

PRACTICAL WIRELESS

NOVEMBER
1969

310

**SPECIAL INSIDE
AUDIO FAIR
SUPPLEMENT**



**BUILD THIS
PEDAL STEEL
GUITAR**



THE RELIABLE SOLDERING INSTRUMENT!



SEND COUPON FOR LATEST LEAFLET

ADCOLA PRODUCTS LTD
ADCOLA HOUSE
GAUDEN ROAD
LONDON SW4

NAME _____
ADDRESS _____

PW175

SEMICONDUCTORS

BRAND NEW AND FULLY GUARANTEED

1N914 1/6	2N2904 9/-	ACY18 5/-	BD124 12/-	MJ491 20/6
1N916 1/6	2N2904A 9/-	ACY19 5/-	BF115 4/6	MPF102 8/6
1N910 3/-	2N2905 8/-	ACY20 4/-	BF117 10/6	MPF103 7/6
1N920 3/6	2N2905A 8/-	ACY21 5/-	BF167 6/6	MPF104 7/6
1N921 4/-	2N2906 8/-	ACY22 4/-	BF173 7/6	MPF105 8/-
1N925 5/-	2N2906A 8/-	ACY28 4/-	BF180 9/-	NKT0013 8/6
1N113 3/-	2N2907 8/-	AD140 8/-	BF181 8/6	NKT216 10/6
1N120 2/6	2N2907A 8/-	AD149 8/-	BF184 7/6	NKT217 8/6
1N121 2/6	2N2923 5/-	AD161 7/6	BF194 6/6	NKT281 4/6
1N130 2/6	2N2924 5/-	AD162 7/6	BFX12 5/6	NKT282 4/6
1N131 2/6	2N2925 5/6	AF114 5/-	BFX13 5/6	NKT264 4/6
1N132 2/6	2N2926 5/6	AF116 5/-	BFX29 12/6	NKT271 4/6
1N144 2/-	2N2927 5/6	AF117 5/-	BFX30 8/6	NKT272 4/6
2G301 4/-	2N2928 5/6	AF118 12/6	BFX35 19/6	NKT274 4/6
2G302 4/-	2N2929 5/6	AF124 5/-	BFX43 8/6	NKT275 4/6
2G303 4/-	2N3011 5/-	AF127 5/-	BFX44 8/6	NKT281 5/6
2G371 3/-	2N3053 6/6	AF139 7/6	BFX84 8/-	NKT403 15/-
2N696 5/-	2N3054 12/6	AF181 8/6	BFX85 10/-	NKT404 12/6
2N697 5/-	2N3055 19/6	AF186 11/-	BFX86 8/-	NKT405 15/-
2N698 4/6	2N3702 4/6	AF239 7/6	BFX87 10/-	NKT613 8/6
2N706 2/6	2N3703 4/6	AF212 5/6	BFX88 5/-	NKT674 5/6
2N706A 2/6	2N3704 5/6	ASV26 5/6	BFY10 4/6	NKT677 5/6
2N708 4/-	2N3705 4/6	ASV27 8/6	BFY11 4/6	NKT713 5/6
2N929 5/6	2N3706 4/6	ASV28 5/6	BFY17 4/6	NKT773 5/6
2N930 0/6	2N3707 4/-	ASV29 4/6	BFY18 4/6	NKT781 6/-
2N1090 0/6	2N3708 4/-	ASZ20 7/6	BFY19 4/6	NKT20329 8/6
2N1091 0/6	2N3709 4/-	ASZ21 4/6	BFY41 10/-	NKT8011 15/6
2N1131 0/6	2N3710 4/6	BA113 2/6	BFY43 13/6	NKT8012 19/6
2N1132 0/6	2N3711 4/-	BAX16 2/6	BFY50 4/6	NKT8013 22/6
2N1302 4/6	2N3819 0/-	BAY31 1/6	BFY51 4/6	OA5 2/6
2N1303 4/6	2N3820 23/6	BAY38 3/6	BFY52 4/6	OA9 2/-
2N1304 5/6	2N3823 17/6	BC107 3/6	BFY76 9/6	OA70 1/6
2N1305 5/6	2N4058 5/-	BC108 3/6	BFY90 12/6	OA73 2/-
2N1306 6/6	2N4059 5/-	BC109 3/6	BSX19 5/6	OA79 1/6
2N1307 6/6	2N4060 5/-	BC113 6/6	BSX20 5/6	OA81 1/6
2N1308 8/-	2N4061 5/-	BC116 12/6	BSX21 8/-	OA85 1/6
2N1309 8/-	2N4062 6/6	BC118 6/6	BSX22 10/6	OA90 1/6
2N1307 8/-	2N4234 9/6	BC125 13/6	BSX27 10/6	OA95 1/6
2N1613 6/6	2N4255 8/6	BC147 5/-	BSX28 6/-	OA200 2/-
2N1711 6/6	2N4284 3/6	BC148 4/6	BSX29 10/6	OA202 2/-
2N1889 8/-	2N4285 3/6	BC149 5/-	BSX26 4/-	OC26 6/6
2N1893 8/-	2N4286 3/6	BC167 3/6	BSY26 4/-	OC28 6/6
2N2102 13/6	2N4287 3/6	BC168 3/6	BSY27 4/-	OC35 6/6
2N2147 17/6	2N4288 3/6	BC169 3/6	BSY28 4/-	OC36 6/6
2N2148 12/6	2N4289 5/-	BC212L 5/-	BSY29 4/6	OC44 3/-
2N2160 14/6	2N4291 3/6	BCY30 7/6	BSY38 4/6	OC45 2/6
2N2193 5/6	2N4292 3/6	BCY31 4/6	BSY39 4/6	OC71 2/6
2N2193A 5/6	2N40361 12/6	BCY32 5/6	BSY40 5/6	OC72 2/6
2N2194A 5/6	2N40362 14/6	BCY33 5/6	BSY51 10/6	OC75 4/6
2N2217 6/-	2N4293 5/-	BCY34 4/6	BSY52 6/6	OC81 4/6
2N2218 8/-	3N128 18/6	BCY38 5/6	BSY53 9/-	OC83 4/6
2N2219 6/-	AAZ13 2/-	BCY39 6/6	BSY54 6/-	OC81D 3/-
2N2220 5/-	AAZ15 2/6	BCY40 7/6	BSY95A 3/6	OC139 6/6
2N2221 5/-	AAZ17 2/6	BCY42 5/-	BY100 4/6	OC140 6/6
2N2222 5/-	AC107 8/6	BCY43 6/6	BYX10 5/6	OC200 5/6
2N2368 6/6	AC126 4/-	BCY54 7/6	BYZ10 9/6	OC201 5/6
2N2369 7/6	AC127 3/-	BCY54 7/6	BYZ11 7/6	
2N2369A 5/-	AC128 4/-	BCY70 5/6	BYZ12 6/-	
2N2539 4/6	AC176 6/-	BCY71 9/6	BYZ13 5/-	
2N2540 4/6	AC187 12/-	BCY72 5/-	MJ480 20/6	
2N2645 11/6	AC188 12/-	BD12 3/6	MJ481 27/6	
2N2696 6/6	ACY17 5/-	BD121 19/-	MJ490 22/6	

MULLARD INTEGRATED CIRCUITS

FCH211 Hexuple DTL Inverter Gate	28/6
FCH221 Triple 3 Input DTL Line	28/6
FCJ101 3 Input JK Flip Flop	35/-
TAA241 Operational Amplifier	47/6
TAA243 Operational Amplifier	47/6
TAA 263 Linear AF Amplifier	18/6
TAA320 Most LF Preamp	15/6

SPEAKERS (3 ohm)

10" x 6" 37/6,	
9" x 4" 23/6,	
8" x 5" 19/6,	
7" x 4" 15/6,	
5" x 3" 12/6,	
3" 9/6, 5" 14/6,	
8" 27/6, 12" 39/6,	

Post and Packing 1/6

SEND 6d. STAMP FOR CATALOGUE
P.P. for Components 1/6 per order

THYRISTORS

1 AMP: 50V 5/-, 100V 5/6, 200V 7/-, 400V 9/6.
3 AMP: 50V 6/-, 100V 7/6, 200V 8/-, 400V 10/-.
ZENERS. 11 WATT 2.7-33V 4/6
400m/w 3.0-33V 5/-

INTEGRATED CIRCUITS—R.C.A.

CA3005 80/-, CA3011 20/-, CA3012 25/-,
CA3013 30/-, CA3014 30/-, CA3018 25/-,
CA3019 25/-, CA3020 27/6, CA3021 42/6,
CA3022 35/-, CA3023 32/6, CA3026 27/6,
CA3028A 25/-, CA3028B 35/-, CA3035 35/-,
CA3036 20/-
FAIRCHILD
L900, 914 11/-, L923 14/-
DATA SHEETS FOR RCA DEVICES 2/- per type

Presets std., horiz. or vert.				1/6			
Potentialometers, Log/Lin				3/3 each			
MFD	V	Price		MFD	V	Price	
1	15	1/6		25	10	1/6	
1	40	1/6		25	25	1/6	
2	15	1/6		25	50	1/6	
2	350	2/0		32	15	1/6	
2.5	16	1/6		32	450	1/6	
4	15	1/6		40	6.4	1/6	
4	40	4/9		40	16	1/6	
4	350	2/3		50	12	1/6	
5	15	1/6		50	25	1/6	
6.4	6.4	1/9		50	50	2/-	
8	18	1/6		64	25	1/6	
8	40	1/6		80	6.4	1/6	
8	450	3/-		80	16	1/6	
10	15	1/6		100	6.4	1/6	
10	25	1/6		100	12	1/6	
12.5	25	1/9		100	25	1/6	
16	18	1/6		100	50	2/6	
25	6.4	1/6		125	4	1/6	

VEROBOARD

31" x 24" 3/6
31" x 31" 4/3
Cutter 9/-
31" x 5" 5/6
17" x 31" 16/-
5" x 24" 4/3

RESISTORS

1 watt 10%, 4d.
1 watt 5%, 5d.
1 and 1 watt, 6d.
3 watt, 5% 1/6
5 watt 2/-
1 watt Metal Oxide, 1/9

A. MARSHALL & SON

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

PREMIER RADIO

23, TOTTENHAM COURT ROAD, LONDON, W.1

Tel: 01-636 3451



SPECIAL OFFER CARTRIDGES

	SHURE	List Price	Premier Price
M3D		£9.10	£8.19.6
M44-5		£14.9.1	£10.10.0
M44C		£12.19.5	£9.9.0
M44E		£17.8.4	£13.18.6
M55E		£20.15.1	£15.15.0
M75-6		£17.8.4	£13.18.6
M75E		£25.18.10	£21.0.0
AUDIO TECHNICA			
A.T.3-7 stereo/mono		£8.18.0	£5.19.6
A.T.3S stereo		£8.18.0	£5.19.6
A.T.3X elliptical		£13.0.0	£9.0.0
A.T.75 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 $\pm$ 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 8 1/2" x 3 1/2". A.C. £20/250V.



WONDERFUL VALUE
AT 25 Gns. Carr. 10/-

PICK-UP CARTRIDGES AT MONEY SAVING PRICES!

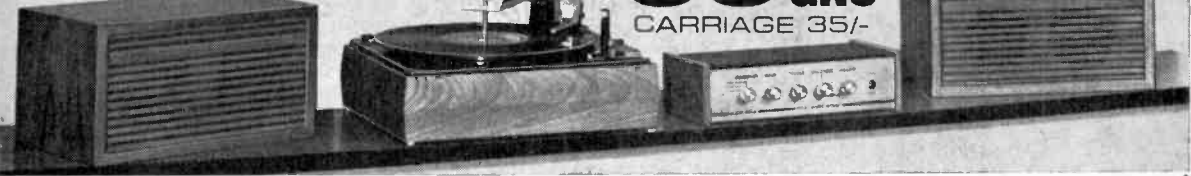
GOLDRING G800 (Stereo)	£8.19.6
SONOTONE STAH/D (Stereo)	£2.15.0
ACOS GP91/18C (Mono compatible)	£1.13.5
ACOS GP93-1 (Stereo)	£2. 8.7
ACOS GP94 (Stereo)	£2.14.8
B.S.R. X3M (Mono compatible)	£1.18.5
B.S.R. X3H (Mono compatible)	£1.18.5
RONETTE 105 (Stereo)	£1.15.0
RONETTE 106 (Stereo)	£1.15.0

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

COMPLETE STEREO SYSTEM

FOR ONLY

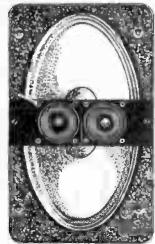
39 GNS
CARRIAGE 35/-



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.)

WIDE RANGE OF HI-FI STEREO EQUIPMENT ON DEMONSTRATION

All leading makes available including Rogers, Armatrong, Dulci, 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.

TEAK FINISHED CABINET
Size 17 1/2 x 10 x 7 1/2 in. Ideal for above speakers £5.10.0, p. & p. 10/-.



HI-FI STEREO HEADPHONES

Designed to the highest possible standard. Fitted 2 1/2" speaker units with soft padded ear muffs. Adjustable headband. 8 ohm impedance. Complete with 6ft. lead and stereo jack plug. 59/6 P. & P. 5/-.

MONO HEADPHONES 2000 ohm 14/6 P. & P. 2/6.
STEREO STETHOSCOPE SET Low imp. 25/- P. & P. 2/-.
MONO STETHOSCOPE SET Low imp. 10/6 P. & P. 2/-.

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 output. 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.



SPECIAL BARGAIN OFFER

B.S.R. U75 RECORD PLAYER UNIT COMPLETE WITH TEAK PLINTH. 4 speeds. Automatic or Manual operation. Low mass arm with cue and pause lever, bias compensator, stylus pressure adjuster, etc. Complete with B.S.R. C1 Stereo Cartridge. Original Price £25.18.8. Our Price 14 Gns. Carr. 10/6



MULTI TESTERS



MODEL D14. 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 1/2" x 1 1/2". Complete with battery, test leads and instructions. 49/6 2/6.



POCKET SIZE MODEL. With wide-angle, jewelled metal 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 A.C. 0-10-50-100-500-1000 volts A.C. 0-50-100-250-500-1000 mA D.C. 0-6000 ohms-6 megohms, 10-100-1000-10000-100000 ohms. 20 to +22dB. Complete battery, test lead and instructions. £4.19.6 P. & P. 3/6.

TWO STATION TRANSISTOR INTERCOMS.

Complete with battery and 5ft. 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
C90 (90 min.) 12/6
C120 (120 min.) 17/6
P. & P. 1/-.



CASSETTE HEAD CLEANER

Removes unwanted deposits from delicate tape heads. Fits all cassette recorders. 11/6 1/-.

"VERITONE" RECORDING TAPE

SPECIALLY MANUFACTURED IN U.S.A. FROM EXTRA STRONG PRE-STRETCHED MATERIAL THE QUALITY IS UNEQUALLED.

(TENSILISED) 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
TT3 3" 450' POLYESTER	7/6	DT6 5 1/2" 1800' POLYESTER	22/6
DT3 3 1/2" 600' POLYESTER	11/6	TT6 5 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/-	TT7 7" 3600' POLYESTER	50/-

TAPE SPOOLS 3" 1/-, 5" 5 1/2", 7" 1/9. 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).



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

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

11/69

INTERNATIONAL CORRESPONDENCE SCHOOLS

MARCONI C.R. 150/2 DOUBLE CONVERSION SHORT WAVE RECEIVERS. freq. e 1.5-22 Mc/s. Features are as follows: Fitted 'B' meter, geared tuning with no backlash, 2 speed motion, slide rule dial, calibrated in Mc/s, logging scales for accuracy, 500 Kc/s xtal calibrator, mechanical bandspread. Technical description, 1st IF is 1.6 Mc/s, 2nd IF 465 with xtal filter giving a passband from 100 c.p.s. to 10,000 c.p.s., B.F.O. variable 3-0.3 Kc/s. Rectified 1FO/p. D.F. input, suit teleprinter o/p, output 800 ohms and 3 ohms for L.S. Front end has 2 R.F. stages of amplification giving a sensitivity of 2-4 μ V depending on band in use. Separate mixer/oscillator. 2nd oscillator is also variable 5-0.5 Kc/s bandspread. A separate power supply is needed to power the above set at 300v at 100 mA and 6-3v 4 amps l.t. A.C./D.C. circuit connections supplied to purchasers of this very fine receiver. These R.X.s are not new but are in quite good condition and tested on despatch. Unrepeatable offer. Price if £22.10.0 plus 30/- carriage.

R209 EX ARMY RECEIVERS. 1-20 Mc/s in 4 tunable bands, 11 valve miniature superhet 1 EF 91 R.F. stage, 2 I.F. stages at 465 kc/s, variable B.F.O. Ae trimmer, internal L.S. switched A.M./C.W./F.M. facilities. Phones, O/P 12v internal power supply in good condition and working order, complete with headphones. Price £13.10.0 plus £1 carriage.

HEADPHONES, new ex W.D. channels padded low impedance moving coil with magnetic microphone. These are extremely comfortable to wear and adjustable. As they are of rare type and we have limited stock we are asking 25/- a pair plus 3/6 p.p. Used and checked D.L.R.5 headphones, balanced armature type, 12/6 a pair plus 2/6 p.p.

AERIALS in new condition extending to 11ft. fully open. Whip type. Price 12/6 plus 3/6 p.p. Whip aerials 12ft. collapsible type, soiled condition ex tank aerial. Price 10/- plus 3/6 p.p. Bases for above available at 5/- each plus 2/6 p.p.

BARGAIN PARCELS. 14lbs. at 29/- plus 6/6 p.p. 28lbs. at 55/- plus 12/6 p.p. 56lbs. at 90/- plus 25/- carriage. Contain res., cond., inductors, diodes, valves, tagboards, chassis, valve holders, trimmers, pots, coil formers, very good value, saves ££££s on experiments. This as a lucky dip postal service.

COMPUTER COMPONENT BOARDS with minimum 30 transistors, also contain silicon/germanium diodes, res., cond., u.h. chokes, trim pots. Transistors are n-p-n or p-n-p or both. 10 boards for 10/- plus 2/6 p.p. 25 boards for £2/6 plus 4/- p.p.

We have a large selection of moving coil meters at reasonable prices e.g. 1mA 75 ohms 2 1/2 in. at 10/- ex equipment plus 5/- post and ins. S.A.E.

MOBILE POWER UNITS made by Pye Limited for the C.12 transceiver but are quite suitable for any 12v mobile TX/RX installation, power output is 400v at 140mA using a rotary transformer and 300v at 100mA using vibratory supply, in good condition. Price £3.10.0 plus £1 carriage.

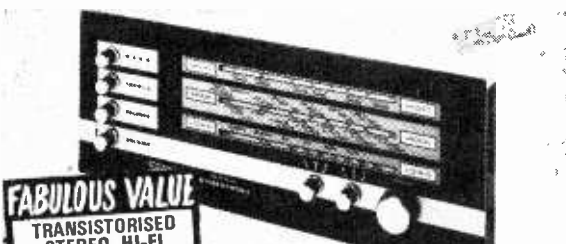
465 Kc/s quartz crystals 10XJ. Tested. 10/- each plus 1/6 p.p.

We have available signal generators type T.F. 144G, CT 218s and others at keen prices. Please send a.s.c. for list of V.F.O.s. All orders marked Radio Dept.

A. H. THACKER

HIGH ST., CHESLYN HAY, WALSALL, STAFFS.

*Radio and electrical surplus
Government surplus*



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 4 1/2" 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

H.P. terms available. Dep. £9.16.0 & 12 monthly payments of 36/9 (Total H.P. £31.17.0)

Send £10.13.6 today. Amplifier available separately at only 17 Gns.

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 P&P
17 Transistors & 10 diodes **34 1/2 GNS. 17/6**

EASILY FITTED NO TECHNICAL KNOWLEDGE NECESSARY
H.P. available £12.1.6 dep. plus 18 monthly payments of 32/- (Total H.P. £40.17.6).

Send £12.19.0 today



Callers Welcome

POST THIS COUPON NOW!

PLEASE SEND ME FREE DETAILS OF YOUR RANGE

Name

Address

LEWIS radio 100 CHASE SIDE, SOUTHGATE, Dep. P.1169 LONDON, N.14. TELEPHONE PAL 3733/9666

COMET Hi-Fi DISCOUNT WAREHOUSE

- ALL ITEMS OFFERED ARE FULLY GUARANTEED AND BACKED BY COMET.
- OPEN TO THE PUBLIC 9 to 5.30 p.m. daily (8 p.m. Thursday and Friday evenings) and 5 p.m. Saturdays.
- COMPLETE FREE PRICE LIST CONTAINING OVER 800 ITEMS ON REQUEST.

	Rec. Price	Retail Price	Comet Price
AMPLIFIERS			
DULCI 207 Stereo Amplifier	£25 0 0		£18 0 0
DULCI 207M Stereo Amplifier takes magnetic P/U	£30 0 0		£21 19 0
DULCI 220 Princess	£44 2 0		£34 19 6
GOODMANS Maxamp	£54 0 0		£42 18 0
New LEAK Stereo 30 Plus	£52 0 0		£41 19 6
New LEAK Stereo 30 Plus In teak case	£58 10 0		£48 14 6
New LEAK Stereo 70	£63 0 0		£50 19 6
LINEAR LT.66 Stereo Amplifier	£15 15 0		£13 10 0
QUAD 33 Preamplifier	£43 0 0		£34 19 6
QUAD 303 Stereo Main Amplifier	£55 0 0		£46 19 6
ROGERS Ravensbourne 50 watt Stereo	£59 10 0		£48 19 6
ROGERS Ravensbourne In teak case	£64 0 0		£54 8 0
ROGERS Ravensbrook	£41 0 0		£34 19 6
ROGERS Ravensbrook In teak case	£46 10 0		£39 19 6
TELETON 203E	£28 7 6		£23 7 6
TRUVOX TSA.200	£54 12 0		£42 9 0
TUNERS			
ARENA 211 Stereo with decoder	£39 18 0		£34 18 0
DULCI FMT.7FM Tuner	£22 1 0		£19 0 0
DULCI FMT.7S FM Stereo Tuner	£29 8 0		£23 0 0
GOODMANS Stereomax AM/FM Stereo Tuner	£82 10 5		£69 19 6
LEAK Troughline Tuner with multiplex	£51 10 6		£39 19 6
QUAD Stereo FM Tuner	£51 0 0		£43 19 6
ROGERS Cadet Mark III Tuner	£20 12 6		£17 13 0
ROGERS Ravensbourne Tuner with Decoder	£60 15 3		£52 2 0
TRUVOX FM 200/IC Tuner	£52 0 0		£39 19 6
TUNER-AMPLIFIERS			
ARENA 2400 with Decoder	£90 6 0		£69 19 6
ARENA 2500 complete with Decoder	£97 0 0		£79 0 0
(NEW) GOODMANS Model 3000 with stereo decoder	£77 14 7		£68 0 0
TANDBERG SolvSuper 10/71 Tuner/Amplifier AM/FM and 2 short wavebands	£75 18 0		£65 18 0
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		£49 19 6
TELETON F.2000 AM/FM Stereo Tuner/Amplifier 2 x 5 watts RMS with silicon transistors	£43 0 0		£35 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 CMS.400 AM/FM Multiplex Tuner/Amplifier with 2 speaker boxes and turntable .. £126 0 0 £99 0 0

TELETON 7AT1 Stereo Tuner/Amplifier AM/FM 50 watts RMS Stereo Decoder and F.E.T. ... £133 0 0 £95 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.
£140 9 0 £115 9 4

CARTRIDGES ALL MAKES STOCKED AT DISCOUNT PRICES

SPEAKERS			
CELESTION Dilton 10	£21 13 1		£17 16 0
CELESTION Dilton 15	£31 3 7		£26 5 0
DULCI AS3 Speaker	£8 8 0		£6 19 6
GOODMANS Maxim	£20 15 6		£16 19 6
GOODMANS Mezzo II	£30 18 0		£25 13 0
GOODMANS Magnum-K	£40 2 0		£29 19 6
GOODMANS Mirimba	£26 0 0		£18 19 6
GOODMANS Mambo	£22 6 6		£18 11 9
GOODMANS Loudspeaker System. Model 3005 (per pair)	£25 0 0		£21 0 0
KEF Celeste	£29 0 0		£23 19 6
KEF Concord	£43 10 0		£36 0 0
LEAK Sandwich	£43 10 0		£32 19 6
LEAK Mini-Sandwich	£29 15 0		£21 19 6
QUAD ELECTROSTATIC	£66 0 0		£55 0 0
WHARFEDALE New "Alredale"	£69 10 0		£57 14 0
WHARFEDALE Denton	£16 6 0		£12 19 6
WHARFEDALE Super Linton	£21 0 0		£16 19 6
WHARFEDALE Meiton	£29 10 0		£22 19 6
WHARFEDALE New Dovedale 3	£39 10 0		£30 19 6
WHARFEDALE Rosedale	£55 0 0		£45 0 0
WHARFEDALE UNIT 3 Speaker Kit	£10 17 6		£9 10 0
Bowers and Wilkins Speakers also available at discount prices.			
Most types of chassis, speakers, cross-over networks etc., available ex stock.			
TURNTABLES			
GARRARD SP.25, Mark II	£15 11 11		£11 10 0
GARRARD AP.75	£23 16 7		£17 19 6
GARRARD SL.55	£13 17 9		£11 2 6
GARRARD SL.65	£18 8 4		£14 19 6

GARRARD SL.75	£35 12 5		£26 19 6
GARRARD SL.95	£45 9 1		£34 19 6
GARRARD 401	£31 14 2		£25 10 0
GARRARD 3000	£11 4 1		£9 10 0
GARRARD 3500	£12 4 10		£10 1 10
GOLDRING Lenco GL.68	£22 7 2		£16 19 11
GOLDRING Lenco GL.75	£35 15 5		£26 19 6
GOLDRING 75P	£46 18 8		£38 0 0
GOODMANS Model 3025 Complete with Magnetic Cartridge	£37 14 9		£31 19 6
THORENS TD.125	£63 4 9		£55 0 0
THORENS TD.150	£28 16 11		£25 7 0
THORENS TD.150A	£35 14 6		£29 10 0
THORENS TD.150B	£32 17 6		£28 18 0
THORENS TD.150AB	£39 16 9		£32 19 6
THORENS TD.124/11	£45 18 1		£40 7 0
Bases, plinths and covers stocked to suit all the above turntables.			

