Stereo Preamp	52/6	CA3036	Dual Dar	18/6
LA709C	Amp	22/6	CA3020	Amplifier	27/6
SL403	3 watt Amp	49/6	CA3018	Array	22/6
TAA263	Amp	15/-	CA3014	FM	29/6

TRANSISTORS: Type 1404 for LF Communication with Circuit £5 18 0 pair
Complete List and Details of all Integrated Circuits No.36A Free on request

BUILD A QUALITY 4 TRACK TAPE RECORDER



To get the best out of your MAGNAVOX DECK, you need a MARTIN RECORDAKIT. This comprises a special high quality 6 valve amplifier and pre-amplifier which comes to you assembled on its printed circuit board—in fact everything for making a superb tape Recorder. You need no experience or technical skill to bring this about. THE INSTRUCTIONS MANUAL MAKES BUILDING EASY, AND SUCCESS IS ASSURED. Kit comprises Deck, Amplifier, Cabinet and speaker, with microphone, 7in. 1200ft tape, and spare spool. ASK FOR BROCHURE 6. TODAY'S VALUE £60. PRICE 39 gns pp. 22/6. NOTHING ELSE TO BUY.

GARRARD DECKS

- * SP25 mk. II L/C £11 19 6
- * SP25 mk. II 9TAH/C £14 5 0
- * SP25 mk. II Mag. Cart. £16 0 0
- * 2025TC 9TAH/C £8 19 6
- * 3000LM 9TAH/C £9 19 6
- * AT60 mk. II L/C £13 10 0
- * AT60 mk. II 9TAH/C £15 15 0
- * AT60 mk. II Mag. Cart. £17 10 0
- † AP75 L/C £17 17 0
- † AP75 AT21 Cart. £25 12 6
- † SL75 L/C £29 0 0
- † SL75 AT21 £36 11 6



(Carriage etc. 7/6)

† Plinth/Cover 95/- pp. 5/- Deluxe £8 10 0 pp. 5/-
Deluxe £8 10 0 pp. 5/- COMPLETE LIST 16/17 ON REQUEST WITH SPECIAL
LOW PRICES WITH CHOICE OF CARTRIDGE.

BUILD THIS VHF FM TUNER

5 MULLARD TRANSISTORS 300 kc/s BANDWIDTH. PRINTED CIRCUIT. HIGH FIDELITY REPRODUCTION. MONO & STEREO. A popular VHF FM Tuner for quality and reception of mono and stereo. There is no doubt about it—VHF FM gives the REAL sound. All parts sold separately. PARTS TOTAL COST £6 19 6 DECODER £5 19 6 ASK FOR BROCHURE No. 3 (FOR STEREO)



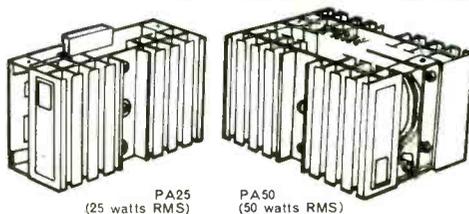
HENELEC 5-5 STEREO AMPLIFIER

Excellent low priced British designed Stereo Amplifier for use with Record Decks, Tuners. T6 transistor mains operated. Output 5+5 watts for 8-15 ohm speakers. Black, silver and wood finish, size 13in x 3in x 6in. PRICE £13 10 0 pp. 7 6 (Leaflet on request). Complete Stereo System 5-5. Garrard 2025 TC stereo, 5-5 Amplifier, Plinth/Cover. Two 10 watt speakers with tweeters in polished cabinets. Size 18" x 11" x 7" Usual price £49 10 0. OUR PRICE £39 10 0 pp. 20/- ASK FOR BROCHURE 13



HENRY'S STOCK EVERY TYPE OF COMPONENT YOU NEED — A CATALOGUE IS A MUST!

NEW FOR 1970



PA25 (25 watts RMS)

PA50 (50 watts RMS)

SILICON POWER AMPLIFIERS WITH DIRECT COUPLED, SYMMETRICAL OUTPUT

* HENELEC 'PA25' POWER AMPLIFIER

This silicon design from Henry's Radio uses complementary transistors in the symmetrical output stage direct coupled to a loudspeaker of 8 ohms impedance or higher. Power output is 25 watts RMS with an 8 ohms load, or 12 watts for 15 ohms, over a frequency range of 15Hz-25kHz 3db. Cool running is assured by the use of generously dimensioned black anodised heatsinks. Price £7 10 0

* HENELEC 'PA50' POWER AMPLIFIER

Basically similar to the 'PA25' the 'PA50' will deliver 50 watts RMS to a 3-4 ohm load. Extra power is handled by complementary triplet circuits using the latest PNP and NPN silicon power transistors. As a result of extra heatsinking the 'PA50' runs as cool as the 'PA25'. Price £9 10 0

* HENELEC MU42 POWER SUPPLY

Designed to run one or two 'PA25's' or one 'PA50' the MU42 connects to the amplifiers by means of plug-on harnesses. No soldering is required to connect up the system. Audio input plug and speaker plug go to the panel of the MU42. Price £6 0 0

* SEND FOR FREE BROCHURES

AMPLIFIERS IN STOCK

- * 1 watt Mullard £2 5 0
 - * PA7 7 watt £3 12 6
 - * MP A12/3 12 watt £4 10 0
 - * MP A12/15 12 watt £5 5 0
 - * MP A25 25 watt £7 10 0
 - * MA7 7 watt Amp/Preamp £8 10 0
 - * MA66 Stereo Amp/Preamp
 - * PA25 25 watt £7 10 0
 - * PA50 50 watt £9 10 0
 - * 100 watt PA £49 10 0
 - * Z30 Sinclair £24 9 6
 - * Stereo 60 £29 19 6
 - * PZ5 £4 19 6
- * Leaflets available on request.

AUDIO EQUIPMENT

Mono or Stereo Audio equipment developed from Dinsdale Mk. II—each unit or system will compare favourably with other professional equipment selling at much higher prices. COMPLETE SYSTEMS AND MIXERS (all units available separately). THE FINEST VALUE IN LOW COST HIGH FIDELITY — CHOOSE A SYSTEM TO SUIT YOUR NEEDS AND SAVE YOURSELF POUNDS 7, 12 and 25 WATT AMPLIFIERS, STEREO AND MONO PREAMPLIFIERS AND MODULES. * SEND FOR BROCHURES No. 12/14 and 21 TODAY!



HENRY'S RADIO LTD.

Mail Order Dept. Electronic Components and Equipment, and Electronic Organ Dept.
303 EDGWARE ROAD, LONDON W2.
Telephone: 01-723 1008/9
Open Mon-Sat, 9am-6pm, Thurs, 9am-1pm

High Fidelity and Audio Centre
309 EDGWARE ROAD, LONDON W2.
Telephone: 01-723 6963
Open all day Saturday