HI-FI STEREO TAPE DECKS AND TAPE RECORDERS

AKAI X-150D deck 4 track	£130 2 4		£109 0 0
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 w/o acc.	£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	£99 10 0		£79 19 6
AKAI X-V 4 track	£180 0 0		£151 0 0
AKAI M-9 4 track w/o acc.	£195 0 0		£139 19 6
MARCONI 4214 twin track Tape Recorder	£35 16 0		£31 0 0
MARCONI 4216 4-track Tape Recorder	£41 5 0		£35 19 6
MARCONI 4218 Stereo Tape Recorder	£88 0 0		£77 19 6
MARCONI 4238 4 track Tape Recorder	£58 11 0		£49 19 6
PHILIPS battery operated tape recorder Model 4200	£35 6 0		£21 19 6
SHARP 504 battery/mains tape recorder, complete with all accessories guaranteed 5 years	£35 5 3		£24 19 6
TELETON 7D 70 Stereo Tape Deck	£85 10 3		£62 0 0
TELETON FXB501D Stereo Tape Deck and preamplifier	£65 0 8		£49 0 0
TELETON 401X FM Multiplex Stereo tuner/amplifier 20 watts RMS	£67 2 6		£49 0 0
TRUVOX R54 3 speed 4-track	£72 2 0		£52 2 0
TRUVOX R52 3 speed 2-track	£72 2 0		£52 2 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	£27 19 2		£23 17 6
SME 3012 with S2 shell	£29 0 0		£25 17 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".

Complete stereo system – 28 gns.

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 Elac 10½" x 6½" 10,000 lines and 2½" tweeter. 3 ohms impedance 5½ guineas plus 7/6d. 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 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 1 Kc/s.

CONTROLS: 4-position selector switch (2 pos. mono and 2 pos. stereo) dual ganged volume control.

TONE CONTROL: Treble lift and cut. Separate on/off switch. A preset balance control.

The items illustrated can be purchased together for 28 gns.

Duetto

Integrated Transistor Stereo Amplifier

9 GNS.
plus 7/6d.
p. & p.



The above 5 items can be purchased together for 28 gns. + £1.10.0 p. & p.

The Classic

8½ Gns. 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.

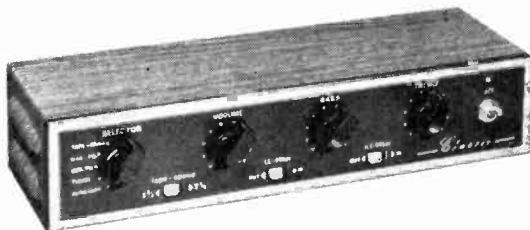
Specification: Sensitivities for 10 watt output at 1KHz into 3 ohms. Tape head: 3mV (at 3½ i.p.s.). Mag. P.U.: 2mV. Cer. P.U.: 80 mV. Tuner: 100mV. Aux.: 100mV. Tape/Rec. output: Equalisation for each input is correct to within ±2dB (R.I.A.A.) from 20Hz to 20KHz. Tone control range: Bass ±13dB at 60Hz. 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

13½ Gns. 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 gns. plus 7/6 p. & p.



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

19 Gns. plus 20/- p. & p.

Also see opposite page



The ELEGANT SEVEN Mk. III (350mW Output)

7 transistor fully tunable M.W.-L.W. 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.

Circuit 2/6
FREE WITH PARTS.

Price £4.9.6 plus 7/6 P. & P.

The DORSET (600mW Output)

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

Price £55.0 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 6×6×4in.

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

X101

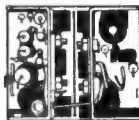
10W SOLID-STATE HI-FI AMP WITH INTEGRAL PRE-AMP

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. D.C. 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) 42/8 plus 4/6 p. & p.



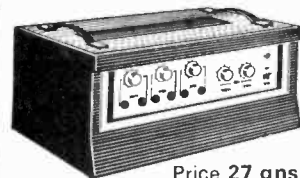
CAR TRANSISTOR IGNITION SYSTEM

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, washers etc.).

Price £4.19.6 plus 5/- P. & P.

50 WATT AMPLIFIER A.C. Mains 200-250V



Price 27 gns.
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 60 Hz. 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 1 KHz. **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 Track Heads. Size 13 1/2 in. long by 8 1/2 in. wide.
Price £8.19.6 plus 7/6 P. & P.

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

The RELIANT



SOLID STATE GENERAL PURPOSE AMPLIFIER

SPECIFICATIONS

Output—10 watts
Inputs—1. xtal mic 10mV 2. gram/radio 250mV
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 8td. 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. 8" x 5" speaker to suit price 14/8 plus 1/6 p. & p. Crystal mike to suit 12/8 plus 1/6 p. & p.

RELIANT Mk. I

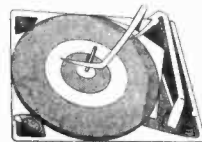
As above less teak case
5 1/2 gns. plus 7/6 P. & P.

RELIANT Mk. II

In teak finished case.
6 1/2 gns. 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 at 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 1/4" x 1 1/2 in. Sensitivity 1,000 O.P.V. on both A.C. and D.C. volts. 0-15, 0-150, 0-1,000 D.C. current 0-150mA. Resistance 0-100kΩ. Complete with test prods, battery and full instructions.

42/6 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.

MOTEK

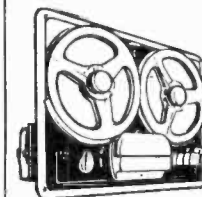
3 Speed 2 track Tape Deck complete with heads, takes 7in. spool.

Incorporating 3 motors.

A.C. mains, 240 volts.

Listed at £21

Our Price £9.19.6
plus 10/- P. & P.



CYLDON 2 TRANSISTOR U.H.F. TUNER

Brand new. Complete with circuit diagram.

Price £2.10.0 plus 1/- 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 13 1/2" x 8 1/2" x 4 1/2 in. By famous manufacturer.

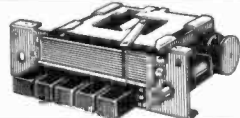
List price £7

OUR PRICE 74/6 plus 5/- P. & P.
Similar speaker to the above without tweeters in 3 and 15 ohms 44/8 plus 5/- p. & p.

PYE CAR RADIO

Push Button Tuning Heart

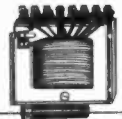
This PRESTOLOK 5 station Push-Button Tune Heart with Manual Over-ride is an ideal basis for a quality AM car radio. Size 6 1/2" x 4" x 2".
25/- plus 3/- P. & P.



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.



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

R.S.T. VALVE MAIL ORDER CO.

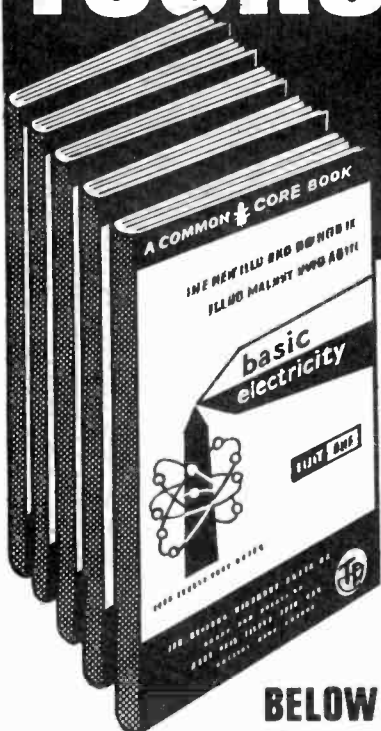
BLACKWOOD HALL, 16a WELLFIELD ROAD, STREATHAM S.W.16

Mon.—Sat. 9 a.m.
—5.30 p.m.
Closed Sat. 1.30—2.30 p.m.
Open Daily to Callers

Tel. 769-0199/1649

1A7 7/9	6BQ7A 7/9	6K7M 6/6	7Y4 8/8	20P5 20/9	80 7/8	DF96 7/6	ECF80 6/6	EM80 7/6	PC97 8/9	RG5/50080 7/6	UF89 7/6
1D5 7/9	6BR7 17/9	6K7GT 2/9	9BW6 7/9	25A6 5/9	85A2 7/8	DR77 4/9	ECF82 6/6	EM81 8/8	PC98 8/9	RG50 40/9	UL41 12/9
1H5 7/9	6BR8 12/6	6K7GT 4/6	10C1 12/6	25L6GT 7/9	150B2 11/6	DK32 7/9	ECCH21 12/6	EM84 7/6	PC99 10/6	SP4 4/9	UL84 7/9
1LD5 6/9	6B87 25/9	6K8 2/9	10C2 12/6	25Y5 6/9	150C4 9/6	DK91 6/9	ECCH35 11/6	ESU15080/9	PC189 10/6	SP41 5/6	UM80 5/6
1N5GT 8/9	6BW6 14/6	6K8M 11/6	10F1 14/9	25Z4 6/8	801 9/6	9K92 9/9	ECCH42 11/6	EY61 7/6	PCF80 6/9	SP61 5/9	UU6 21/9
1B5 6/9	6BW7 12/6	6K8G 3/9	10F3 18/9	25Z5 8/9	807 9/9	DK96 7/9	ECCH81 5/9	EY86 7/6	PCF82 6/6	STV280/60	UU7 21/9
184 5/6	6C4 5/6	6K8GT 7/9	10F9 10/6	25Z6 9/6	813UBA 8/9	DL66 25/9	ECCH83 9/6	EY88 7/6	PCF84 8/9	STV280/60	UU8 21/9
185 4/6	6C5G 5/6	6K25 15/9	10F18 8/9	25D7 9/8		DL92 6/3	ECL80 9/6	EZ40 8/8	PCF86 9/9	STU25 19/6	UY9 8/8
1T4 4/6	6C6 3/9	6L1 12/6	10L1 8/9	30C1 6/9	813 75/9	DL93 4/9	ECL82 7/9	EZ41 9/6	PCF801 9/9	STU150 12/6	UY21 9/6
3A4 4/9	6C8G 9/9	6L6G 7/9	10L1D11 10/6	30C15 15/9	868A 15/9	DL94 6/9	ECL83 10/3	EZ80 5/6	PCF802 9/9	T41 17/6	UY41 8/6
3Q4 7/9	6CD6G 24/9	6L18 6/9	10P13 13/6	30C17 18/9	954 5/3	DL95 7/9	ECL86 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
3Q5 7/9	6CH6 7/9	6Q7G 8/9	11E3 70/9	30C18 15/9	1925 8/6	DL96 7/6	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
354 6/9	6CW4 12/9	6Q7GT 8/9	12A7 6/9	30P5 17/9	4022AR 67/9	DM70 6/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
3V4 6/9	6E6 3/9	68A7M 7/9	12A7 6/9	30FL1 18/9	5753 12/9	DY66 6/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6B4GY 10/6	6E5 7/9	68G7 7/9	12A7 6/9	30FL12 19/9	7193 2/9	DY87 5/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6U4G 5/6	6F1 12/6	68G7 7/9	12A7 6/9	30FL14 15/6	7475 14/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6V4G 5/6	6F5G 8/9	68H7 3/8	12A7 6/9	30L15 17/9	A61 9/6	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6Y3GT 6/9	6F6G 5/9	68J7 6/9	12A7 6/9	30L17 17/9	ATP4 2/8	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6Z4G 7/9	6F8G 5/6	68K7GT 4/9	12A7 6/9	30P12 16/9	ATP6 12/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6/3012 15/9	6F11 6/6	68L7GT 8/9	12A7 6/9	30P19 15/9	ATP7 9/6	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A7 18/9	6F13 6/6	68N7GT 5/6	12A7 6/9	30P21 16/9	AU2 80/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F14 12/6	68Q7 7/6	12A7 6/9	30P21 16/9	AU5 8/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F23 16/9	6U4GT 12/9	12A7 6/9	30P21 16/9	AZ1 8/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F24 14/9	6U5G 7/6	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F25 16/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F26 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F27 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F28 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F29 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F30 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F31 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F32 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F33 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F34 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F35 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F36 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F37 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F38 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F39 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F40 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F41 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F42 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F43 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F44 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F45 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F46 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F47 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F48 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F49 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F50 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F51 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F52 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F53 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F54 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F55 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F56 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F57 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F58 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F59 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F60 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F61 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F62 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F63 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F64 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F65 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F66 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F67 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F68 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F69 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F70 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F71 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F72 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F73 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F74 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9	ECL88 9/9	EZ81 5/6	PCF803 15/9	TDD4 8/6	UY85 8/6
6A8G 12/6	6F75 14/9	6V6M 12/9	12A7 6/9	30P21 16/9	AZ31 10/9	E88CC 12/9					

YOURS FOR 7 DAYS FREE!



The 'PICTURE BOOK' way of learning **BASIC ELECTRICITY** (5 VOLUMES) **BASIC ELECTRONICS** (6 VOLUMES)

You'll find it easy to learn with this outstandingly successful 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

BELOW ARE EXTRACTS FROM THE MANY LETTERS RECEIVED

What readers say...

- ... played an important part ...
These Manuals have played an important part in my career ...
K.W., West Drayton.
- ... a sound basis ...
These books create a sound basis on which to build a successful future ...
R.G., Lowestoft.
- ... well set out ...
I am well pleased with the series. Everything is well set out in self-explanatory diagrams ...
D.D., West Ham.
- ... make interesting reading ...
These books make interesting reading of a complicated subject ...
V.L., Basingstoke.
- ... so easy to follow ...
I am delighted with these marvellous manuals, so easy to follow, well done ...
W.A., Bushy.
- ... clear and easy to understand ...
I have found these manuals extremely clear and easy to understand ...
L.L., York.
- ... readily understood ...
The Basic Electricity volumes, were readily understood by my 13 year old son ...
J.B., Wolverhampton.
- ... every confidence in your series ...
I have every confidence in your series for creating a sound basis on which to build a successful future ...
J.R., Birmingham.
- Everything is clearly set out ...
I am well pleased with this pictorial system. Everything is clearly set out in diagrams ...
L.P., Co. Armagh.
- ... very pleased with the set ...
I was very pleased with the set of Basic Electronics. Please send Basic Electricity ...
D.W., Margate.
- ... how understandable your books are ...
Pleased to say how understandable your books are, I now have a sound knowledge of the subject ...
A.A., Hull.

- ... lucid and clear ...
I find them easy to follow because of their lucid and clear descriptive format ...
M.V., East Grinstead.
- ... carefully written ...
I am very satisfied with these carefully written and well expressed manuals ...
A.W., Shanklin.
- ... 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.
- The series will be of exceptional value in training mechanics and technicians in Electricity, Radio and Electronics.

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.

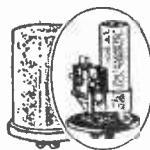
Signature
(If under 21 signature required of parent or guardian)

Name
Block letters
Full Postal
Address

DON'T MISS THIS OFFER! POST NOW!

PW

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 DC operation. Maximum load 6 amps. Size 2-11/16in. dia. x 4in. Supplied brand new at a fraction of original cost. 6/8 each P. 2/6. (3 for 17/6 P. 4/6).

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. Supplied in excellent condition, fully tested and checked £15.0.0. 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 0/110/200/250V. A.C. Supplied in excellent working condition. £22.10.0. Or complete with all accessories, probe, leads, lid, etc. £25. Carriage 30/-.



MARCONI

T/44/TF956

AF Absorption Wattmeter

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

SOLARTRON CD-1016 OSCILLOSCOPE

Double beam. D.C. To 5 Mc/s. Excellent condition. £55 each. Carr. 20/-.

CLASS D WAVEMETERS



A crystal controlled heterodyne frequency meter covering 1-7.5 Mc/s. Operation on 6 volts D.C. Ideal for amateur use. Available in good used condition. £5.19.6. 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/-.

SOLARTRON CD.711S.2 OSCILLOSCOPES

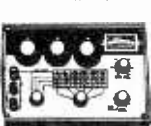
Double beam. D.C. to 9Mc/s. Perfect order. £65. Carr. 50/-.

TO-3 PORTABLE OSCILLOSCOPE



3in. tube. Y 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 350 mm. Weight 154 lb. 220/240V. A.C. Supplied brand new with handbook. £25.0.0. Carr. 10/-

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



A new portable bridge offering excellent range and accuracy at low cost. Ranges: R. 1 Ω -11.1 meg Ω . 6 Ranges $\pm$ 1%. L.I. μ F. $\pm$ 11%. HEXVYS 6 Ranges -2%. C. 10pF $\pm$ 1110mFd. 6 Ranges $\pm$ 2%. TURNS RATIO 1:1/1000-1:11100. 6 Ranges $\pm$ 1%. Bridge voltage at 1,000 cps. Operated from 9 volts. 100 μ A. Meter indication. Attractive 2 tone metal case. Size 7 1/2 x 5 1/2 in. £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.



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 Bandspread • 230V. A.C./12V. D.C. neg. earth operation • RF gain control. Size 15in. x 9in. x 8in. 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 bandspread on 10, 15, 20, 40 and 80 metres. 8 valve plus 7 diode circuit, 4/8 ohm output and phone jack. SSB-CW • ANL • Variable BFO • 8 meter • Sep. bandspread • 4 • 11.455 Kc/s • Audio output 1-1W • 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. £42.10.0. 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 AMATEUR RECEIVER

Covers all the amateur bands in 7 separate ranges between 3.5 and 29.7 Mc/s, 7 valves, 2 transistors and 5 diodes plus 8 crystals: output 8 and 500 ohm and 5,000 ohm phone jack. Crystal controlled oscillator. Variable BFO. VFO. AVC. ANL. 8 meter, SSB-CW. Stand-by switch. Special double gear dial drive with direct reading down to 1 kHz. Remote control socket for connection to a transmitter. Audio output 1 watt, 115/250V. A.C. mains. Superb modern styling. Size 7 x 13 x 10in. with instruction manual and service data. £69.10.0. Carr. Paid.

TRIO TS 510 AMATEUR TRANSCEIVER with speaker and mains P.S.U. £212. IN STOCK!



SPECIAL BONUS OFFER!

TRIO SP5D Matching Speaker Mate and TRIO HS4 Communication Headphones. Normal value £10.7.0, FREE OF CHARGE with every JR.500SE purchased.

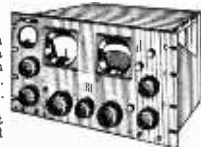
HAMMARLUND SP600JX COMMUNICATION RECEIVER

High quality professional dual conversion communication receivers available for the first time in this country at a reasonable price. Frequency range 540 Kc/s-84 Mc/s. in 6 bands variable tuning or 6 channel crystal controlled. 2-5 watt output into 600 ohms. Input 110/230V. A.C. 20 valve circuit incorporating: Xtal filter B.F.O. A.N.L. Xtal calibrator, 8 meter etc. Size 19 x 12 x 22in. (List £520). Offered in excellent condition, fully tested and checked. £100 each.



RCA COMMUNICATIONS RECEIVERS AR88D

Latest release by ministry BRAND NEW in original cases. 110-250V. A.C. operation. Frequency in 6 Bands. 435 Kc/s-32 Mc/s continuous. Output impedance 2-5-600 ohms. Incorporating crystal filter, noise limiter, variable BFO, variable selectivity, etc. Price £87.10.0. 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 volume controls. Tape recorder output. 75 Ω aerial input. Headphone jack. Operation 230V. A.C./12V. D.C. Neg. earth. £87.10.0. Carr. 10/-.



CLEAR PLASTIC PANEL METERS



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

500-0-500 μ A	27/6	50mA	27/6	150V. D.C.	27/6
1mA	27/6	100mA	27/6	300V. D.C.	27/6
1-0-1mA	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
750mA	27/6	3V. D.C.	27/6	150V. A.C.	27/6
1 amp	27/6	10V. D.C.	27/6	300V. A.C.	27/6
100-0-100 μ A	35/-	20V. D.C.	27/6	500V. A.C.	27/6
200 μ A	35/-	20mA	27/6	8 meter 1mA	38/-
5 amp	27/6	100V. D.C.	27/6	VU meter	42/-
500 μ A	40/-				

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

POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wear. Continuous rating. Wide range ex-stock. Single hole fixing, $\frac{1}{4}$ in. dia. shafts. Bulk quantities available. 25 WATT. 10/25/50/100/250/500/1,000/1,500/2,500 or 5,000 ohms. 14/6. P. & P. 1/6 50 WATT. 10/25/50/100/250/500/1,000/2,500 or 5,000 ohms. £1/- P. & P. 1/6 100 WATT. 15/50/125/50/100/250/500/1,000 or 2,500 ohms. 27/6. P. & P. 1/6

AVOMETER MOVEMENTS



50 μ A

20K Ω /V

Spare movements for Model 8 or 9. (Fitted with Model 9 scale) or basis for any multi-meter. Brand New & Boxed. 69/6. P. & P. 3/6

TE-40 HIGH SENSITIVITY A.C. VOLTMETER

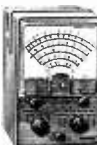
10 meg. input 10 ranges: .01/0.03/-1/-3/13/10/30/100/300V. R.N.S. 4cps. 1-2 Mc/s. Decibels -40 to +50dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17.10.0. Carr. 5/-.



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.

COSSER 1049 DOUBLE BEAM OSCILLOSCOPES

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

AM/FM SIGNAL GENERATORS



Oscillator Set 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 μ V-100mV. Operation from 12 volt D.C. or 110/200/250 volt A.C. Size 12 x 8 1/2 x 9 in. Supplied in brand new condition complete with all connectors fully tested. £45. Carr. 20/-.

GEARED MAINS MOTORS

Paralux type SD19 230/250V. A.C. Reversible. 30 r.p.m. 40 lb./ins. Complete with capacitor. Excellent condition. 99/6. Carr. 10/-.



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. £11.9.6. P. & P. 3/6. 300 W. £2. 7.6. P. & P. 4/6. 800 W. £4.10.0. P. & P. 6/6. 1,000 W. £5.10.0. P. & P. 7/6. 1,500 W. £7.19.6. P. & P. 8/6. 7,500 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/P600Ω 3-8V. P.P.
TF 100 Kc/s-300 Mc/s. Variable R.F. attenuation int/ext. modulation. Incorporates dual purpose meter to monitor AF output and % mod. on R.F. 220/240V. A.C. £20.0.0. Carr. 7/6.

TE-200 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 140 x 215 x 170 mm.

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

TY75 AUDIO SIGNAL GENERATOR

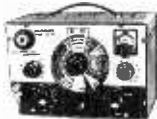
Sine Wave 20c/s to 200 Kc/s. Square Wave 20c/s to 30Kc/s. High and low impedance output. Output variable up to 6 volts. 220/240 volts A.C. Size 210 x 150 x 120 mm. Brand new with instructions. £18. Carr. 7/6.



MARCONI TP142E DISTORTION FACTOR METERS. Excellent condition. Fully tested. £20. Carr. 15/-.

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

2 pF-2000 mF
2 ohms 200 meg-ohms. Also checks impedance, turns 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: 0.7-0.9987. B: 0-200. Ico: 0-50 microamps 0-5mA. 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 **VM.78 VALVE VOLTMETER**. R.F. measurements in excess of 100 Mc/s and D.C. measurements up to 100V with accuracy of +2% D.C. range 300 MV to 1 KV. A.C. range 300 MV to 300 V RMS. Resistance 0.2-500 MΩ. Price £72.
VM.78 A.C. MILLIVOLT METER. Transistorised 1 MV-300 V. Frequency 1 c/s to 1 Mc/s. Price £55.
VM.79 UHF MILLIVOLT METER. Transistorised. A.C. range 10 MV-3 V. D.C. current range 0.1μA-3 MA. Resistance 1 ohm-10 megohms. Price £125.
11B AUDIO SIGNAL GENERATOR. 15 c/s-50 Kc/s. sine or square wave. Price £30.
11B AUDIO SIGNAL GENERATOR. 15 c/s-50 Kc/s. Price £30.
12B AUDIO SIGNAL GENERATOR. As per 11B except fitted with output meter. Price £35.
TT15 TRANSISTOR TESTER. £37.10.0. Carriage 10/- per item.

SONOTRONIC PORTABLE OSCILLOSCOPES. Ex. govt. scope, general purpose. 3in. CRT. Main operated. Fully tested and checked. £12.10.0. Carr. 7/6.

SOLARTRON MONITOR OSCILLOSCOPE TYPE 101

An extremely high quality oscilloscope with time base of 10μsec to 20msec. Internal Y amplifier. Separate mains power supply 200/250V. Supplied in excellent condition with cables, probe, etc., as received from Ministry. £28.19.6. carriage 30/-.

Latest Catalogue

The latest edition giving full details of a comprehensive range of Hi-Fi EQUIPMENT COMPONENTS, TEST EQUIPMENT and COMMUNICATIONS EQUIPMENT. Nearly 200 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

8RP22 Stereo £5.19.6 *SP25 MK II £11.19.6
*1025 Mono £7.10.0 *SL55 £11.19.6
*1025 Stereo £7.15.0 *A70 MK II £12.10.0
*2025 Stereo £7.19.6 *AT60 MK II £18. 5.0
*2025T/C £7.19.6 *SL65 £14.14.0
Mono/Stereo £8.17.6 AP75 £17.17.0
401 £23. 7.6
*3000 Stereo £9.19.6 SL75 £28.10.0
SL95 £35. 0.0



Carriage/Insurance 7/6 extra any model. WR4 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



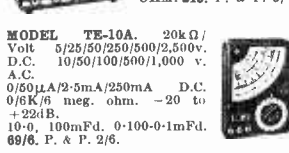
19 transistors, 8 diodes, 1HF music power, 30W at 8Ω. Response 30-20,000 ± 2dB at 1W. Distortion 1% or less. Inputs 3mV and 250mV. Output 3-16Ω. Separate L and R. volume controls. Treble and bass control. Stereo phone jack. Brushed aluminium, gold anodised extruded front panel with complementary metal case. Size 10 1/2 x 8 9/16 x 7 13/16in. Operation 115/230V. A.C. £28. Carriage 7/6.

MULTIMETERS for EVERY purpose!

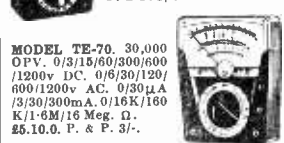
TE-61. NEW 20,000Ω/VOLT MULTIMETER with overload protection and mirror scale. 0.6/60/120/1,200V. A.C. 0.3/30/60/300/600/1,200V D.C. 0.6/60/120/300/600V A.C. 0.1/10/100/1,000/5,000V D.C. 0.6/60/120/300/600V. P. & P. 2/6.



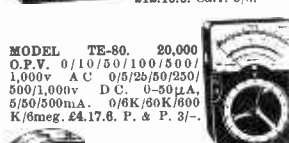
TE-900 20,000Ω/VOLT GIANT MULTIMETER mirror scale and overload protection. 6in. full view meter. 2 colour scale. 0.2/5/10/250/1,000/5,000V. A.C. 0.2/5/12/5/10/50/250/1,000/5,000V D.C. 0.50/10/100/500/1,000/5,000V. 500mA/10 amp. D.C. 0.2K/200K/20 MEG. OHM. £15. P. & P. 5/-.



MODEL AS-100D. 100K Q/VOLT. 5in. mirror scale. Built-in meter protection. 0.3/12/60/120/300/600/1,200V D.C. 0.6/30/120/300/600V A.C. 0.1/10/100/1,000/5,000V D.C. 0.6/60/120/300/600V. P. & P. 3/6.



MODEL TE-10A. 20kΩ/Volt 5/25/50/250/500/2,500V. A.C. 10/50/100/500/1,000 V. D.C. 0.6/60/120/300/600V A.C. 0.1/10/100/1,000/5,000V D.C. 0.6/60/120/300/600V. P. & P. 2/6.



MODEL TE-70. 30,000 O.P.V. 0.3/15/60/300/600/1,200V D.C. 0.6/30/120/300/600/1,200V A.C. 0.3/30/60/300/600/1,200V D.C. 0.1/10/100/1,000/5,000V D.C. 0.6/60/120/300/600V. P. & P. 3/6.



MODEL TE-80. 20,000 O.P.V. 0.1/10/50/100/500/1,000V A.C. 0.5/25/50/250/500/1,000V D.C. 0.5/50/100/500/1,000V A.C. 0.6/60/120/300/600V D.C. 0.6/60/120/300/600V. P. & P. 3/6.



MODEL PT-34. 1,000 O.P.V. 0.1/10/50/250/500/1,000V A.C. and D.C. 0.1/100/500mA D.C. 0.1/100K Ω. 39/6. P. & P. 1/6.



★ TRANSISTORISED FM TUNER ★



6 TRANSISTOR HIGH QUALITY TUNER. SIZE ONLY 6 x 4 x 2 1/2in. 3 I.F. stages. Double tuned discriminator. Ample amplifiers. Operates on 9V battery. Coverage 88-108Mc/s Ready built ready for use. Fantastic value for money. £6.7.8. P. & P. 2/6. Stereo multiplex adaptor 99/6.

TRANSISTORISED TWO-WAY TELEPHONE INTERCOM

Operative over amazingly long distances. Separate call and press to talk buttons. 2-wire connections. 1000's of applications. Beautifully finished in ebony. Supplied complete with batteries and wall brackets. £6.19.6. P. & P. 3/6.



SINCLAIR EQUIPMENT

Z12 12 watt amplifier, 89/8
P24 Power Supply Unit 89/8
Stereo 25 Preamp. £9.19.6
Q14 Speakers £7.19.6
Micromatic Radio Kit 49/6. Built 59/8.
Now In Stock
IC10 59/6. All post paid.

SPECIAL OFFER
Two Z12 Amps., P24 Power Supply, Stereo 25 Preamp/amp, £25, or with two Q14 speakers, £37.

NEW SINCLAIR 2000 SYSTEM

35 watt Integrated Amplifier, £29. Carr. 5/-
Self-powered FM Tuner, £25. Carr. 5/-.

HOSIDEN DH04S 2-WAY STEREO HEADSETS



Each headphone contains a 2 1/2in. woofer and a 1/2in. tweeter. Built in individual level controls. 8Ω imp. 35-18,000Ω/s with cable and stereo plug. £5.19.6. P. & P. 2/6.

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/-.

RECORDING HEADS
Renter i-track. As fitted to Collaro Mk. IV and Studio Decks. High imp. record playback, low imp. erase. Lower track only. Brand new. 18/6 pair.
COSMOCORD i-track heads. High imp. record/playback 65/- Low imp. erase 20/-
MARRIOTT i-track heads. High imp. record/playback 65/- 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
3 1/2in. 600ft. T.P. mylar 10/-
5in. 600ft. std. plastic 5/6
5in. 900ft. L.P. acetate 10/-
5in. 1,200ft. D.P. mylar 15/-
5 1/2in. 1,200ft. L.P. acetate 12/6
5 1/2in. 1,200ft. L.P. mylar 18/-
5 1/2in. 1,800ft. D.P. mylar 32/6
5 1/2in. 2,400ft. T.P. mylar 39/6
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 £3 post paid.

MAXELL TAPE CASSETTES

C60, 10/8; C90, 14/8; C120, 19/8. Post extra

G.W. SMITH & CO (RADIO) LIMITED
3 and 34, LISLE STREET, O1-437 8204
LEICESTER SQ. LONDON, W.C.2 O1-437 9155
311, EDGWARE RD., LONDON, W.2 O1-262 0387
[ALL MAIL ORDERS TO: 3, LISLE STREET, LEICESTER SQUARE, LONDON, W.C.2]

Or Kn
9 a.m. to 6 p.m.
every day Monday to Saturday
(Edgware Road 4 days Thurs.)
Trade supplied.

Lasky's

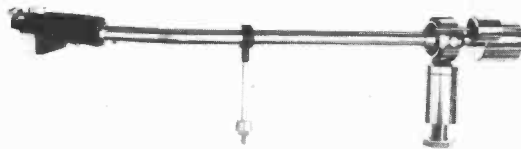
AMAZING VALUE AD-309K PICK-UP ARM

FITTED WITH
AD-76K CARTRIDGE

This new AUDIO DEVELOPMENT precision counterbalanced pick-up arm—ready fitted with the outstanding AD-76K magnetic cartridge—offers a truly remarkable breakthrough in quality and value for the Hi-Fi enthusiast. The arm is constructed of brass throughout, heavily chrome plated, uses needle and miniature ball race bearings; both coarse and fine balance adjustment is provided. The fixed head has standard 1/4 in. mounting centres and is finished in black enamel with chrome lifting handle. Tech. details: Overall length 285mm; needle to pivot length 223mm; offset angle 24°; overhang 10mm. Requires single 1/4 in. dia. mounting hole. Completely wired, with all fixing nuts and washers. Arm rest also supplied.

BRIEF DETAILS OF AD-76K. Magnetic cartridges: High compliance with stereo diamond LP stylus/Output 5mV, frequency response: 20-20KHz, tracking weight 2 grammes.

LASKY'S PRICE £9.19.6 Post 5/-



TMK METER KITS ANOTHER LASKY'S EXCLUSIVE

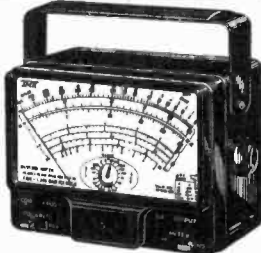
These two meter kits by TMK offer both the professional, electronics hobbyist and student the unique opportunity of building a really first-class precision multimeter at a worthwhile saving in cost. The impact resistant bakelite cabinets are supplied with the meter scale and movement mounted in position; the model 200 also has the rotary range selector in position.



MODEL 200 20,000 O.P.V. Multimeter. Features 24 measurement ranges with mirror scale. Large 3 x 2 1/2 in. meter. Full scale accuracy: DCV and current: $\pm 2\%$, ACV: $\pm 3\%$, resistance $\pm 3\%$. Special 0-6V DC range for transistor circuit measurements.

LASKY'S PRICE 85/- Post 3/6

MODEL 5025
50,000 O.P.V.
FEATURING 57
MEASUREMENT
RANGES



A highly reliable instrument using an entirely new range selection mechanism which permits the use of a really large meter in a more compact cabinet. The range selected is clearly indicated on the actual meter face facilitating instant identification without taking your eyes from the meter. High speed rotary range selection knob; also features polarity reversal switch, shielded meter movement, with overload protection circuit; Special uA and mA measurement ranges.

SPECIFICATION

● DCV: 0-0.25-2.5-10-50-250-1,000V at 25K/OPV. 0-0.125-1.25-5-0.25-125-500V at 50K/OPV. ● ACV: 0-3-10-50-250-1,000V at 25K/OPV. 0-1.5-5-25-125-500V at 50K/OPV. ● DCuA: 0-25uA at 125mA; 0-50uA at 250mA. ● DCmA: 0-2.5-25-250mA at 125mA; 0-5-50-500mA at 250mA. ● DC Amps: 0-5A at 125mA; 0-10A at 250mA. ● Resistance: 0-10M/ohms (13, 65, 650, 6.5K and 65K/ohms at centre scale). ● Output: Capacitor (0.1uF, 400V) in series with ACV ranges. ● Decibels: -20 to +81.5dB in 10 ranges. ● Operates on two 1.5V (U7 type) batteries. Black bakelite cabinet, size 5 1/2 x 6 1/2 x 2 1/2 in. Strong, resilient plastic handle. Complete with test leads.

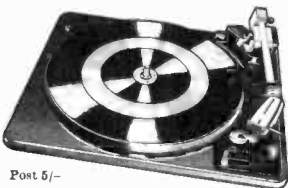
LASKY'S PRICE £10.10.0 Post 5/-

ALSO AVAILABLE READY BUILT AND TESTED £13.10.0, Post 5/-

Garrard

SP25 MkII

**LASKY'S
PRICE £11.19.6**



Post 5/-

AUTOCHANGERS

1025 less cartridge £6.9.6
1025 with GCM21 mono cartridge. Stereo comp. £6.19.6
2025TC with GCM21 mono cartridge. Stereo comp. £7.19.6
SL55 with J2006 stereo cartridge £11.19.6
SL65 less cartridge £14.15.0
SL75 less cartridge £28.10.0
SL95 less cartridge £35.0.0
AT 60 Mk II less cartridge £13.19.6
AT 60 Mk II £13.5.0
BSR UA47 less cartridge £5.9.6

SINGLE PLAYERS

AP75 with AD 86K magnetic

cartridge £21.10.0
AP75 less cartridge £18.10.0
SRP22 Mains model less cartridge £16.12.10
SRP22 Battery model less cartridge £7.15.3
TRANSCRIPTION DECKS
401 £28.10.0
GARRARD BASES
WB1 £3.8.11; WB4 Mk II £5.8.11; WB5 £5.8.11
CLEARVIEW PERSPEX COVERS:
SPC1 £3.5.0; SPC4 MK II £4.6.6
Postage on all above

tion. The highest quality components and 1% tolerance resistors are used throughout

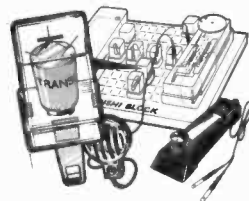
Both offer professional standards of accuracy. Supplied complete in every detail with full constructional, circuit and operating instructions.

SPECIFICATION

● DCV: 0-0.6-6-30-120-600-1200V at 20K/OPV. ● ACV: 0-0.6-6-30-120-600-1200V at 10K/OPV. ● DC Current: 0-0.05-0.5-5-50-500mA. ● Resistance: 0-10K-100K-1M-10M ohms (58-580-5.8K-58K at mid-scale). ● Capacitance: 0-0.002-0.2uF (AC 6V range). ● Decibels: -20 to +83dB. ● Output: 0.05uF blocking capacitor. Uses two 1.5V (U7 type) batteries. Black bakelite cabinet—Size 5 1/2 x 3 1/2 x 1 1/2 in. Complete with test leads.

DENSHI BOARD KITS

NEW EXPERIMENTAL AND EDUCATIONAL CIRCUIT SYSTEM



The DENSHI BOARD system enables the young experimenter and electronics hobbyist to produce a wide range of transistor circuits of increasing sophistication—without soldering or the use of any tools at all! Basically the system comprises a slotted circuit board into which plug-in components and bridge pieces are set to produce up to 30 different circuits. The components are encapsulated in transparent plastic blocks bearing the appropriate circuit symbol and value thus enabling even the complete novice to visually grasp the fundamentals of circuitry after only a few moments study. In addition each DENSHI BOARD KIT comes complete with an 80 page manual of circuits and data.

DENSHI BOARD KIT SR-1A comprises:

Base board; tuner block; 4 resistors; choke coil; transformer; 2SA transistor for RF; 2 diodes; 3 capacitors; battery block; Morse key; antenna lead; crystal earphone; various bridge and connecting pieces and 80 page manual. This kit permits the building of 16 basic circuits.

Post 3/6

THESE ARE JUST A FEW OF THE
CIRCUITS YOU CAN BUILD IN
MINUTES:

VARIOUS RADIO RECEIVERS, AMPLIFIERS, MORSE CODE PRACTICE DEVICE, CONTINUITY TESTER, SIGNAL INJECTOR, SIGNAL TRACER, WIRELESS MICROPHONE ETC., ETC.

LASKY'S PRICE £4.19.6 Post 3/6

DENSHI BOARD KIT SR-2A as SR-1A but with the following additional parts: 2SB transistor for AF; 2 resistors; 1 capacitor; crystal microphone; test probes; electrode additional connecting pieces; 9V battery. This kit permits the building of 30 basic circuits

LASKY'S PRICE £7.2.6 Post 2/6

GET YOUR LASKY'S AUDIO-TRONICS PICTORIAL

16 colour page catalogue in large 16 x 11 in. format packed with 1,000's of items from our vast stocks. Hi-Fi, Radio, Electronics, Test Equipment, Components etc., etc.
Send 1/- for post only and inclusion on our regular mailing list (5/- overseas)

Lasky's Radio Limited

Branches

207 EDGWARE ROAD, LONDON, W.2

Tel. 01-723 3271

33 TOTTENHAM CT. RD., LONDON, W.1

Tel. 01-636 2605

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

152/3 FLEET STREET, LONDON, E.C.4

Tel. 01-353 2833

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

LASKY'S RADIO ESTABLISHED OVER
36
YEARS
Tel. 01-790 4821

SCOOP!

THE WORLD'S SMALLEST
6 TRANSISTOR TWO WAVE-
BAND RADIO RECEIVER
FROM RUSSIA

THE ASTRAD ORION



Made to the highest Russian space-age standard—this remarkable micro-size set measures only 1 1/4" x 1 1/2" x 5/16", yet it contains 6 transistors and other components combined in a photo etched circuit, only 7 x 1/2" 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 160 kc/s, Long wave 150 kc/s to 408 kc/s. Sensitivity—33mV max. Selectivity—10dB (at 30 kc/s detuning). Power consumption 4mA max. Power source: 1 x 1.4V Mercury battery (Mallory type RM625 or equivalent).

The Orion is supplied fully built and tested complete with battery, left and right fitting earphone supports and attractive black and ivory plastic presentation/carrying case (matching the Orion). Never miss your favourite music, sport, news—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

BATTERY CHARGER UNITS

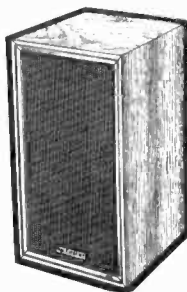
*NOTE: The battery we supply with the Orion is a rechargeable type. Charger units are available enabling you to re-charge the battery from AC Mains 220/240V supply.

Price 19/6 post free with radio—otherwise 2/-.

NEW FOSTER "Criterion" Mk II

2 SPEAKER TWO WAY BOOKSHELF
SPEAKER SYSTEM

Another high quality sub-miniature bookshelf system from Foster. The "Criterion" Mk II is a sealed infinite baffle type enclosure using 5 1/2" bass/mid range woofer with rolled cloth edge and a 2 1/2" HF cone type tweeter. The compact cabinet is constructed of 1/2" 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". The performance of the "Criterion" is superior to many larger and more expensive units and at Lasky's exclusive price offers absolutely unbeatable value.

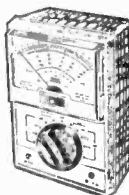


Lasky's Price £9.10.0 or 2 for £18

Post 1-7/8. 2-12/8.

TTC MODEL C-1000

A really tiny 1,000 O.P.V. pocket multi-tester with "big" meter performance. Precision 2 jewel meter movement. Hand calibrated to $\pm 3\%$ accuracy on full scale of DC ranges, 4% on AC ranges. 2 1/2" square meter. SPECIFICATIONS AC/V ranges: 0-10, 50, 250, 100V at 1K/O.P.V. DC currents: 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 instructions with circuit data.



LASKY'S PRICE 39/6 Post 2/6



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 4 1/2 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. PW11D, Nailsea, Bristol BS19 2LP

WIRECOMP ELECTRONICS

LONDON'S LEADING
BARGAIN SPECIALISTS

FOR THE RADIO • HI-FI
& ELECTRONICS ENTHUSIAST

Special displays of radios, recorders, record decks, tuners, amps, meters, speakers, etc., etc. ALL faulty or damaged needing repair—

AT GIVE AWAY PRICES!

100's of component bargains from our easy to see and choose from self service racks.

100's OF OLD TYPE VALVES — from 2/- each

ASSORTED TRANSISTORS 9d each. 7/6 per doz

Huge stocks of shop soiled and reconditioned second hand radios, record players, tape recorders, etc.

SPOT CASH PART EXCHANGES

WE OFFER THE HIGHEST RATES IN LONDON

There's something for everyone

COME AND LOOK TODAY (Open 6 days a week!)

ALL THESE ITEMS ARE AVAILABLE TO CALLERS ONLY

PERSONAL CALLERS TO:

48 TOTTENHAM CT. RD., W.1

Tel. 01-636 0647

SENSATIONAL STEREO OFFERS!

SAVE
UP TO
33 1/3%
OFF OUR
STEREO
SYSTEMS

NuSound
BRITAIN'S LARGEST SPECIALISTS

As Britain's Largest Specialists our tremendous purchasing power enables us to offer you the famous makes—Garrard, Goldring, Rogers, Decca, Wharfedale, Arena, Philips, etc., etc.—at unbelievably low prices. We offer over 30 Hi-Fi Stereo Systems utilising these famous makes all showing substantial savings off our normal list prices. A NUSOUND STEREO SYSTEM represents the finest value for money available today. Every system is complete with all leads, plugs etc., fully guaranteed and backed by 100% NuSound after sales service. Illustrated literature and technical data sent by return of post (Dept. PW1NR).

24 OXFORD STREET, LONDON, W.1

Tel: 01-580 4638, 4639, 5755

50 yards from Tottenham Ct. Road Tube
Open 6 days a week

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

30 WATT OUTPUT

★ Goldring Transcription Turntable on Plinth
★ Shure or Goldring Magnetic Pick-up Cartridge
★ Super 30 Amplifier in veneered housing
★ Pair of Stanway II Loudspeaker Units
Special total price. Four fully wired units ready to "plug-in". Carr. 30/-
TERMS AVAILABLE ALL PACKAGE OFFERS

86 Gns.

AUDIOTRINE HIGH FIDELITY LOUSPEAKERS



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 £25.15.0
HF101L 5" 10W £7/9 HF120 12" 15W 79/9
HF801D 8" 8W 59/9 HF120D 12" 15W 79/9
HF811D 8" 10W 4 gns. HF126 12" 15W £25. 5.0
HF102D 10" 10W 65/- HF126D 12" 15W £25.15.0

HIGH FIDELITY LOUSPEAKER UNITS

Cabinets latest style Satin Teak or Afrormosia veneer. Acoustically lined or filled woollen damping. Ported where appropriate. Credit terms available

DORCHESTER Size 16 x 11 x 9in. Appr. Range 45-15,000 c.p.s. Rating 8-10 watts. Fitted High flux 13 x 8in. Dual £8.19.9
Cone spkr. Imp. 3 or 15 ohms Carr. 7/6

STANWAY II Size 20x10x9in. Rating 10 watts. Incorporating Fane 13x8in. speaker with rubber cone surround and 11,000 line magnet. High flux tweeter. Handsome Scandinavian design cabinet. net. Range 35-20,000 c.p.s. Imp. 15 ohms Carr. 16 Gns.

GLOUCESTER Size 25 x 16 x 10in. 12in. High flux 12,000 line speaker. Cross-over unit and Tweeter. Rating 10 watts. Frequency range 12 1/2 Gns. 40-20,000 c.p.s. Impedance 15 ohms

E2 CABINET Size 17" wide 14" deep, 11" high. Cut for TA12. Super 15, Super 30 and other amplifiers. Roll over transp. plastic cover. Satin Teak or Afrormosia veneer finish 8 Gns. Inc. carr.

MOTOR BOARDS cut for Garrard Turntables and many other units. Price 12/9

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. -24dB. Harmonic Distortion 0.3% at 1,000 c.p.s. Separate Bass and Treble Inc. Carr. 7/6

"lift" and "cut" controls. 3 input sockets for Mike, Garr. Radio or Tape. Input selector switch. Output for 3-15 ohm spkrs. Max. sensitivity 5mV. Output rating, I.H.F.M. Fully enclosed enamelled case, 9 1/2 x 2 1/2 x 5 1/2 in. Attractive brushed silver finish fascia plate 10 1/2 x 3 1/2 in. and matching knobs. Complete kit of parts with full wiring diagrams and instructions. Carr. 7/6

Or factory built with 12 months guarantee. £28.19.9

R.S.C. SUPER 30 Mk II 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
HARMONIC DISTORTION 0.1% at 10 watts 1,000 c.p.s.
CROSS TALK 52 dB at 1,000 c.p.s.

BRADFORD 10 North Parade. (Half-day Wed.) Tel. 25349
BLACKPOOL (Agent) O. & C. Electronics, 227 Church Street
BIRMINGHAM 30/31 Gt. Western Arcade 021-236-1279 (Half-day Wed.)
DERBY 26 Osmaston 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

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 one branch within 3 months. See leaflet.



EXTREMELY ATTRACTIVE PLINTHS finished in Teak or Afrormosia veneer. Transparent plastic "roll over" cover.

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

RP2 Garrard SP25 Mk II (with heavy turntable) fitted Goldring CS90 high compliance ceramic Stereo/Mono cartridge with diamond stylus. Inc. Carr. 22 Gns.

RP3 Goldring Lenco GL68 Transcription unit and CS90 cartridge. Inc. Carr. 28 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. 59/9 Available with transp. plastic cover. Inc. Carr. 6 Gns.

INTEREST CHARGES REFUNDED On Credit Sales settled in 3 months.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
Total cost of parts with detailed wiring diagrams & instructions. 14 Gns. Inc. Carr. 7/6

Or factory built 16i gns. Or in Teak finished cabinet as illustrated 19i gns. Terms: Deposit £5 and 9 monthly payments £2. Total £23.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER
★ High-sensitivity VHF-FM. A.C. Mains operation. ★ Sharp A.M. Rejection. ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Simple alignment instructions. ★ Output available for feeding tuning meter. ★ Output for feeding Stereo Multiplexer. ★ Tuner head uses silicon Planar Transistors. ★ Designed for co-axial input. Visually matching our Super 15 or Super 30 amplifiers and of the same high standard of performance and reliability. The pre-wired tuning head facilitates speed and simplicity of construction. Printed circuitry. Only high grade transistors and components used. A quality product at considerably less than the cost of comparable units. Stereo version. all parts 20 Gns. Inc. carr. Assembled 22i Gns. Inc. carr.

30 WATT OUTPUT

★ Garrard SP25 Mk II Turntable on Plinth
★ Goldring CS90 Ceramic P.U. Cartridge with diamond stylus
★ Super 30 amplifier in veneered housing
★ Pair Stanway II Speaker Units
Four fully wired units ready to "plug-in". Special total price 76 Gns. Carr. 30/-

13 WATT OUTPUT

★ Garrard SP25 Mk II 4 sp player unit on plinth
★ Goldring CS90 Ceramic P.U. Cartridge
★ TA12 Amplifier in veneered housing
★ Pair of Dorchester Loudspeaker Units. Special total price. Carr. 25/-
Or Dep. £10 and 9 mthly payments £25.11.0 (Total £59.19.0). Transparent plastic cover 3 gns. extra

R.S.C. TA12 13 WATT STEREO AMPLIFIER
FULLY TRANSISTORISED, SOLID STATE CONSTRUCTION
HIGH FIDELITY OUTPUT OF 4.5 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 Fascia and Knobs. Complete kit of parts with full wiring diagrams & instructions. Factory built with 12 mthly guarantee 16 Gns. Or Deposit £5.2.6 and 9 mthly pymts 31/6 (Total £19.6.0) Or in Teak or Afrormosia veneer housing 19i Gns. Dep. £5.10.6 and 9 mthly pymts 39/- (Total £23.1.6).

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 surprising realistic reproduction. £5.15.0
Or Senior 15 watt inc. HF 126 15,000 line Speaker £6.15.0 Carr. 6/6

LINEAR L10 HIGH FIDELITY 10W 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. Prices Inc. carr. £4.10.0

JF8 Size 16 x 11 x 9in. Pressurised. Gives pleasing results with any 8in. HI-FI speaker. £5.10.0
SE8 For optimum performance with any 8in. HI-FI speaker. Size 22 x 15 x 9in. Ported. £5.10.0
SE10 For outstanding results SE12 For excit princnce with 12in HI with 10in HI-FI spkr £5.15.0 F1 speaker and Tweeter. £6.15.0
Size 24x15x10in. P.t.d. Size 25 x 16 x 10in.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.

SUPER 15 MONO 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 1/2 Gns. or factory built 15i 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.



MAIL ORDERS TO: 102 Henconner 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 please. Open all day Sats.

Mail Orders must not be sent to shops

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 Blackett Street (Opp. Fenwicks Store) (Half-day Wed.) Tel. 21469 **NEWCASTLE UPON TYNE**
13 Exchange Street (Castle Market Bldgs.) (Half day Thursday) Tel. 20716 **SHEFFIELD**

THE 'YORK' HIGH FIDELITY 3 SPEAKER SYSTEM

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

DEMONSTRATIONS AT ALL BRANCHES

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 units: Hum level -70dB. Frequency response +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 36 mV. 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. 500c/s A.C. mains. For 3 and 15 ohm speakers. Complete kit of parts with point-to-point wiring diagrams and instructions. Carr. 12/6

Twin-handled perforated cover 27/6. Supplied factory built with EL34 output valves. 12 months' guarantee for 18 gns. TERMS: Deposit £6.3.0 and 9 monthly payments of 34/- (Total £21.9.0). 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 associated controls allowing mixing of 'mike' and gram, etc. etc. High sensitivity. 5 valves—ECC83 (2), EL84 (2), EZ81. High quality sectionally wound output transformer. IND. BASS AND TREBLE CONTROLS. Frequency response +3dB 30-20,000 c/s. Hum level -70dB. SENSITIVITY 40 millivolts. For Crystal or Ceramic P.U.'s. High Impedance. For Musical Instruments such as String Bass, Electronic Guitars etc. Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 cps 9 1/2 Gns. Output for 3 and 15 ohm spkrs. SAE for leaflet. Complete kit. Full instructions and point-to-point wiring diagrams. Carr. 11/6 (or factory built 12 1/2 gns). Twin handled metal cover 27/6. TERMS ON ASSEMBLED UNITS. Deposit 99/6 and 9 monthly payments of 23/- (Total £15.6.6)

R.S.C. BASS-REGENT

50 WATT AMPLIFIER



An exceptionally powerful 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. £13.4.9 and 9 monthly payments of 25.11.9. (Total 601 gns.). Send S.A.E. for leaflet. G100 100 watt peak output with Pr. speaker column and a Bass Unit (Six 12" and Two 15" Spkrs.) 99 1/2 gns

R.S.C. BATTERY/MAINS CONVERSION UNITS



Type BM1 An all-dry battery eliminator. Size 5 1/2 x 4 1/2 x 2 1/2 in. approx. Completely replaces batteries supplying 1.5v. and 90v. where A.C. mains 200/250v. 500c/s is available. Complete kit with diagram 49/11 or assembled 59/11.

SELENIUM RECTIFIERS (Bridged)

All 6/12v. D.C. output. Max. A.C. input 18v. 1a. 4/3. 2a. 6/11. 3a. 9/9. 4a. 12/8. 6a. 15/9.

R.S.C. MAINS TRANSFORMERS

FULLY GUARANTEED. Interleaved and Impregnated. Primaries 200-250v. 500c/s. Screened

MIDGET CLAMPED TYPE 2 1/2 x 2 1/2 in.

250v.-60mA, 6-3v. 2a. 18/11

250-0-250v., 60mA 6-3v. 2a. 18/11

FULLY SHROUDED UPRIGHT MOUNTING

250-0-250v. 60mA, 6-3v. 2a., 0-5-6-3v. 2a. 23/9

250-0-250v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

300-0-300v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

300-0-300v. 130mA, 6-3v. 4a., c.t., 6-3v. 1a. 45/9

For Mullard 510 Amplifier

350-0-350v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

350-0-350v. 150mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

425-0-425v. 200mA, 6-3v. 4a., c.t., 5v. 3a. 75/9

425-0-425v. 200mA, 6-3v. 4a., 6-3v. 3a., 5v. 3a. 79/11

450-0-450v. 250mA, 6-3v. 4a., c.t., 5v. 3a. 93/6

TOP SHROUDED DROP-THROUGH TYPE

250-0-250v. 70mA, 6-3v. 2a., 0-5-6-3v. 2a. 23/9

250-0-250v. 100mA, 6-3v. 3-5a. 25/9

250-0-250v. 100mA, 6-3v. 2a., 6-3v. 1a. 26/9

350-0-350v. 80mA, 6-3v. 2a., 0-5-6-3v. 2a. 27/9

250-0-250v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

300-0-300v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

300-0-300v. 130mA, 6-3v. 4a., 0-5-6-3v. 1a. 44/9

Suitable for Mullard 510 Amplifier

350-0-350v. 100mA, 6-3v. 4a., 0-5-6-3v. 3a. 27/9

350-0-350v. 150mA, 6-3v. 4a., 0-5-6-3v. 3a. 45/11

FILAMENT or TRANSISTOR POWER PACK Types

6-3v. 1.5a. 7/9; 6-3v. 2a. 8/9; 6-3v. 3a. 10/9; 6-3v. 6a. 21/9; 12v. 1a. 8/9; 12v. 2a. 9/9; 12v. 1.5a. 21/9; 0-9-18v. 1 1/2a. 17/9; 0-12-25-42v. 2a. 29/9.

CHARGER TRANSFORMERS 0-9-15v. 1 1/2a. 14/11; 2 1/2a. 17/9; 3a. 19/11; 5a. 25/9; 6a. 27/9; 8a. 33/9.

AUTO (Step UP/step DOWN) TRANSFORMERS

0-110/220v. 250-250v. 50-50 watts 13/9

150 watts 29/11; 250 watts 49/9; 500 watts 99/9

OUTPUT TRANSFORMERS

Standard Pentode 6,000Ω to 7,000Ω to 3Ω .. 8/9

Push-Pull 8 watts EL84 to 3Ω or 15Ω .. 12/9

Push-Pull 10 watts 6V6 ECL86 to 3, 5, 8 or 15Ω .. 22/9

Push-Pull EL84 to 3 or 15Ω 10-12 watts .. 21/9

Push-Pull Ultra Linear for Mullard 510, etc. 39/9

Push-Pull 15-18 watts, sectionally wound 6L6, KT66, etc. for 3 or 15Ω .. 35/9

Push-Pull 20 watt high quality sectionally wound EL34, 6L6, KT66 etc. to 3 or 15Ω .. 59/9

SMOOTHING CHOKES

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

FANE POP 30c LOUDSPEAKERS

12in. 8-15Ω 25 watts R.M.S. £5.19.9
continuous. Dual cone. Carr. free



R.S.C. COLUMN SPEAKERS Covered in two-tone Rexine/Vynal. Ideal for vocalists and Public Address. 15 ohm matching. C57 15 watts inc. five 7 x 4in. speakers £7.19.11.
TYPE C48 30 WATTS. Fitted four 8in. high flux 8 watt speakers. Overall size approx. 42 x 10 x 5in. Or deposit 67/- and 9 mthly pmts 34/9 (Total £18.18.9) Carr. 10/-
TYPE C4125 50 WATTS. Fitted four 12in 11,000 line 15 watt speakers. Overall size 56 x 14 x 9in. approx. Carr. 15/-
Or Deposit £6.17.6 and 9 monthly payments of 64/9 (Total £30.7.0).

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. Current valves. Peak output rating. Strong Rexine covered cabinet with handles. Attractive black/gold perspex facia. 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 mthly payments of 39/8 (Total 22 gns). Carr. 12/6



F.A.L. 'Phase Fifty' PUBLIC ADDRESS AMPLIFIER

Solid State Circuitry. 50 Watts Peak Output. 3 separately controlled inputs for mixing purposes. Separate Bass and Treble Controls. Output for loudspeakers 3-30 ohms. Suitable for Dynamic, Ribbon or Crystal Mikes. For Clubs, Theatres, Restaurants, Hotels, Schools, etc. For Vocal or Instrumental Groups. Send S.A.E. for leaflet. only 29 Gns.

HIGH QUALITY LOUDSPEAKERS

In Teak or Afrormosia veneered Cabinets
1 1/2 13" x 8" 10 Watt L12 12
10,000 lines £4.19.9 20 Watt 10,000 lines £8.19.9
3 or 15 ohms Carr. 7/6 15 ohms Carr. 8/9



FANE ULTRA HIGH POWER LOUDSPEAKERS

All power ratings are R.M.S. continuous. 2 year guarantee. High Flux 14,000 line ceramic magnets. Heavy cast chassis.

'POP' 100	'POP' 60	'POP' 50
18" 100 Watt	15" 60 Watt	12" 50 Watt
21 GNS.	12 GNS.	10 GNS.
Carr. free	Carr. free	Carr. free

POWER PACK KIT

Consisting of Mains transformer, Metal Rectifier, Electrolytics, smoothing choke, chassis and circuit. 200/250v. A.C. mains. Output 250v. 60mA 6-3v. 2a. Supplied with case in lieu of chassis 29/11. Or assembled 39/11.

MINI-8 HI-FI Loudspeaker Units Special Offer

Teak or Afrormosia veneered cabinet, size approx. 10 1/2 x 6 1/2 x 7 1/2 in. Carr. free
Peak power handling 8 watts 3-5 ohms. Inc. Carr. 69/11



We put 23,340 cigarettes in our Budget combination storage unit!

Think what you could put in it!
Storage. Lots of it. for a thousand things you stock; replacement parts; light bulbs; cameras; anything up to 7 x 8 x 10 1/2 in. Safety drawer-stops as 'standard'. Smooth guide runners 'throw-out'. All in a compact 3ft. 6in. high, 2ft. 11in. wide, 11in. deep area. Ready assembled, in handy enamelled green or grey. With 18 drawers, 6 large 8 king-sized drawers. At £17 5s. worth every penny! See the rest of the N. C. Brown range!



Send your FREE BROCHURE ☐ or Send ☐ (how many) Budget Storage Units at £17. 5s. in green or grey.

NAME
ADDRESS
Dept. P.W. Eagle Steelworks, Heywood, Lancs. Tel: 69018
London: 25-27 Newton St., W.C.2. Tel: 01-405 7931

14 WATT HI-FI AMPLIFIERS

High sensitivity. Two separate inputs. Two vol. controls for mixing purposes. Separate Bass and Treble Controls. Valves ECC83, ECL86, ECL86, EZ80. Output for 15 ohm Loudspeaker. 200-250v 50 c.p.s. A.C. mains operation. Size approx. 8 x 8 x 6in. Factory built and fully guaranteed. Limited number to clear at £7-19-11 10/-

Learn at home... First Class Radio and TV Courses

get a
certificate

After brief, intensely interesting study—undertaken at home in your spare time—**YOU** can secure a recognised qualification or extend your knowledge of Radio and TV. Let us show you how.

FREE GUIDE

The New Free Guide contains 120 pages of information of the greatest importance to both the amateur and the man employed in the radio industry. Chambers College provides first rate postal courses for Radio Amateurs' Exam., R.T.E.B. Servicing Cert., C. & C. Telecoms., A.M.I.E.R.E. Guide also gives details of range of certificate courses in Radio/TV Servicing, Electronics and other branches of engineering, together with particulars of our remarkable terms of

'Satisfaction or Refund of Fee'

Write now for your copy of this valuable publication. It may well prove to be the turning point in your career.

Founded 1885—Over 150,000 successes

CHAMBERS COLLEGE

(Incorp. National Inst. of Engineering)
(Dept. 805F) 148 Holborn, London, E.C.1.

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., 7½v. and 9v. DC. attractive case with indicator light, mains lead output socket, plug and lead.
Size 4½ x 3½ x 2½ in.
(Extra lead with DIN plug for Cassette Recorders 7/6)



57/6 P. & P. 2/6



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 P. & P. 5/-

£4.15.0

MAJOR POWER PLUS

MAINS UNITS

For single outputs, 6v, 9v, 12v, 18v, 30/6.
For two separate outputs, 4½v + 4½v,
6v + 6v., 9v + 9v. 42/6. P. & P. 2/6 per unit. (Please state outputs reqd.)



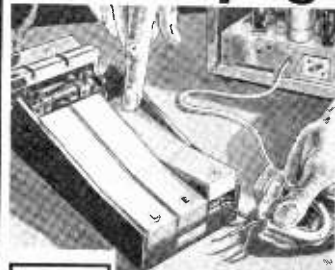
R.C.S. PRODUCTS (RADIO) LTD.

(Dept. P.W.), 31 Oliver Road, London, E.17

MAINS Keynector

A REVOLUTIONARY PRODUCT

cuts out plugs



SAFEST & QUICKEST WAY TO CONNECT ELECTRICAL EQUIP- MENT 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 1½ in. Price 39/6, plus 5/- p & p

E. B. INSTRUMENTS

DIVISION OF ELECTRONIC BROKERS LTD
49-53 PANCRAS ROAD, LONDON, N.W.1
Telephone: 01-837 7781

BIGGEST BREAKTHROUGH IN RADIO KITS!

THE REVOLUTIONARY APOLLO "6" CAN BE BUILT

SPECIALLY made for the thousands of discriminating people who want the finest easy-to-build radio... at a reasonable price! This is a different breed—it will startle you! EIGHT MONTHS AGO our two designers were briefed to produce a radio kit that would fill these technical demands:—DEMAND—A. IT SHOULD BE POSSIBLE TO BUILD PAINLESSLY IN ONE EVENING... ANSWER—the Apollo "6" has simplified, well illustrated step-by-step plans.

CONTAINS FEATURES THAT CAN'T BE BOUGHT IN READY MADE SETS—AT ANY PRICE

- receives medium wave & trawler broadcasts.
 - every component brand new—no surplus rejects or "seconds".
 - uses latest Silicon Planar Epitaxial Epoxy transistors.
 - six stage stable reflex—2 R.F., 1 Diode demodulation, 3 A.F.
 - simplified illustrated plans.
 - from parts to programmes in an evening
- ... PLUS MANY MORE!

No soldering iron is necessary and you don't have to have a magnifying glass and a pair of tweezers. DEMAND—B. IT SHOULD WORK FIRST TIME... —ANSWER—Apollo "6" uses latest rugged Silicon Transistor Circuitry and every single transistor, diode, capacitor, resistor, inductance etc. is brand new and fully tested—no surplus parts, no manufacturers

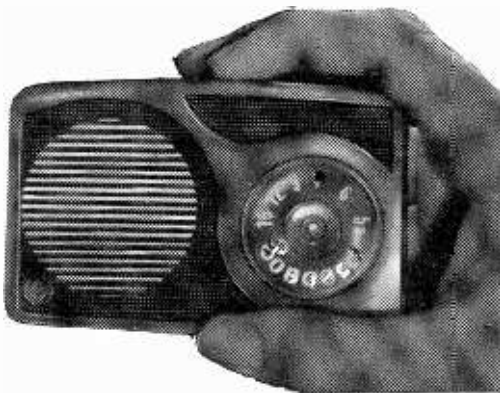
rejects, no manufacturers' seconds", and uses "Ever Ready" battery. DEMAND—C. IT MUST HAVE THE POWER TO OPERATE. RATE OPTION: AL LOUDSPEAKER... DEMAND—D. IT MUST GIVE GOOD RECEPTION IN DIFFICULT AREAS... DEMAND—E. IT MUST WORK ON ITS OWN INTERNAL FERRITE ROD AERIAL. ETC. ETC. ANSWER—The Apollo "6" does all this—and much more! REVOLUTIONARY SILICON PLANAR EPOXY CIRCUIT DESIGN

Apollo "6" will probably be bang up-to-date well into the seventies! it bristles with latest technical innovations. Six stage stable reflex N.P.N. and P.N.P. circuit consisting of 2 Radio Frequency stages, 1 Diode demodulation stage and 3 Audio Frequency stages. Uses latest Silicon Planar Epitaxial Epoxy transistors (similar to types used in America's Space

IRON CLAD GUARANTEE

Should you not be completely satisfied with your purchase when you receive it from us, your money will be refunded in full, at once and without quibble or question...

Project). The first two transistors give amplification of 100 to 400 each, (at only 100 Microamps collector current approx). Output transistor gives amplification



of 235 to 470. Stable reflexing gives the Apollo "6" staggering selectivity, uncanny sensitivity, true-to-life sound reproduction—in fact its range, power and selectivity must be experienced to be believed. Enter a new magic world of reception—station after station (home and abroad).

THRILLING SOUND OF AN SOS AT SEA

Listen to the thrilling sound of an SOS at sea—tune in to a world you've never heard before... NOTE. Because members of our own Staff (and their friends) are enthusiastic and have already bought Apollo "6" parts we know demand will be enormous. DON'T DELAY—SEND FOR YOURS NOW, send 59/6 + 3/6 P. & P. for all parts, illustrated plans, personal listening earpiece etc. (all parts can be bought separately) MONEY BACK GUARANTEE (see panel).

Orders despatched in strict rotation.

PHOENIX ELECTRONICS (Dept. PW5) 18 Little Preston St, Brighton, 1. Sussex.



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 lin. of a MW band radio full coverage of VHF Aircraft Band 108-136 Mc/s can be obtained. All transistor, 9v battery operation. Fully tunable 18in. x 7 section telescopic aerial. Size 4 x 2 1/2 x 1 1/2 in. 79/6. P. & P. 3/6.



MODEL MAKER'S MOTOR
No. 15RM. Voltage 1.5v.
Current 400mA. Torque 12g-cm. Body size 1 1/2" long x 1/2" dia. Shaft 5/16" long x 1/16" dia. Ideal for small models and toys. 5/6 ench.



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 25-13,000cps. With lead and stereo plug. Only 59/6. P. & P. 3/6.



NEW STEREO/MONO HEADPHONES

8DH-7. Soft rubber earpieces with slide switch for mono/stereo listening and ind. vol. controls. Impedance 8-16 ohm. Freq. response 25-15,000 cps. With lead and stereo plug. 56.8/6. 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 230/250v. Output 13v. at 0.5 amp. 12/6. P. & P. 2/6.

HI-TONE RECORDING TAPE

BRITISH MADE. TOP QUALITY			
J1001	3"	Long Play PVC	225ft. 5/6
J1002	3"	Triple Play Poly	600ft. 10/6
J1003	5"	Long Play PVC	900ft. 10/-
J1004	5"	Double Play Poly	1200ft. 15/-
J1005	5 1/2"	Long Play PVC	1200ft. 12/6
J1006	5 1/2"	Double Play Poly	1800ft. 22/6
J1007	7"	Standard Play PVC	1200ft. 12/6
J1008	7"	Long Play PVC	1800ft. 17/6
J1009	7"	Double Play Poly	2400ft. 25/-
J1010	7"	Triple Play Poly	3600ft. 50/-



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 0-115-200-230-240v except MT113-0-115-210-240v.

MT113	20W	Size 2 1/2 x 1 1/2 x 1 in.	Wgt	11oz	Price 12/6	P & P 2/6
MT14	75W	Size 2 1/2 x 2 1/2 in.	Wgt	1 lb 14oz	Price 21/8	P & P 4/6
MT65	150W	Size 3 1/2 x 2 1/2 x 3 in.	Wgt	3 lb	Price 38/-	P & P 6/-
MT66	300W	Size 4 x 4 x 3 1/2 in.	Wgt	4 lb	Price 39/6	P & P 6/-
MT66	300W	Size 4 x 4 x 3 in.	Wgt	6 lb 7 oz	Price 59/4	P & P 9/-
MT110	400W	Size 4 1/2 x 4 1/2 x 4 in.	Wgt	11 lb	Price 85/-	P & P 10/-
MT67	500W	Size 5 1/2 x 4 x 4 1/2 in.	Wgt	12 lb 8oz	Price 89/-	P & P 10/6
MT83	750W	Size 4 1/2 x 5 1/2 x 5 1/2 in.	Wgt	13 lb 4oz	Price 142/8	P & P 10/6
MT84	1000W	Size 4 1/2 x 6 1/2 x 6 1/2 in.	Wgt	16 lb	Price 142/2	Carr. ex.
MT93	1500W	Size 5 1/2 x 6 1/2 x 6 1/2 in.	Wgt	28 lb 9oz	Price 170/6	Carr. ex.
MT94	1750W	Size 5 1/2 x 6 1/2 x 6 1/2 in.	Wgt	31 lb	Price 195/-	Carr. ex.
MT96	2000W	Size 7 x 7 x 8 1/2 in.	Wgt	40 lb	Price 211/2	Carr. ex.
MT73	3000W	Size 6 1/2 x 7 1/2 x 8 1/2 in.	Wgt	45 lb	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 1/2 in.	Wgt 1 lb
MT71	2 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT69	4 Amp	Size 3 1/2 x 2 1/2 x 2 1/2 in.	Wgt 2 lb
MT70	6 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 3 lb
MT72	10 Amp	Size 3 1/2 x 4 1/2 x 4 in.	Wgt 6 lb
MT115	20 Amp	Size 4 1/2 x 4 1/2 x 4 in.	Wgt 11 lb
MT187	30 Amp	Size 5 1/2 x 4 1/2 x 4 in.	Wgt 16 lb

LOW VOLTAGE 24 VOLT RANGE

Primary 200/250v. Secondary 24v			
MT58	1 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT114	3 Amp	Size 2 1/2 x 3 x 3 in.	Wgt 3 lb
MT72	5 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 5 lb
MT17	8 Amp	Size 4 1/2 x 3 1/2 x 4 in.	Wgt 7 lb
MT115	10 Amp	Size 4 1/2 x 4 1/2 x 4 in.	Wgt 11 lb

LOW VOLTAGE 30 VOLT RANGE

Primary 200/250v. Secondary Tapped 12-15-20-24-30			
MT112	0.5 Amp	Size 3 1/2 x 2 1/2 x 1 1/2 in.	Wgt 1 lb
MT79	1 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 2 lb
MT20	3 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 4 lb
MT51	5 Amp	Size 4 1/2 x 3 x 4 in.	Wgt 6 lb
MT88	8 Amp	Size 5 1/2 x 3 1/2 x 4 in.	Wgt 9 lb
MT89	10 Amp	Size 5 1/2 x 4 x 4 in.	Wgt 12 lb

LOW VOLTAGE 50 VOLT RANGE

Primary 200-250v. SECONDARY TAPPED 12-15-20-24-30-40-50v			
MT102	0.5 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT104	2 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 5 lb
MT106	4 Amp	Size 4 1/2 x 4 1/2 x 4 in.	Wgt 9 lb
MT118	8 Amp	Size 5 1/2 x 4 1/2 x 4 in.	Wgt 18 lb
MT119	10 Amp	Size 5 1/2 x 4 1/2 x 4 in.	Wgt 19 lb

LOW VOLTAGE 60 VOLT RANGE

Primary 200/250v. Secondary Tapped 24-30-40-48-60			
MT124	0.5 Amp	Size 3 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT127	2 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 5 lb
MT123	4 Amp	Size 4 1/2 x 4 1/2 x 4 in.	Wgt 10 lb
MT122	10 Amp	Size 5 1/2 x 4 1/2 x 4 in.	Wgt 23 lb

MAINS H.T. RANGE.

MT1AT	250-0-250v	80MA	6-3v 3-5A 5/6-3v 1A	3 1/2 x 3 x 3 in.	33/-	6/-
MT6AT	250-0-250v	100MA	6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 in.	38/8	6/-
MT110	250-0-250v	120MA	6-3v 3-5A 5/6-3v 1A	4 x 4 x 3 1/2 in.	44/9	6/-
MT11AT	300-0-300v	100MA	6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 in.	37/9	6/-
MT12AT	300-0-300v	120MA	6-3v 4A 5/6-3v 1A	4 x 3 1/2 x 3 in.	46/2	9/-
MT33AT	300-0-300v	150MA	6-3v 4A 5/6-3v 1A	4 x 4 x 3 1/2 in.	59/4	9/-
MT2AT	350-0-350v	80MA	6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 in.	38/8	6/-
MT7	350-0-350v	100MA	6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 in.	42/4	6/-
MT8	350-0-350v	120MA	6-3v 3-5A 5/6-3v 1A	4 x 3 1/2 x 3 in.	60/-	6/-

BATTERY CHARGER TYPES

Primary Voltage 200-250v. Secondary 6-12v.			
MT7	1 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT45	1.5 Amp	Size 2 1/2 x 2 1/2 x 2 1/2 in.	Wgt 1 lb
MT46	2 Amp	Size 3 1/2 x 2 1/2 x 2 1/2 in.	Wgt 2 lb
MT47	3 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 3 lb
MT5	4 Amp	Size 4 x 2 1/2 x 3 1/2 in.	Wgt 3 lb
MT78	5 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 5 lb
MT46	6 Amp	Size 4 x 3 x 3 1/2 in.	Wgt 5 lb
MT48	7 Amp	Size 4 x 4 x 3 1/2 in.	Wgt 6 lb
MT146	8 Amp	Size 3 1/2 x 4 x 4 in.	Wgt 6 lb
MT49	9 Amp	Size 4 1/2 x 3 1/2 x 4 in.	Wgt 7 lb
MT147	10 Amp	Size 4 1/2 x 3 1/2 x 4 in.	Wgt 9 lb
MT50	12.5 Amp	Size 5 1/2 x 4 1/2 x 4 in.	Wgt 11 lb

Amperages are D.C. with nominal selenium bridge rectifiers

MAINS ISOLATING RANGE ALSO AVAILABLE

TTG.C1001 MULTITESTER in leather case.

Overload protection.
20,000 ohm. AC volts
10, 50, 250, 1,000v.
DC volts 5-25, 125, 500, 2500v. D.C. Current 0-50μA, 0-250mA Resistance 0-80K, 0-6 Megohm. Decibels -20 to +22dB. Size of meter 4 1/2 x 3 1/2 in. 85/- P. & P. 3/6.



SHIRA 6SD MULTI-TESTER 20,000 o.p.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: 0-50μA, 0-2-5mA, 0-250mA. Resistance: 0-6K, 0-6MΩ (300 ohm and 30K at centre scale). Capacitance: 10pF to 0.01 mfd. -0.01μF to 1μF. Decibels: -20 to +22dB. Size 4 1/2 x 3 1/2 in. 71/- P. & P. 3/6



8-DeC BREAD BOARD

British Made
Solderless breadboard panels, for fast reliable component connections. Single DeCs. One 8-DeC with Control Panel, Jigs and Accessories for solderless connections to controls, etc. with booklet "Projects on 8-DeC" giving construction details for a variety of circuits. 29/6. P. & P. 2/6.

4-DeC KIT. Four 8-DeCs with two Control Panels, Jigs and Accessories and the booklet "Projects on 8-DeC" all contained in a strong attractive plastic case. Ideal for the professional user. 55/17.6. P. & P. 2/6.

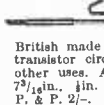
GARRARD DECKS



8RP23 less cartridge	25. 9/6
1025 Stereo/Mono with cart.	26.19/6
2026 Stereo/Mono with cart.	27.19/6
3000S Stereo/Mono with cart.	29.19/6
3000D Stereo/Mono with cart.	31.09/6
SP25 less cartridge	31.19/6
SP25 with Decca Deram cart.	37. 4/6
SL55 less cartridge	37.19/6
SL55 with Decca Deram cart.	41.7/6
SL65 less cartridge	41.9/6
SL65 with above	42.19/6
Bases for above	42.10/6
AP75 less cartridge	43.18/6
SL75 less cartridge	43.27/6
SL95 less cartridge	43.28/6
Bases for above	44.19/6
SPECIAL OFFER!	
SP25 less cart., with base	41.3. 2/6
P. & P. Decks 12/6, Cover 4/6, Base 4/6.	
P. & P. Deck/Cover/Base 17/-	

MINIATURE SOLDERING IRON

British made and designed for use with transistor circuitry but ideal for many other uses. AC 240v. 18 watt. Length 7 1/2 in. jin. slide on bit. Price 22/6 P. & P. 2/-.



LIND-AIR OPTRONICS LTD

18, 25 & 53 TOTTENHAM COURT 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. PW1169,
54a Tottenham
Court Road,
London, W1

LOOK!

PRACTICAL!

VISUAL!

EXCITING!

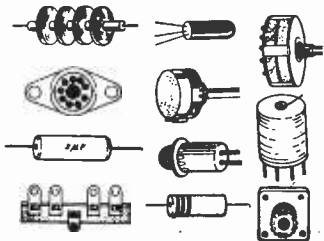


a new 4-way method of mastering
ELECTRONICS
by doing — and — seeing . . .

1

**OWN and
HANDLE a**

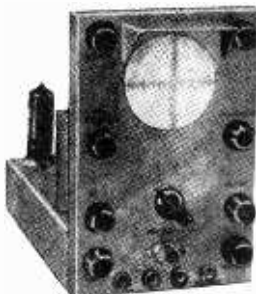
complete range of present-day **ELECTRONIC PARTS** and **COMPONENTS**



2

**BUILD
and USE**

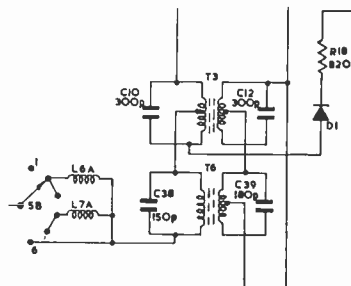
a modern and professional **CATHODE RAY OSCILLOSCOPE**



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 PW11

PRACTICAL WIRELESS

VOL 45 No 7

Issue 753

NOVEMBER 1969

TOPIC OF THE MONTH

Fair Comment

FOR the manufacturer and retailer, audio is now very big business—and the build-up has by no means yet reached its peak. This is a good thing for several reasons. Apart from the smaller, specialised, hi-fi companies the big boys have jumped on the bandwagon with budget schemes of audio separates. These are attractive propositions to the purchaser with more limited means and most of those that we have heard make very acceptable listening. Not, perhaps, always true hi-fi but a definite giant step from the often awful radiograms and other instruments of torture long accepted by the public as music reproducers.

The optimists amongst us are really beginning to believe that the man in the street is at last learning to realise that audio (be it from tape, radio or record sound sources) can be so much more enjoyable when played through decent equipment. And with all this new gear, the emphasis in the tuners is on f.m. reception and stereo at that. Loud applause from all the P.W. staff, who marvel why any listener without cloth ears can still listen to low-fi a.m. when f.m. offers such incomparable improvement.

And on the home constructor front, a keen interest is being maintained in audio projects and shows no sign of abating. This, and the activity on the commercial side, are complementary factors. The sheer quantity of audio merchandise on the market, not to mention the number of technical innovations and ideas, serves to whet the appetites of the home constructors and experimenters for constructional and theoretical reading matter on the subject.

This is one reason why *Practical Wireless* and *Practical Electronics* will be sharing a demonstration booth at the Audio Fair this month—their first participation in the event—to display and demonstrate some of the audio projects now part and parcel of the coverage of the two journals. We hope as many readers as possible will get along and look us up on stand 73 on the ground floor. For those unable to visit the Fair, perhaps the special supplement in this issue will be some consolation.

W. N. STEVENS—*Editor*.

NEWS AND COMMENT

Leader	473
News and Comment	474
Showtime '69	487
Practically Wireless <i>by Henry</i>	491
Audio Fair Preview	499
Letters to the Editor	511
M.W. Column	513
On the Short Waves <i>by Malcolm Connah and David Gibson, G3JDG</i>	522, 525

CONSTRUCTIONAL

Pedal Steel Guitar <i>by F. C. Judd</i>	476
I.C. of the Month, Audio amplifier <i>by L. A. J. Ireland</i>	483
Medium Wave DX Receiver Part 2 <i>by David Gibson, G3JDG</i>	492
Sub-Miniature Power Supply <i>by A. Ring</i>	512
Mono-Stereo Amplifier <i>by James Hossack</i>	521
Beginner's Transistor Capacitance Bridge Part 2 <i>by Keith Johnson</i>	526
Take 20, Signal Generator/B.F.O. <i>by Julian Anderson</i>	533

OTHER FEATURES

P.W. Guide to Components Part 11 <i>by M. K. Titman, B.Sc.</i>	496
Basic Semiconductor Technology, Part 6 <i>by M. F. Docker, M.Sc.</i>	514

DECEMBER ISSUE WILL BE PUBLISHED
ON NOVEMBER 7th

©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 Tower House, Southampton Street, London, W.C.2. 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 AND COMMENT...

FREE RADIO AND MORE FOR TELEVISION

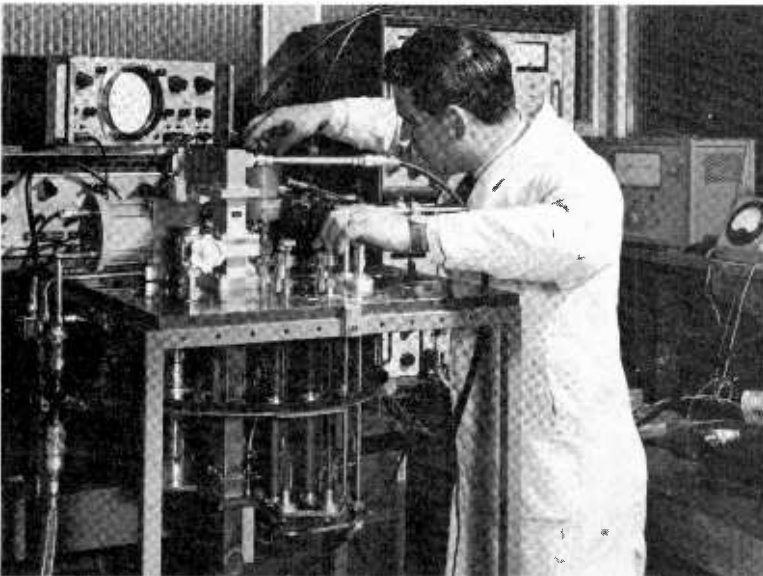
No, not pirate stations—but the abolition of the radio licence. On 1st April, 1970, the combined radio/TV licence will go up 10s to £6 10s. Also on this date, the 25s. separate sound and car radio licence will go.

Announcing these changes recently, Mr. Stonehouse, the PMG, said that the increased revenue of £5,600,000 would finance a general service of local revenue by the BBC.

A further £3,500,000 would be gained from licence evaders as a result of intensified measures against them. This would make a total of £9,100,000 extra revenue.

Mr. Stonehouse pointed out that abolition of the sound radio licence would benefit many elderly people. He said that the fee involved in collecting licence revenue was quite expensive—being 4s. 10d. per licence—this would be the same for the combined fee.

Goonhilly I uses Mullard Parametric Amplifiers



Goonhilly I station, inaugurated recently by the PMG John Stonehouse uses Mullard parametric amplifiers to boost the low power of 10-12W signals received from Japan and Australia via the new Intelsat III communications satellite. This new link (over the Indian Ocean) provides for direct TV communication with Japan and it is planned to cover "Expo 1970" the international exposition whose site in the hills above Osaka is being completed for the opening next year.

Goonhilly I was used to receive Apollo 11 TV pictures bounced off satellites positioned above the Indian and Pacific oceans.

The only other device that could be used in the same role as the parametric amplifier is the maser but this has the disadvantage that it always needs to be cooled. Although the Goonhilly parametric amplifiers are cooled it is possible for them to operate at room temperature. The maser used in Goonhilly II uses a pumped liquid helium cooling system to keep it at a temperature of 1.4°K giving a "noise" temperature of 10°K. The parametric amplifier cooled with liquid helium to 4.2°K has a noise temperature of 20°K.

The parametric amplifier also has the advantage that it can handle a bandwidth of 500MHz and the maser can only handle 50MHz. This makes possible the reception and transmission simultaneously of TV programmes and hundreds of telephone channels.

The picture shows a development engineer at Mullards, Mitcham, checking one of the parametric amplifiers prior to installation at Goonhilly.

The Litegard

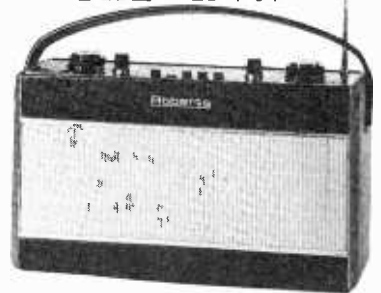
Soldering irons, like some predatory animal, have a nasty habit of leaping at you as soon as you move at your workbench. If you have, like some members of the P.W. staff, burnt hands, ruined shirts and scorched ties, the Litegard soldering iron stand is almost an essential.

Designed for virtually all soldering irons up to 35W, the Litegard incorporates a bit cleaning pad and screw holes for bench mounting. It retails at 25s. *Light Soldering Developments Ltd., 28 Sydenham Road, Croydon, CR9 2LL.*

ONE TO LISTEN FOR

GB3MAN, 28th September-5th October 1969. From the City of Manchester during Fresher's Week at the University of Manchester Institute of Science and Technology. It's intended to give novices an insight into the working of Amateur radio and the station is being operated by members of the UMIST Amateur Radio Society. Transmission is on all bands 10-160m running a.m./c.w./s.s.b./RTTY. Details and QSLs from T. F. C. Davis, G3YMM, Hon. Sec., Amateur Radio Society, Students' Union, UMIST, Sackville Street, Manchester 1.

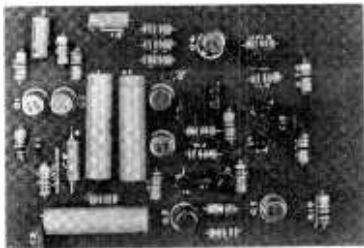
THE "R 707"



New from Roberts' Radio Co. Ltd., comes the model R 707 which incorporates v.h.f., medium, long and short wavebands. Twelve transistors and 7 diodes are used in the design and an i.f. amplifier module employing combined 10.7MHz and 470kHz is used. The a.f. amplifier has a transformerless output and power output is approximately 1.5W. Short waves covered are 41 and 49m bands. Price including batteries and PT is £34 10s. *Roberts Radio Co. Ltd., Molesey Avenue, West Molesey, Surrey.*

NEWS AND COMMENT...

MAINLINE MARKETS



An assembled amplifier

A new company, Mainline Electronics Ltd., has been formed specifically to give the amateur enthusiast the price and other advantages enjoyed by industrial and professional component buyers. The company is a subsidiary of Electronic Component Supplies (Windsor) Ltd. which was established in 1965 and now represents 12 of the leading electronic component manufacturers.

In addition to components, Mainline are introducing kits, starting off with a series of hi-fi amplifiers. Three basic types are available, in 12W, 25W and 70W r.m.s. versions, all universal quasi-complementary-symmetry amplifiers using the same assembly board (see picture) providing full power to beyond 20kHz. The kits are the result of joint research and development by RCA and SGS (UK) Ltd. Basic performance figures (of the Mainline 12) are 12W r.m.s. output, hum and noise 75dB input shorted, sensitivity 500mV at 20k Ω , intermodulation distortion (60Hz and 70kHz, 10dB below continuous power output) 0.2%.

The prices of the kits are £7, £8 5s., and £10 10s. which include all transistors, resistors, capacitors, heatsink, printed circuit board and full instructions for assembly. For those wishing to buy the transistor packs only, these are available at £5 3s., £6 2s. 6d. and £8 6s. 8d. respectively. Further kits are to be introduced, including suitable pre-amplifiers for the Mainline amplifiers, by the end of the year.

Detailed price lists and descriptive literature on the amplifiers is available from *Mainline Electronics Ltd., Thames Avenue, Windsor, Berks.* Also available, at 4s. post paid, is a catalogue containing full details of the numerous components available from the company.

WANSTEAD AND WOODFORD RADIO SOCIETY

Are any readers interested in re-establishing the Wanstead and Woodford Radio Society and helping it again to be active in forwarding the hobby of radio and electronics in London, E.11 and E.18? If so, please contact Ken Smith, G3JIX, at 82 Granville Road, Walthamstow, London, E.17 or at the Electronics Laboratory, The University, Canterbury, Kent.

HOME RADIO CREDIT ACCOUNT

Mr. A. Sproston, Director of Home Radio (Components) Ltd., has announced a new scheme to help home constructors.

In a letter to P.W. he says: "It has often occurred to us that the serious experimenter must sometimes suffer frustrations at the time taken to obtain a certain component. Supposing he is working on a project Sunday afternoon and finds he needs a certain item; even if he has a cheque book, envelope and stamp to hand, his suppliers would not receive his order until Tuesday and the customer would not receive his item until Thursday or Friday.

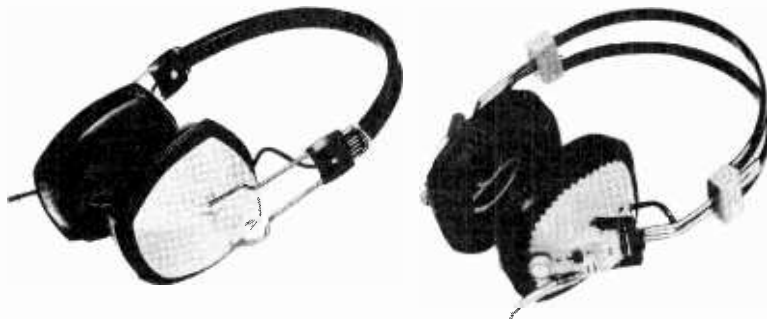
"If he could 'phone his requirements, how much easier and quicker the transaction would be. We would like to give customers this facility but it would be necessary to offer a credit account and the problem arises as to how this can be done without the tedious and often unreliable method of taking up references.

"After much thought we came up with this solution—the Credit Deposit Account. This offers to customers the facility for starting a credit account and at the same time protects us against incurring too great a loss through bad debts.

"This scheme of course is only offered to customers using our catalogue and we have a telephone answering machine for customers wishing to place orders outside business hours."

How it works is simple: the customer decides what monthly credit he requires to the nearest £10. He then fills in a simple form and sends it to Home Radio with his deposit (which is half the amount of credit he requires). For example, if he requires credit of £10, he sends Home Radio £5 deposit. He may then receive goods up to the value of three-quarters of the credit he has selected. This three-quarters only applies to the first month's buying—after this he may purchase goods to the full amount of his selected credit. Further details from *Home Radio (Components) Ltd., 234-240 London Road, Mitcham, Surrey, CR4 3HD.*

EAGLE STEREO HEADPHONES



Added to the Eagle range of stereo headphones are two new models—SE.5 and SE.30.

Model SE.5 is a budget model, retailing at 59s. 6d. The SE.30 (£7 7s.) is the more sophisticated of the units, incorporating a stereo/mono slider switch which eliminates any possibility of phase distortion when listening to a mono signal through stereo equipment. Leather ear-cushions make the SE.30 comfortable to wear even over long periods. Eagle products are available from retail radio stores.

PEDAL STEEL GUITAR

Part 1

F.C. JUDD

THE popularity of "Country and Western" style music has brought about a new kind of electrical musical instrument which stems from the Hawaiian steel guitar and which has become generally known as the "pedal steel guitar". The basic playing technique is similar to that of the Hawaiian guitar, i.e., the notes are selected with a "steel" and the strings are sounded with finger picks but here the similarity really ends.

The modern pedal guitar allows the production and rapid playing of full chords of the major, minor, diminished seventh, major sixth, minor sixth and minor seventh etc. etc. without complicated manipulation of the steel, in fact without the aid of the pedal controlled tuning system, rapid playing in chords of this calibre would be difficult, to say the least. The pedal steel guitar can be tuned in a number of different ways but the various combinations are far too numerous to deal with in these articles which are concerned with the construction of an otherwise very expensive musical instrument and not how to play it. Those who contemplate building such an instrument and then learn to play it are advised to have proper tuition because it is not an instrument that can be easily "played by ear". However, for the purpose of understanding the musical function of the pedal steel guitar a basic tuning is given for the instrument described in these articles. This is an 8 string E6th tuning which, with the aid of two pedals, will allow the playing of full major, minor, diminished 7th, major 6th, minor 6th and minor 7th chords without slanting or other difficult manipulation of the steel, i.e., such chords

can be produced with what is called "straight steel" which means that the steel is across the strings and at right angles to them as in Fig. 1.

Readers with a knowledge of music and especially of either the plectrum guitar or Hawaiian steel guitar will of course realise that more than 8 strings and 2 pedals could be used. Some commercially available single neck models have 8 or 12 strings and up to 4 pedals whilst twin neck instruments may employ as many as 8 pedals divided between 8 or 12 strings per neck, hence the earlier comment about the many possible tuning and tuning change combinations. Incidentally the cost of a commercially made pedal steel guitar ranges from around £250 to £350. The instrument described here should not involve a total outlay of more than about £30. It is however only fair to point out that a very considerable amount of "mechanical" construction is called for and which must be quite accurate if the finished instrument is to play correctly and in perfect pitch at all fret positions. *None of the "mechanical" parts, except the machine head tuning pegs, can be purchased ready made.* The special fret board and the 8 string magnetic pick-up are however both available (details later).

Eight Strings—Two Pedals

The pedal guitar shown on the cover and described in this article could of course be modified for additional pedals by duplicating the pedal controlled string tension or release tension arrangements shown in Figs. 2 and 3 respectively. Otherwise the design featured here employs 8 strings for an E6/7th tuning with the pedals operating on strings 2 and 4. With the E6/7th tuning as shown in Fig. 4 it will be seen that string 2 is tuned to C sharp which is the 6th note of the scale of E major. This string can be raised a half-tone by a pedal so as to become D natural which is the diminished 7th of the scale of E. With no extra tension on string 2, i.e., with the pedal off, strings 1, 2, 3 and 4 together produce a chord of E6. When the pedal is pressed the pitch of string 2 is raised by a half-tone and strings 1, 2, 3 and 4 together will produce a chord of E diminished 7th or E7th.

To produce minor chords, string 4, which is G sharp and the third note of the scale of E, must be lowered in pitch to G natural so that it now becomes the minor 3rd

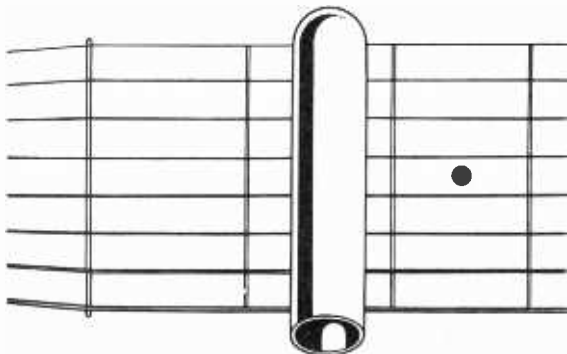


Fig. 1: As explained in the text; many different chords can be played with a straight steel, i.e., without slanting.

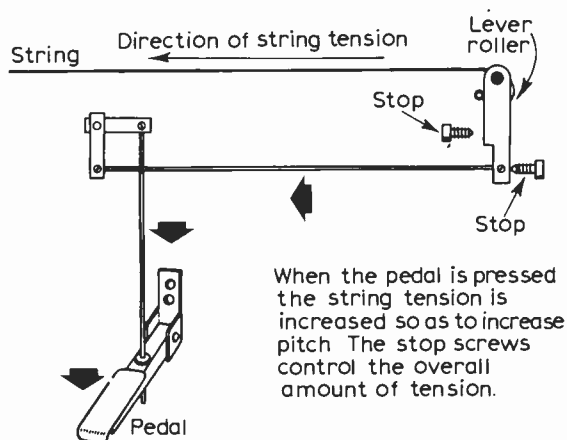
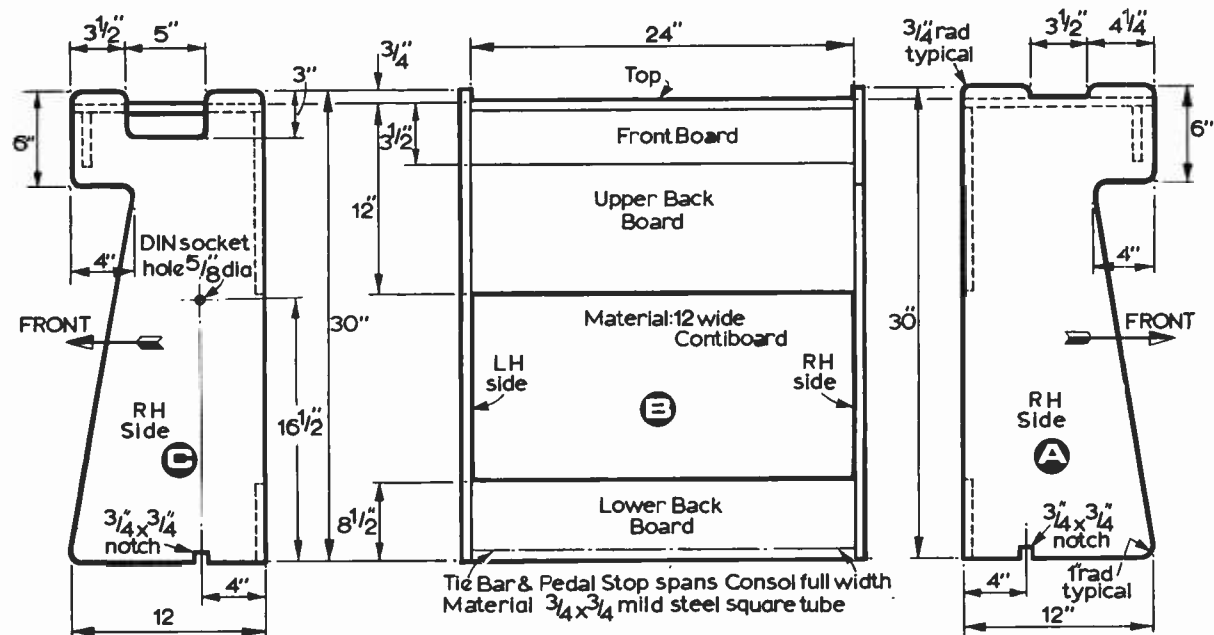
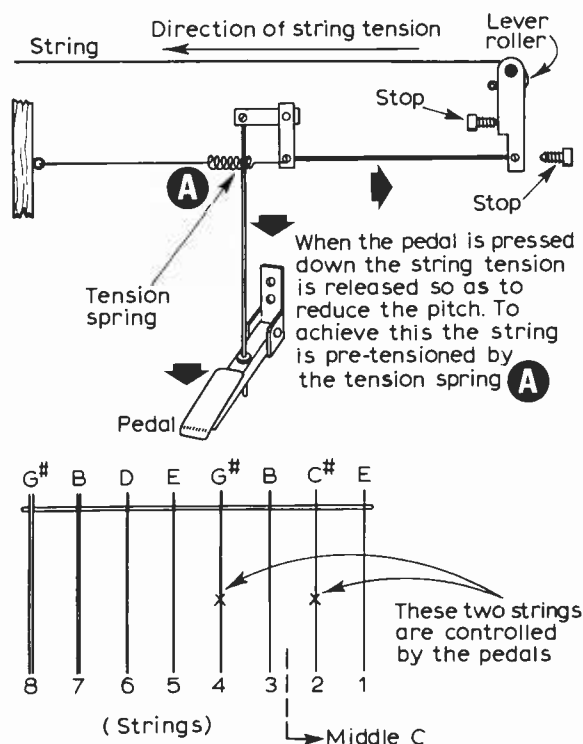


Fig. 2 (above): Pedal mechanism for tensioning a string, i.e., to raise the pitch by a tone or semitone.

Fig. 3 (top right): Pedal mechanism for de-tensioning a string, i.e., to reduce the pitch by a tone or semitone.

Fig. 4 (right): Tuning for the pedal guitar described in this article and for use with pedal control on strings 2 and 4 as shown.



Figs. 5A/B/C: Details for constructing the pedal steel guitar console. Note the different depths of the cutaways at the top of the left and right hand sides. The sections A, B and C are fitted together as in Fig. 6. Section A is the left-hand side and not as indicated on drawing.

of the scale of E. This string is pre-tensioned by means of a spring as shown in Fig. 4 so that it can be de-tensioned when the pedal is pressed. When this is done the chord of E minor can be obtained with strings 3, 4 and 5 or 1, 3 and 4. By playing strings 1, 2, 3 and 4 a chord of E minor 6th will be produced. If the other pedal is simultaneously pressed then strings 1, 2, 3 and 4 will produce a chord of E minor 7th. The remaining strings,

5, 6, 7 and 8, when played together will produce the chord of E7. If string 6 is not played then the chord produced by 5, 6 and 7 will of course be E major. As pointed out earlier the combinations of tuning and chord patterns obtainable with multiple stringed pedal guitars of this nature are almost endless so here all further reference to the musical possibilities must stop and we will go on to the actual construction.

Console Construction

Like the commercially available pedal guitars this is a small console type instrument which allows the player to be seated. The console itself, as shown in the photographs, was constructed from Contiboard and if the dimensions given are adhered to then standard 12 inch wide $\frac{3}{4}$ inch thick Contiboard can be used. This is supplied in cut lengths and two 6 foot lengths will make the entire console to the dimensions given in Fig. 5. The guitar itself is fitted to the top of the console as shown by the outline in Fig. 5D. Note also the cut-out on the top panel which is for the guitar preamplifier.

Although both sides of the console have the same overall dimensions please note that the right hand side has a wider and deeper cutaway at the top which extends below the level of the console top panel to allow the pedal rods to go through. This side also carries the DIN output socket to take the signals from the built-in preamplifier to a suitable external power amplifier. The complete console assembly is shown in Fig. 6. All the sections should be screwed together to provide a good solid structure and when the console is completed the wood, if it is Contiboard, should be sanded down and given two or three coats of Contipol varnish for a high gloss finish.

The Guitar Body

Next comes the woodwork for the guitar itself, the dimensions for this being shown in Fig. 7. The wood for this must be absolutely straight, completely free of any warping and $30\frac{3}{4}$ inches long, $3\frac{1}{8}$ inches wide and 1 inch

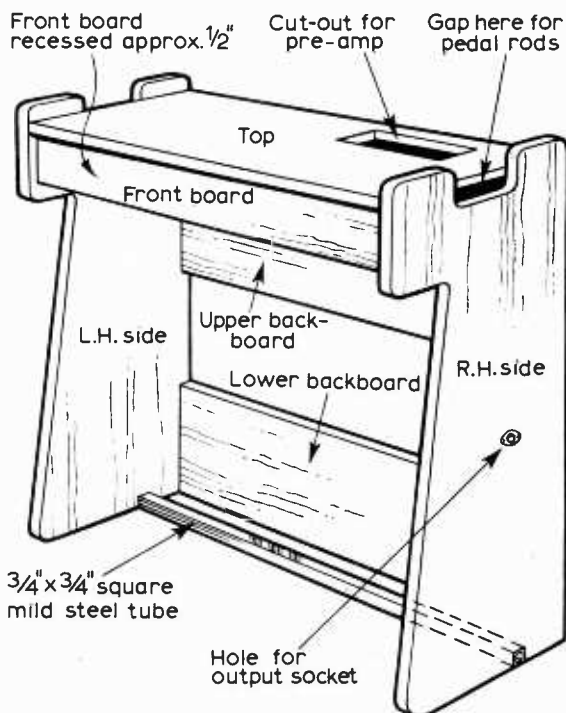
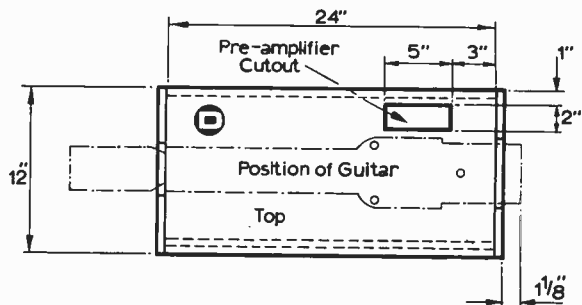
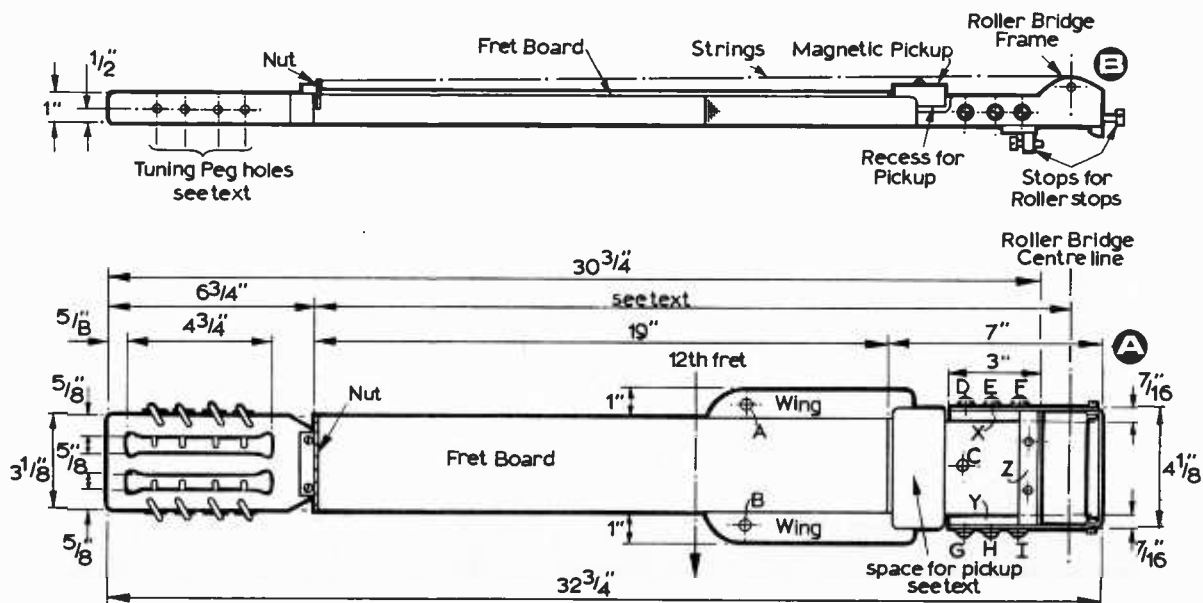


Fig. 5D (top right): Position of the pedal guitar and pre-amplifier on the console.

Fig. 6 (right): The assembly of the console. Note the tie bar at the bottom which also serves as the pedal stop.

Figs. 7A/B (below): Details for constructing the guitar body including the positions of the peg heads, nut, fretboard, magnetic pick-up and roller bridge assembly.



COMPONENTS AND MATERIALS

Parts 1 and 2—The Console and Guitar Console:

Contiboard—12ft. (2 × 6ft. cut lengths) 12in. × $\frac{3}{4}$ in.
Mild steel square tube— $\frac{3}{4}$ in. × $\frac{3}{4}$ in. × 25in. (pedal stop rail)

Quantity c/s woodscrews—1 $\frac{1}{2}$ in. × size 5 or 6

Contipol varnish as required

Guitar and Pedal Mechanism:

Hardwood (mahogany)—30 $\frac{3}{4}$ in. × 3 $\frac{1}{8}$ in. × 1in. (guitar body)

Hardwood—2ft. × 1in. × 1in. (wing pieces and tail)

Mild steel— $\frac{1}{8}$ in. thick (piece 12in. × 6in. should be sufficient for bridge frame and pedal plates etc.)

Aluminium angle—4in. × $\frac{1}{2}$ in. × $\frac{1}{2}$ in. (tail piece)

Aluminium angle—4in. × $\frac{3}{4}$ in. × $\frac{3}{4}$ in. (lower stop bar)

Mild steel square tube—12in. × $\frac{1}{2}$ in. × $\frac{1}{2}$ in. (pedals)

Dome head screws (with chromed dome caps) 1in. long × size 7 or 8 (6 off)

Dome head screws 1 $\frac{1}{2}$ in. long × size 7 or 8 (3 off)

2BA Allen screws 1in. long (12 off) (lever stops)

Compression springs $\frac{1}{2}$ in. to $\frac{3}{8}$ in. long with inside 2BA clear

Brass— $\frac{1}{4}$ in. thick (1 piece approx. 12in. × 1 $\frac{1}{2}$ in. for roller levers and stop screw bars etc.)

Silver steel rod— $\frac{1}{4}$ in. dia. 12in. long (roller bridge and foot pedal volume control)

Mild steel rod— $\frac{3}{8}$ in. dia. Approx 5ft. (pedal linkage)

Mild steel rod— $\frac{1}{8}$ in. dia. Approx 3ft. (lever linkage)

Brass tube— $\frac{3}{8}$ in. dia. with $\frac{1}{4}$ in. dia. inner bore (roller lever spacers)

Brass tube or rod— $\frac{3}{8}$ in. dia. (tube with $\frac{1}{4}$ in. dia. inner bore) (rollers)

Tension spring—Approx 2in. long × $\frac{1}{2}$ in. dia. with loops

Fret board—24fret 25in. scale 8 string. Cyril Proctor. (see text for address etc.)

Magnetic pick-up—H.G. 8 string. Cyril Proctor. (see text for address etc.)

Machine head tuning pegs—4 LH and 4 RH Cyril Proctor (see text for address etc.)

3-pin DIN socket—(1 off) (preamp output)

Sundry 6BA, 4BA and 2BA screws and nuts as indicated in diagrams

Part 3—The Preamplifier and Footpedal Volume Control

The Footpedal Volume Control:

Contiboard or deal—(see text) cut as per diagrams.

Duraluminium— $\frac{1}{8}$ in. thick. Piece approx. 14in. × 7in. (sides and front)

Aluminium angle—20in. × $\frac{1}{2}$ in. × $\frac{1}{2}$ in. (inside supports)

Aluminium angle—3in. × $\frac{3}{4}$ in. × $\frac{3}{4}$ in. (foot pedal bearings)

Silver steel rod— $\frac{1}{4}$ in. dia. (allowed for in previous list)

Jack socket—standard (1 off)

3-pin DIN socket (1 off)

L.D.R.—type ORP12 (1 off)

6 or 12V lamp (1 off) see text

R9—47kΩ $\frac{1}{4}$ W resistor

RL—(see text)

3-pin DIN plugs—(2 off)

Sundry screws, 4BA and 6BA screws and nuts, screened cable etc. as per text

The Preamplifier:

Panel—Aluminium $\frac{1}{8}$ in. thick 6in. × 3in. Also aluminium angle $\frac{1}{2}$ in. × $\frac{1}{2}$ in. and approx 5in. long

Assembly board—3 $\frac{3}{4}$ in. × 2 $\frac{3}{4}$ in. perforated s.r.b.p.

Control knobs—(2 off) type PK2 (Henrys Radio Limited)

On/Off switch—S.P. toggle type (1 off)

Transistors:

Tr1 and Tr2 BC109

Capacitors:

C1 0.05μF paper C4 0.02μF paper

C2 100μF elec 12V C5 100pF mica

C3 0.01μF paper C6 100μF elec 12V

C7 2.5μF elec 12V

Resistors:

R1 4.7kΩ R5 150kΩ

R2 120kΩ R6 470Ω

R3 1kΩ R7 1.2kΩ

R4 12kΩ R8 1.8kΩ

All 10% $\frac{1}{4}$ W carbon

Potentiometers:

VR1 4.7kΩ preset

VR2 50kΩ linear

VR3 100kΩ log

Power supply:

Transformer T1 Henrys Radio type as per circuit

Rectifier MR1 Bridge type 1H3

Capacitor C 2500μF 25V wkg

Materials for chassis as suggested in diagrams.

Come and see the **Pedal Steel Guitar on Practical Wireless Stand 73** at the International Audio and Photo-Cine Fairs, Olympia, 16–22nd October, 1969. Opening hours: daily 10 a.m. to 9 p.m. (excluding Sunday, 19th October).

Admission: Adults 4/–; Children 2/–.

thick. The writer eventually obtained a piece of 1 inch thick mahogany for this. Very soft wood should be avoided. The shaping of the machine peg head section is the most tedious part and calls for a little fancy work with files and sandpaper. The section between the "nut" and the recess for the magnetic pick-up is left flat to take the plastic fretboard and only requires a smooth sandpapered surface. The two "wings", each 1 inch wide, serve as decor and to anchor the guitar to the top of the console. Holes are drilled at a, b and c as shown in Fig. 7A. These take 1½ inch dome head screws to secure the finished guitar to the console. Similar dome head screws are used to fix the roller bridge frame to the tail of the guitar as in Fig. 7A. These screws are marked d, e, f, g, h, i and are each 1 inch long.

As the special bridge assembly is 4 inches wide, the tail of the guitar must be widened by ⅜ths of an inch. This is done by means of two pieces of wood shown in Fig. 7A as X and Y. The final part of the guitar "woodwork" is the recess for the magnetic pick-up and if the 8 string pick-up specified is used then the recess will be approximately 4 × 1½ × ⅜ inches deep. If anything the recess may be a bit oversize to allow for a thin felt packing around the pick-up.

The guitar woodwork is completed by sandpapering and for a gloss finish two or three coats of Contipol varnish applied. Do not varnish the section for the fretboard because it has to be glued on and this should be left until all other assembly work is completed.

Please note that reference will be made later to Fig. 7 in connection with the fitting of the bridge frame and the magnetic pick-up. This is why the position of the 12th fret and the centre line of the bridge roller spindle are both indicated. Note also that no measurements have been given for the spacing between the holes for the geared tuning pegs as this will depend on the physical size of those obtained. The shafts of the pegs must however be located on the centre line (C/L) as shown in Fig. 7B and should be spaced at least 1½ inches apart.

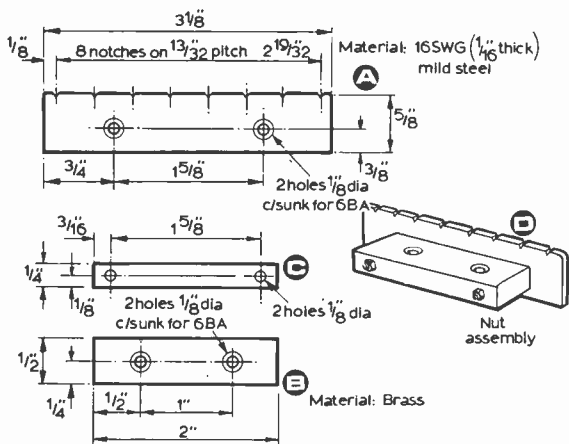


Fig. 8 (below): Details for constructing the "nut" which is the small bridge at the peg head end of the fretboard.

Next comes the mechanical work involved in the making of the "nut", the special roller bridge assembly and the pedal mechanism which not only calls for some ability in metal working but also reasonable accuracy. None of these parts can be obtained ready made.

Details of the "nut" which is the bridge at the top end of the fretboard are given in Fig. 8. It consists of a piece of 1/16th inch thick mild steel, the lower portion of

NEXT MONTH IN

PRACTICAL WIRELESS

STEREO DECODER

Stereophonic f.m. transmission are at present available to listeners in the service areas of a number of BBC v.h.f./f.m. sound transmitters. In order to hear these programmes "stereophonically" a v.h.f./f.m. receiver with a special "decoder" is required. The decoder may be added to the majority of those receivers and tuners which do not have a built-in decoder.

The design is compatible—no manual switching is required from stereo to mono operation. A stereo beacon is included which lights when a stereo transmission is present.

All components are readily available including the specially wound potted coils.

AUDIO LIMITER

A self contained unit fitting between the headphone jack socket and headphones. It minimises ignition noise, static and even sideband splash; the circuit having a number of advantages over previous designs.

THE INJECTRACE

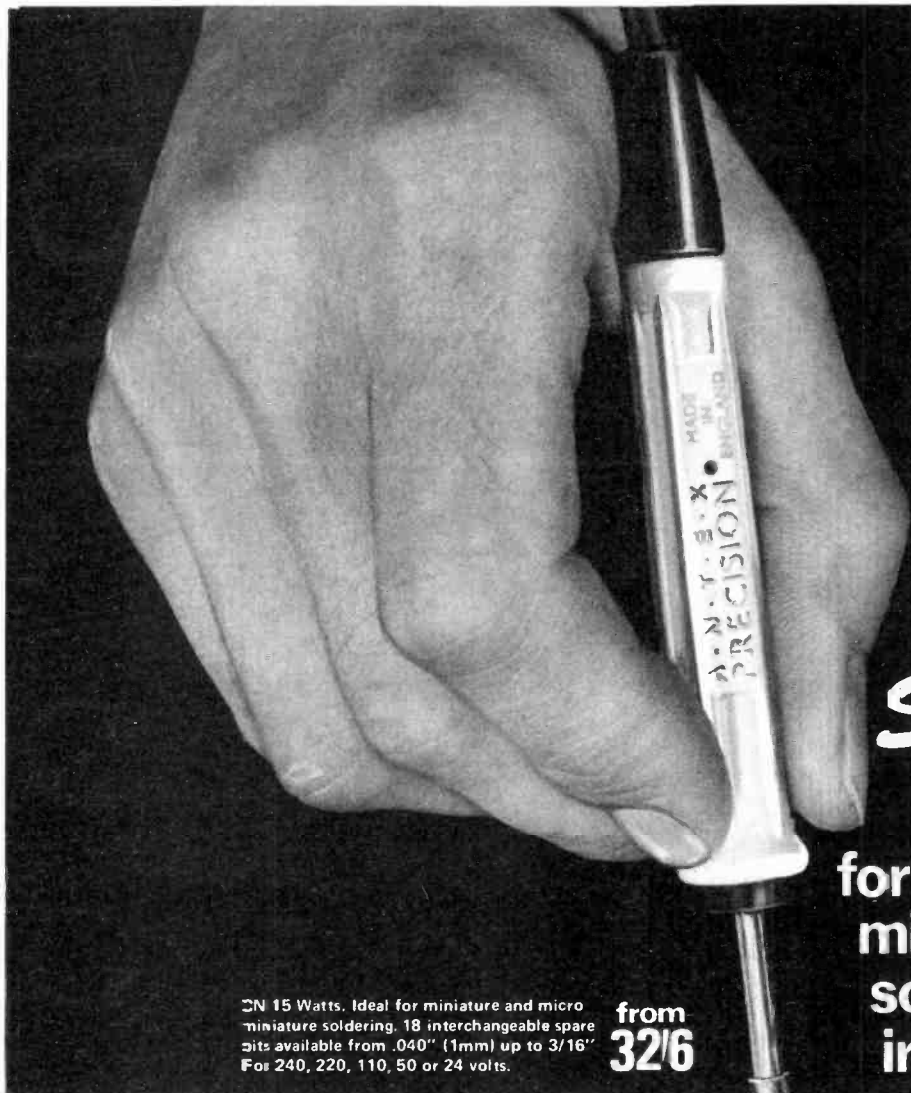
An ingenious piece of test gear small enough to fit into an inside jacket pocket, that functions as a wideband signal injector from 1 KHz to over 200MHz and becomes an a.f./r.f. signal tracer simply by plugging in a miniature earpiece.

**DECEMBER issue on sale
NOVEMBER 7th.**

which is recessed into the guitar body as shown in Fig. 7B, so as to leave the top edge containing the slots for the strings about ⅜th inch above the fretboard. The slots must be spaced as accurately as possible and can be made with a fine hacksaw blade or thin triangular file. They should not be more than about 1/32nd of an inch deep but those for strings 8, 7, 6 and 5 will have to be slightly wider because the strings are thicker. The nut itself is secured to a brass block which in turn is screwed on to the guitar body.

The next items include the roller bridge assembly and the pedal mechanism which will be dealt with in the next article. The final article, part 3, will cover the special tone control preamplifier for the magnetic pick-up and a "swell" pedal (pedal operated volume control) which employs a light-discriminating resistor instead of the more usual gear operated potentiometer.

To be continued



Sign here..!

for your miniature soldering iron.

Model 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



G18 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/-

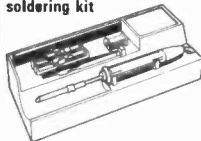


ES25 watts. Fitted with 1/8" bit. Interchangeable bits 3/32", 3/16" and 1/4" available. Ideal for high speed production lines. For 240, 220, 110, 24 or 12 volts. From 35/-



F40 watts. Fitted 5/16" bit. Interchangeable bits 1/4", 3/8", 1/2", 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



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

This kit—in a rigid plastic "tool-box"—contains

- Model CN 15 watts miniature iron, fitted 3/32" bit. Interchangeable spare bits 1/8", 3/16", 1/4"
- Reel of resin-cored solder
- Felt cleaning pad
- Stand for soldering iron

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/-**



PRECISION MINIATURE SOLDERING IRONS

Antex, Mayflower House, Plymouth, Devon.
Telephone Plymouth 67377/8.
Telex: 45296. Giro No. 2581000.

- ☐ 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-11

VARIABLE VOLTAGE TRANSFORMERS



150
AMPS

1 AMP
£3.10.0.



INPUT 230/240v. A.C. 50/60—
OUTPUT VARIABLE 0-260v.

BRAND NEW
Keenest prices in the country. All
Types (and Spares) from 1 to
50 amp. from stock.

SHROUDED TYPE
1 amp, £5.10.0. 2.5 amps, £6.15.0.
4 amps, £9.0.0. 5 amps, £9.15.0.
8 amps, £14.10.0. 10 amps, £18.10.0.
12 amps, £21.0.0. 15 amps, £25.0.0.
20 amps, £37.0.0. 37.5 amps, £72.0.0.
50 amps, £92.0.0.

OPEN TYPE (Panel Mounting) 1 amp, £3.10.0. 1 amp, £5.10.0.
2 1/2 amps, £6.12.6.

100 WATT POWER RHEOSTATS (NEW)

AVAILABLE IN THE FOLLOWING VALUES

1 ohm, 10 a.; 5 ohm, 4.7 a.; 10 ohm, 3 a.; 25 ohm
2 a.; 50 ohm, 1.4 a.; 100 ohm, 1 a.; 250 ohm, .7 a.;
500 ohm, .45 a.; 1,000 ohm, 280 mA.; 1,500 ohm,
230 mA.; 2,500 ohm, .2 a. Diameter 3 1/2 in. Shaft
length 1 1/2 in. dia. 1 1/4 in. All at 27/6 each. P. & P. 1/6

50 WATT. 1/5/10/25/50/100/250/500/1,000/1,500/2,500 ohm. All at
21/-, P. & P. 1/6.

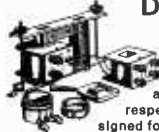
25 WATT. 10/25/50/100/250/500/1,000/1,500/2,500 ohm. All at
14/6, P. & P. 1/6.



DEMONSTRATION TRANSFORMER

(STENZYL TYPE)

Two separate removable coils tapped
at 0, 110, 220 volts, and 6, 12, 36 volts
respectively. A composite apparatus de-
signed for class demonstration. Electro magnetic
Induction, lumping ring, Induction lamp, relationship between
field intensity and ampere turns, Induction melting, are just a
few of the possible experiments. New modified model. £14.10.0.
P. & P. 10/-.



230v. A.C. SOLENOID

Heavy duty type. approx. 3 lbs. pull. Price 17/6
plus 2/6 P. & P.

12v. D.C. SOLENOID

Approx. 1 lb. pull. 10/6 plus 1/6 P. & P.

50v. D.C. SOLENOID

Approx. 1 lb. pull. 10/6 plus 1/6 P. & P.

50v. D.C. SOLENOID

Approx. 2 lb. pull. 12/6 plus 1/6 P. & P.



Large Digit 12v. D.C. MAGNETIC COUNTER.

4in. drum calibrated 0-9. Figures 1 1/2 in. high, 1 1/2 in.
wide. Set of 1m, 1b; 1c/o contacts operated by
drum cam. The units can be used in pairs and
are ideally suited for batch or lap recording or for
the many purposes where large easily read nu-
merals are required. Price 18/6. P. & P. 2/6.



LIGHT SOURCE AND PHOTO CELL MOUNTING

Precision engineered light source with
focusable lens assembly and ventilated
lamp housing, to take MBC bulb.
Separate photo cell mounting assembly for
ORP 12 or similar cell. Both units are single
hole fixing. Price per pair £2.15.0. P. & P. 3/6.



CONSTANT VOLTAGE TRANSFORMER

Input 185-250 v. A.C. Output 230 v. A.C.
Capacity 250 watt. Attractive metal case.
Fitted red signal lamp. Rubberfeet. Weight 17 lb.
Price £11.10.0. P. & P. 15/-.



L.T. TRANSFORMERS

All primaries 220-240 volts.			
Type No.	Sec. Taps	Price	Car.
1	30, 32, 34, 36v. at 5 amps.	£4.5.0	6/-
2	30, 40, 50v. at 5 amps	£6.5.0	6/6
3	10, 17, 18v. at 10 amps	£4.10.0	4/6
4	6, 12v. at 20 amps	£5.17.6	6/6
5	17, 18, 20v. at 20 amps	£6.12.6	6/6
6	6, 12, 20v. at 20 amps	£6.5.0	7/6
7	24v. at 10 amps.	£4.15.0	5/6
8	4, 6, 24, 32v. at 12 amps.	£6.10.0	6/6

DOUBLE WOUND VARIABLE L.T. TRANSFORMER
Input 230v. A.C. OUTPUT CONTINUOUSLY VARIABLE 0-36v.
A.C. 0-36v. at 5 amp. £9.12.6. P. & P. 8/6. 0-36v. at 20 amp.
£21.0.0. P. & P. 15/-.

LIGHT SENSITIVE SWITCHES

Kit of parts, including ORP12 Cad-
mium Sulphide Photocell, Relay,
Transistor and Circuit, etc., 6-12
volt D.C. ORP. price 25/- plus 2/6
P. & P. ORP. 12 including circuit,
10/6 each, plus 1/- P. & P.



A.C. MAINS MODEL. Incorporates Mains
Transformer. Rectifier and special relay with
two 5 amp mains c/o contacts. Price inc. circuit
47/6 plus 2/6 P. & P.

NICKEL CADMIUM BATTERY

1-2v. 35 A.H. Size 3 1/2 in. high x 3 1/2 in. x 1 1/2 in. 30/-
each plus 4/- P. & P.
Sintered Cadmium Type 1-2v. 7 A.H. Size:
height 3 1/2 in., width 2 1/2 in. x 1 1/2 in. Weight approx.
13 oz. Ex-R.A.F. Tested. 12/6. P. & P. 2/6.

MINIATURE UNISELECTOR SWITCH

3 banks of 11 positions plus
homing bank. 40 ohm coil 24-
36v. D.C. operation. Tested.
22/6 plus 2/6 P. & P.



VEEDER ROOT

230v. A.C. 50 cycle, 5-figure
counter (non-resettable). 18/6
P. & P. 1/6.



SANWA MULTI RANGE METERS

New Model U50D Multi tester, 20,000
OPV, mirror scaled with overload protection.
Ranges—D.C. volts: 100mV, 0.5v., 5v., 250v.,
1,000v.; A.C. volts: 2.5v., 10v., 50v., 250v.,
1,000v. D.C. current: 5µA, 0.5mA, 5mA, 50mA,
250mA. Complete with battery and test probe.
£7.5.0 post paid.



STROBE! STROBE! STROBE!

Three easy to build Strobe Units using the
latest type Xenon white light flash tube.
Solid state timing and triggering circuit.
230/250v. A.C. operation.

ECONOMY KIT. Flash rate 1-36 flash per
second. All components including Uni-
junction, thyristor, tube and circuit. £5.5.0
plus 3/6 P. & P.

NEW INDUSTRIAL KIT
Ideally suitable for schools, laboratories
etc. Roller tin printed circuit. New trigger
coil, plastic thyristor and new improved
type of tube, 1-80 f.p.s. Price 9 gns. 7/6
P. & P.

HY-LIGHT STROBE

This strobe has been designed for use in
large rooms, halls and the photographic
field. It has 4 times the light output at 30 f.p.s.
and utilizes a silica tube for longer life
expectancy, printed circuit for easy assembly
also a special trigger coil and output cap-
acitor. Light output approx. 4 joules. Price
£10.17.6. P. & P. 7/6.

7in. POLISHED REFLECTOR. Ideally
suited for above Strobe Kits. Price 10/6 plus
2/6 P. & P. or post paid with kits.

RELAYS

Bulk purchase enables us to offer the follow-
ing new **SIEMENS, PLESSEY**, etc. mini-
ature plug in relays complete with base, at a
fraction of maker's price.

Coil	Working	Contacts	Price
280	6-12	2 c/o	14/6
700	12-24	2 c/o	12/6
700	16-24	4 c/o	15/6
700	16-24	4M 2B	12/6
1250	20-40	2 c/o H.D.	12/6
2500	30-50	2 c/o H.D.	12/6
9000	40-70	2 c/o	10/-

H.D. — Heavy Duty. POST PAID

4-STATION INTERCOM



£7/15/0

Solve your communica-
tion 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, Burg-
lary, Schools, Hospitals, 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 12 gns.
P. & P. 8/6 extra.

INTERCOM/BABY ALARM



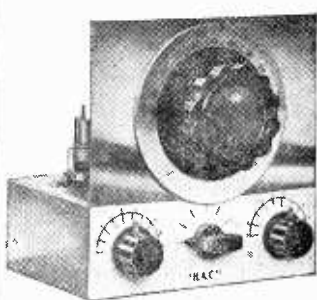
Same as 4-Station Intercom for two-way instant
communication. Ideal as Baby Alarm and Door
Phone. Complete with 66ft. connecting wire.
Battery 2/6. P. & P. 4/6.

Transistor TELEPHONE AMPLIFIER

59/6
Why not boost
business effi-
ciency with this incredible De-luxe Telephone Ampli-
fier. 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.
8/6. Full price refunded if not satisfied in 7 days.
WEST LONDON DIRECT SUPPLIES (P/W11)
169 KENSINGTON HIGH STREET, LONDON, W.8.

H.A.C. SHORT-WAVE KITS

WORLD-WIDE RECEPTION



Famous for over 30 years for Short-Wave Equip-
ment 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, Hos-
pitals, Public Schools, R.A.F., Army, Hams, etc.

IMPROVED 1969 RANGE

One-valve model "DX", complete kit—price 58/6
(Postage and packing 3/6).

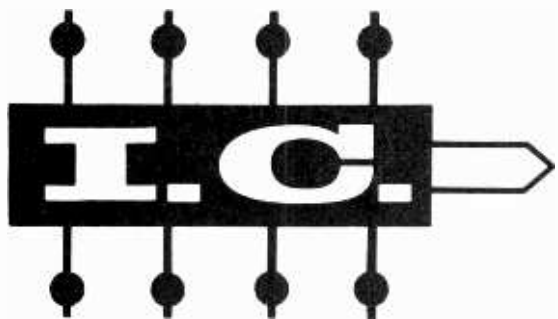
Customer writes:—"Definitely the best one-valve
S.W. Kit available at any price. America and
Australia received clearly at good volume." This
kit contains all genuine short-wave components,
drilled chassis, valve accessories and full instruc-
tions. Ready to assemble, and of course, as all our
products—fully guaranteed. Full range of other
S.W. kits still available, including the famous model
"K" (recommended by radio clubs). 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

SERVICE TRADING CO

All Mail Orders—Also Callers—Ample Parking Space
57 BRIDGMAN ROAD, LONDON, W.4
SHOWROOM NOW OPEN
Phone 995 1560
CLOSED SATURDAY

Personal callers only
9 LITTLE NEWPORT STREET
LONDON, W.C.2. Tel. GER 0576



OF THE MONTH

L.A.J. IRELAND

Number 1

The SL402A and SL403A, audio amplifiers

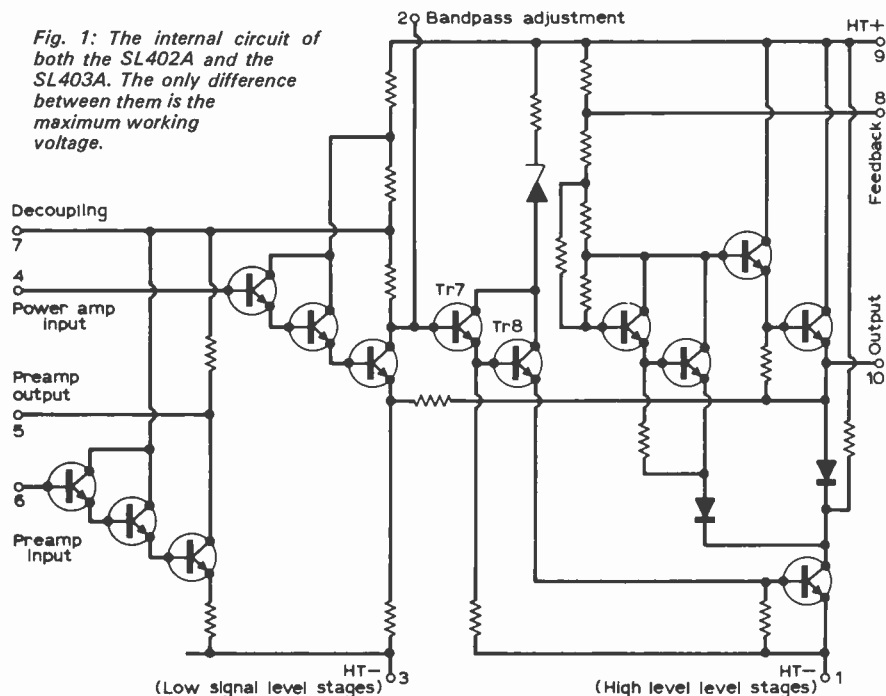
Since the word "microelectronics" first became current, this magazine has kept before its readers the latest developments in this field, and has repeatedly induced its readers to gain practical experience in the application of integrated circuits by the publication of realistic constructional projects. However, the stream of new devices has become a flood, so that it is totally impossible to give full instructions in article form for the wealth of i.c. projects now possible. At the same time such a source of ideas for the enthusiast must be tapped, and hence this new feature. It is intended, each month, to present a new device, idea, or theme from the world of microelectronics which readers can develop for themselves as their experience, interests, or leisure permit. Detailed instructions will not be given—for such articles will continue to appear as in past issues—but all sorts of goodies which must otherwise be left in obscurity as far as the amateur is concerned, will be sought out.

FOR a starter, a pair of interesting new audio amplifier circuits from the Plessey stable has been chosen. These products from a UK firm are emerging as strong favourites in a field until recently dominated by American imports, and are a really good example of the results available to the home constructor as a result of the fierce competition in the industrial world. The SL402A has a typical output power of 2 watts operating from up to 14 volts (a car battery is an ideal source, and car radios or tape players an obvious application), while the SL403A is rated for up to 21 volts, with a corresponding increase in power delivered, to 3 watts.

The internal circuit

Each unit, in a circuit containing 13 transistors, a zener, and several other diodes, provides a complete audio system, preamplifier as well as power amplifier, with an overall voltage gain of 50dB. Further, as a glance at the equivalent circuit will confirm, the input to both preamp and power amp is through an emitter follower chain, giving a very high input impedance in both cases. This obviously increases the utility of the circuit when used in conjunction with crystal record player cartridges; more sophisticated applications in the instrumentation field are also evident, since signal tracers, for example, are only useful to the extent that the loading they place on a test circuit is minimised.

It also permits the introduction of a really comprehensive tone control system, despite the severe signal attenuation this involves. This final point relies also on the fact that the noise level is -75dB relative to the output signal, while overall distortion is a negligible 0.5%. An attractive feature from the point of view of the constructor of economy mains-powered equipment utilising either of these new Plessey units is an inherent



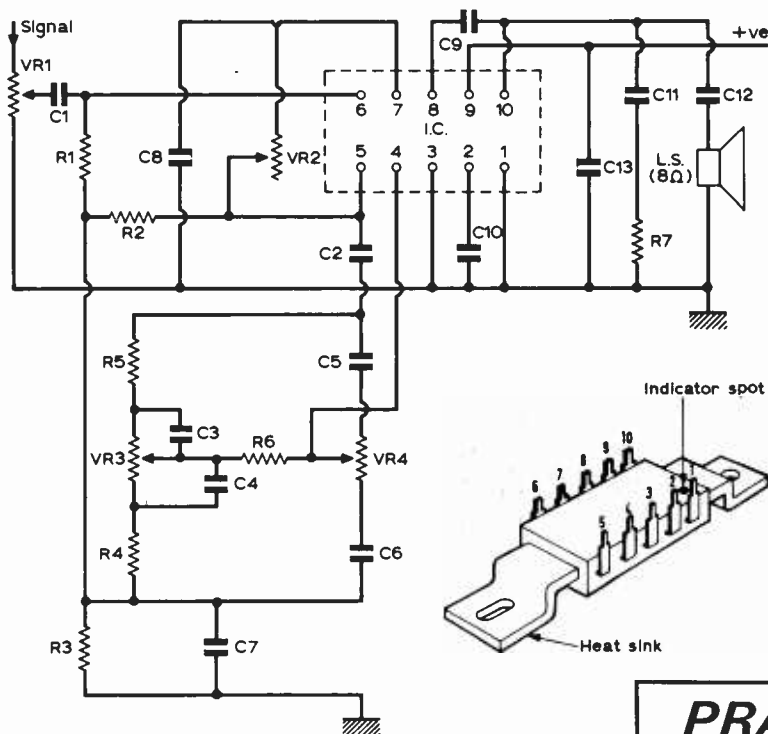


Fig. 2: The discrete components associated with the I.C. and the pin connections.

★ components list

Resistors:

R1	1MΩ	R7	10Ω
R2	150kΩ	VR1	2MΩ log.
R3	68kΩ	VR2	50kΩ lin. (preset)
R4	3.3kΩ	VR3	250kΩ lin.
R5	33kΩ	VR4	250kΩ lin.
R6	10kΩ		

All resistors ½ Watt 10% miniature.

Capacitors:

C1	0.02μF	C8	25μF 25V
C2	2μF 25V	C9	25μF 25V
C3	0.01μF	C10	0.01μF
C4	0.1μF	C11	0.05μF
C5	0.001μF	C12	1,000μF 25V
C6	0.01μF	C13	1,000μF 25V
C7	2μF 25V		

I.C. SL402A or SL403A, available from S.D.S. Ltd., Hillsea Industrial Estate, Portsmouth.

ripple rejection of 30dB in a properly designed system. This is assisted by decoupling the supply line to the preamp and input section of the power amp using an external discrete capacitor. The device is self-protecting to some extent against transient overvoltages in the h.t. supply, since the emitter follower pair Tr7 and Tr8 break down first, biasing off the main amplifier, but with their own dissipation limited by a resistor.

The chip carrying the elements of the integrated circuit is mounted directly on a metal bar which functions as a heatsink; the unit is then potted in epoxy, with ten leads for external connections.

Constructional notes

For safe operation, a heatsink of 20 square inches of 18s.w.g. aluminium is advisable; the integral heatsink of the device should be in good thermal contact with this larger metal sheet, which could well form part of the structure of the audio system in which the unit is incorporated.

The last point may well be the most attractive of all; these Plessey units are currently available from distributors at 39s. 6d. each, *plus postage*. This is a sample of what is available right now, if one knows where to look. More next month! ■

PRACTICAL TELEVISION in the NOVEMBER issue

★ GETTING STARTED WITH CLOSED-CIRCUIT TV

If you think closed-circuit TV is a bit of a mystery beyond your capabilities this new series is designed to show how with reasonably simple equipment you can hook-up your own CCTV network. To start with the basic requirements—equipment, signal levels, etc—and the scope for CCTV work are outlined.

★ STABILISING THE BLACK LEVEL

A great deal is talked about black-level clamping. If you are not sure what the basic problems are—how for example simple a.g.c. systems affect the black level—this article will give you the full story. Details are also given of circuits that have been used to improve receiver performance in this respect.

★ FAULTS OF THE DEVIL

Why are some faults so very hard to pin down? In this feature the shortcomings of standard test procedures are detailed: it is these shortcomings that lead to the culprit so often being overlooked.

★ FOCUS ON WAVETRAPS

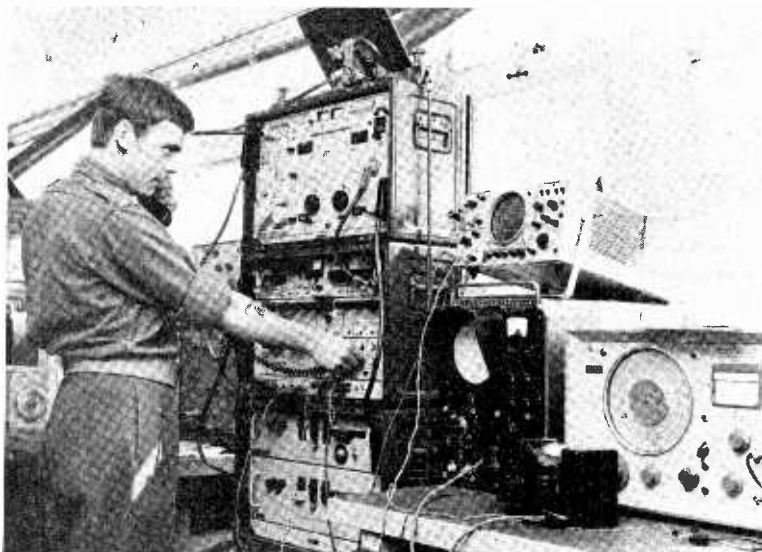
Wavetraps determine the basic response of a receiver and thus the quality of the display. The various types of wavetraps found in TV receivers are illustrated and their operation explained. The wavetraps requirements of the luminance channel in colour receivers are also described and typical circuits shown.

★ DX-TV FILTER

An aerial notch filter giving sharp rejection of interference from local stations to aid DX reception.

PLUS ALL THE REGULAR FEATURES on sale

OCTOBER 17th



Radio Mechanics—read this now

£100 a year for a fortnight's camp plus 2 week ends

You are paid the above minimum amount for a fortnight's camp in the Summer, sometimes abroad, plus two week ends in the Winter by joining the ROYAL ELECTRICAL & MECHANICAL ENGINEERS, TERRITORIAL AND ARMY VOLUNTEER RESERVE as an Army Telecommunications Technician—Existing Volunteers find it great for a change from the same dull routine and faces. Adventure and comradeship as a member of an Army Unit are the keynotes, but full use is made of your trade skills and at least one year in every three you will be taught new techniques and new equipment as an individual at one of REME's Ultra Modern Technical Schools. As a Telecommunications Technician you will work on Army receivers and transmitters employing both valves, transistors, printed circuits and their ancillary equipment, using modern electronic test equipment. You are not expected to know it all on entry.

We are interested in men between 18 and 40 years of age with or WITHOUT former service. We want men with apprenticeships and several years' practical experience plus a good basic theoretical knowledge and are also interested in the enthusiastic amateur who does another job but spends much of his time working on (and not dreaming about) radio. We need practical men who can do a job of work.

If you are one of these tell us about your experience.

Let us send you details. Fill in the coupon and post it now.

Be a soldier, go abroad— and get paid for it

TO: CVHQ REME
BROXHEAD HOUSE, BORDON, HANTS.

Please send me details of the T & AVR REME:

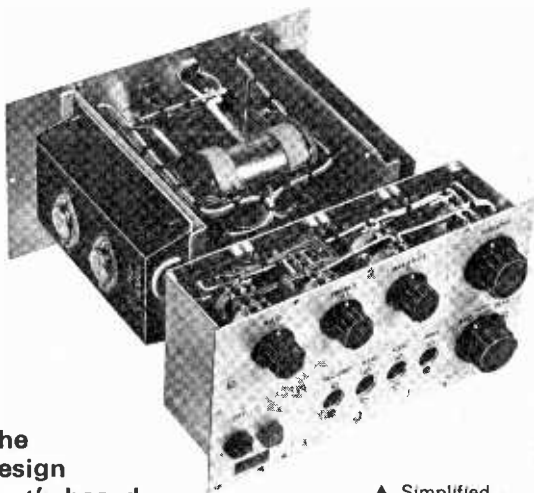
Name _____ Age _____

Address _____

Details of experience _____



BUILD AND ENJOY THE PW DOUBLE 12



The design that's based on PEAK SOUND "Cir-Kit"

- ▲ Simplified Unit Construction
- ▲ Fantastic Performance

This 12+12 watt integrated stereo hi-fi amplifier and pre-amp is proving one of the most successful P.W. designs ever. With good ancillary equipment, you will find it one of the best you have ever heard, and it is a delight to build and handle. Basically, the design of the "P.W. Double 12" as described in P.W. April, May and June demonstrates the value of using "Cir-Kit". However, Peak Sound have contributed more besides to the success of this project. This includes the power amplifiers, the power pack and the ingenious cabinet which almost assembles itself. Go right ahead and build this exciting new design now with authentic, exact-to-specification Peak Sound Kits as recommended by the designers.

This is your PW Double 12 Shopping List

These are the Peak Sound units with which you can build this excellent design. Transistors included.

2 Spools of "Cir-Kit" at 2/- each	4 0	2 P.A. matrix boards	8 0
2 Pre-amp and tone control kits	4 13 0	1 PS.45K 45 volt power supply kit	4 10 0
4 Pre-amp matrix boards	7 0	1 Pack-flat afrosmosia teak finished Cabinet kit	2 12 6
2 PA.12-15 Power Amplifier Kits	7 19 0	5 Controls as specified	2 0 0
2 Heat Sink assemblies	12 0		
		TOTAL COST £23 5 6	
		Hardware Kit of knobs, plugs, sockets, switches, fuses, screws, wire, etc.	£2 10 0
		Metalwork cut, shaped and punched.	£2 12 6

P.W. Double 12 abridged specification

Controls—Bass and treble cut and lift based on Baxandall circuitry/Volume/Balance/Rotary selector.
Input Sensitivity—Magnetic P.U. (per channel) 2.5mV into 68kΩ. Ceramic P.U.—25mV into 27k, equalised for flat response. Radio/Aux. 60mV. HIGH OVERLOAD FACTOR ON ALL INPUTS.
Frequency Response—20Hz to 30KHz ±1dB overall.
Output—12 watts per channel into 15Ω (8Ω speakers may be used).
Negative Feedback—43dB over each section.
Cabinet—Afrosmosia teak finish, pack-flat, easy to build kit. Size 9½ x 5½ in. high x 9½ in. deep.
Transistors—Ultra low noise in pre-amp and tone control stages.

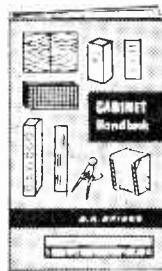
GO TO YOUR DEALER NOW

for your authentic Peak Sound Kits. In case of difficulty, please send direct, giving the name and address of your usual supplier where possible and add 11/- postage for complete assembly, or 5/6 if without power pack.

TRADE ENQUIRIES INVITED

PEAK SOUND (HARROW) LTD

32 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM
Egham 5316 SURREY.



CABINET BY G.A. BRIGGS HANDBOOK

112 PAGES
FINE ART PAPER
90 ILLUSTRATIONS
FIRST EDITION APRIL 1962

Reprinted April 1963, October 1964, October 1966, February 1969

PRICE 7s 6d (8s 6d post free)
semi-stiff cover

Now available in cloth bound Library Edition at 15s, 16s 6d post free

Intended for the "Do-it-yourself" man and the audiophile, this book contains a lot of first-hand information about woodworking, veneering, polishing, etc. But its main value, probably rests on the vital information given on cabinet design and the acoustic principles involved, particularly in relation to compact enclosures which are now so popular for stereo.

CONTENTS

	Pages		Pages
Bibliography	1	Chapter 9	Resonance
Introduction	2	.. 10	Absorbents
Chapter 1	Materials	.. 11	Home Equipment
.. 2	Plywood	.. 12	Cabinet Design
.. 3	Adhesives	.. 13	Treble Enclosures
.. 4	Veneering	.. 14	Electric Guitars
.. 5	Machines	.. 15	Room Treatment
.. 6	Assembly		
.. 7	Polishing	Conclusion	1
.. 8	Mesh	Index	2

Please send orders and enquiries to:

RANK WHARFEDALE BOOK DEPT. B.W.S.
13 WELLS ROAD, ILKLEY, YORKSHIRE Telephone: Ilkley 4246
Published by RANK WHARFEDALE LTD., IDLE, BRADFORD, YORKSHIRE



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. 90 ft. 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, 202 ft. 22 gauge on plastic reel. Recommended retail price 15/-



A RANGE OF SOLDERS IN HANDY DISPENSERS.

REF. ALLOY SWG

4A	60/40	18	2/6*
Size 5 (illustrated)	Savbit	18	2/6*
15	60/40	22	3/-*

*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.

SHOWTIME '69

NEARLY fifty firms exhibited in this year's radio-trade shows in late August. Most of them took space in London's best-known hotels, but a few staged exhibitions on their own premises. The shows were once again for the Trade only, the manufacturers obviously taking the view that their aim must be to sell to the dealers, leaving them to persuade the public to buy.

TRENDS

The emphasis of the shows this year was on colour TV, as might be expected, and we found no signs of startling developments in radio and audio. True, there were many new models to see, but the main differences between them and their predecessors was in the styling and cabinets rather than circuitry.

More of the "popular" firms seem to be bringing out better quality audio equipment such as record-players and stereograms. For example, many more stereograms now have detachable loudspeakers which give much better results than loudspeakers positioned about 3ft. apart and housed in the same cabinet. The makers seem to be realising at last that a lot of people want equipment somewhat better than the very cheap type, but at a price less than that charged for hi-fi units.

NEW ITEMS

Details of new TV receivers are contained in a special report in the November issue of our companion magazine *Practical Television*, on sale on 17 October.

News from *Alba* was model 665, an a.m./f.m. personal radio with eight transistors and four diodes. The receiver covers m.w. and v.h.f./f.m. and the recommended price is £9 17s. 0d. The *Alba* 5007 stereogram has a price of £95 2s. 0d. and features a mains-powered 15-transistor chassis. Later in the year, *Alba* will release the 6003 stereogram at about £71. Like the 5007, it will cover l.w., m.w., and f.m. (with a.f.c.).

The Beomaster 3000 from *Bang and Olufsen* gives 30W r.m.s. output per channel with less than 0.6% distortion. The radio tuner section has six keys to give instant selection of six f.m. programmes. The unit is available in teak or Brazilian rosewood finish at £135 9s. 0d. and £136 10s. 0d. respectively.

The Beocord 2400 tape recorder by *B. and O.* is a four-track machine with studio-type slide controls for microphone, radio, gram or line. A fifth slider controls the volume. The 2400 sells at £208 19s. 0d. in teak and £210 in rosewood.

A clock radio, model 450, from *Benkson* uses nine transistors and has an automatic alarm. It covers m.w. and l.w. and is available in green, brown and black. The suggested retail price is £9 19s. 6d. The *Benkson* 458 is a ten-transistor radio covering m.w., l.w., and f.m. and retails at 12gn.

A 3½in./sec. tape recorder from *Bosch*, the Uher 714, retails at £49 17s 8d. and has a frequency range of 40Hz to 15kHz. It records mono on four tracks and will accommodate 7in. spools. On the radio side, *Bosch* have a new luxury receiver, the Supernova. This set covers f.m., l.w., m.w., and s.w. (187m. to 10m.) and operates from mains or batteries. The price is £93 10s. 0d. At the other end of the price scale is the Dixie covering a.m. and f.m. for £16 3s. 0d.

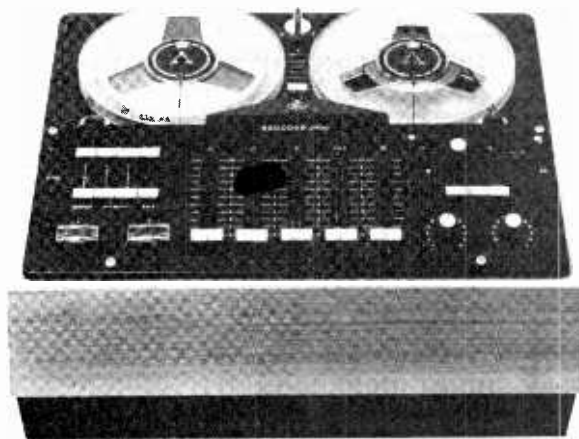
The New York stereogram from *Bosch* incorporates slider-type controls for tone and volume etc., and has an automatic stereo decoder which has 7μV sensitivity. The price of the New York is £330 13s. 2d.

The CR128 is a combined clock and radio introduced by *Bush*. It covers m.w. and incorporates an alarm clock. The price is 14gn. The *Bush* VHF101 is a mains-operated transistorised table radio with long low styling in teak or tropical olive veneer. Coverage is l.w., m.w., and v.h.f./f.m., and there are sockets for tape recording and external v.h.f. aerial. This model is priced at £30 19s. 9d.

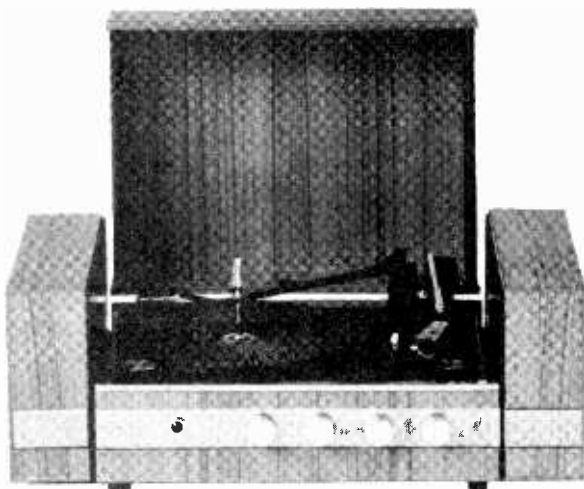
Model TR-145 from *Crown* is a four-band eleven-transistor portable with 1.8W output. It covers m.w. (525kHz to 1605kHz) and s.w. (1.6MHz to 22MHz in three wavebands). This model sells at £27 15s. 8d.

Among new items from *Dansette* was the Graduate stereo system, a record-playing unit and amplifier with separate loudspeakers. The retail price is £47 0s. 4d. The *Dansette* Compact is another new stereo record-playing system and retails at £39 9s. 4d. The cabinet is finished in teak and the two loudspeakers are detachable.

New to the *Decca* range of radios are the PR303, a three-band a.m./f.m. receiver with switchable car aerial, and the PR205 (Parade), a three-waveband set with switchable a.f.c. for the f.m. band. The prices of these two models have yet to be announced.



Beocord 2400 from *Bang and Olufsen*.



Dansette 'compact' with detachable speakers.

From *Ekco* at £21 was the *Nautilus* covering m.w., l.w., s.w., and f.m. This mains/battery radio has an olive green padded cabinet.

The 3247 from *Ferguson* is a new tape recorder in charcoal grey with teak or rosewood veneer. This four-track machine operates at 3½ in/sec. and retails at £42 10s. 0d.

A radio from *Fidelity*—the RAD16—covers m.w., l.w., s.w., and the marine band. Other features include an earphone or tape socket together with a push-button and socket for car aerial. The price is 17gn. The other new radio from *Fidelity* is the RAD18 which has a wrap-round dial and nine push-buttons for waveband selection and on/off switching. This set has a teak-veneered cabinet and retails at £28 7s. 0d.

The G989/1 stereo radio tuner from *G.E.C.* retails at £33 12s. 0d. and works with any stereo system or amplifier since it has its own power supply. Mono and stereo transmissions are kept in tune by a.f.c. and there is a pilot light to indicate stereo programmes.

The three-waveband *Solo Boy* from *Grundig* covers l.w., m.w., and f.m. This receiver has an r.f. stage for f.m. reception and gives 700mW audio output. The price is £17 19s. 6d.

The VHF *Herald* from *Hacker* is a portable receiver for f.m. only, and is finished in black padded leather-cloth with satin silver trim. The audio output is 1½W, and there are sockets for external aerial and output to tape recorder. The sensitivity is better than 1µV for 10dB signal-to-noise ratio, with full limiting at 5µV. The price is £29 18s. 0d.

From *ITT KB* comes an unusual mains table radio which has a sloping front, with tuning scale on the right and loudspeaker on the left. The sides of the cabinet are finished in teak, the l.s. grille is black, and the trim is brushed aluminium. The list price of the receiver, model KR068, which covers l.w., m.w., and f.m., is £32 15s. 0d.

Interesting items at the *National* show included stereo headphones with built-in radio, and a miniature personal radio which can also be plugged into a separate amplifier unit to make a table radio. These two items formed a part of a display of equipment at present available in the USA, but not yet on sale here.

National also showed the RF-5000 19-transistor portable which covers l.w., m.w., f.m., and s.w. (1.6MHz to 30MHz). This eleven-band set sells at £169 4s. 0d.

A new receiver from *Perry and Pharo* is the *Action* by *Nova-Tech*. This portable five-band set covers 30MHz to 50MHz; 1.5MHz to 4.5MHz; 550kHz to 1600kHz; and 200kHz to 400kHz.

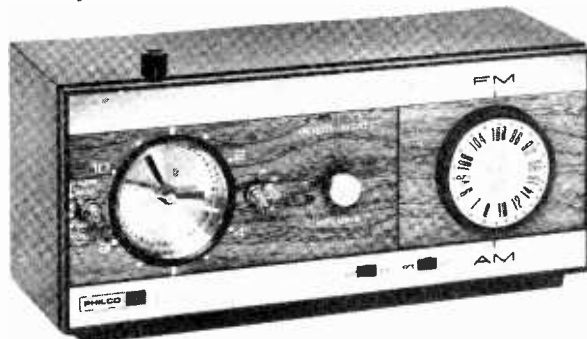
From *Philco* comes model R440WA, an elegant mains table radio covering m.w. and f.m. The price is £20 6s. 1d. An a.m./f.m. clock radio, model R530BK, retails at the same price.

The GF822 stereo record player by *Philips* features a new press-button auto-changer with built-in cueing device. Two dual-cone loudspeakers with teak-veneered enclosures are provided, and the retail price of the complete system is £61 19s. 0d.

The *Philips* RL693 mains/battery radio was also on show. This has two medium wavebands, and also covers l.w., s.w., and v.h.f. The price is £78 16s. 0d.

Sony unveiled a vast range of new items which included the ICR200, an integrated-circuit radio with rechargeable batteries. This receiver covers m.w. and is available in red or black, and comes complete with battery charger. The price is £18.

The ICF8500, also from *Sony*, covers f.m., m.w., and the aircraft, marine, and beacon bands. The retail price of this model is £60. The *Sony* TFM 6600L is a portable covering l.w., m.w., and f.m. It has a 3½ in. l.s. and operates from internal batteries or a.c. mains (via an optional adapter). The retail price is £21 15s. 0d.



Philco's clock radio, model R530 BK.

One of the lowest priced items seen during the shows was the *Teleton* 6X705 single-waveband portable receiver which weighs only 8oz. The suggested retail price is £2 15s. 0d.

Two new stereograms were shown by *Unitra*; the *Sandpiper* at 62½ gn. covers l.w., m.w., and f.m. and has 4W peak output per channel. The DGS303 has five wavebands including f.m. and has an output of 2½W per channel into 5Ω loudspeakers. The DGS303 retails at 89½gn.

Van der Molen showed the *Sonic* 4+4 stereo record-player. One of the loudspeaker enclosures may be detached for optimum results. The system retails at £24.

The Stereo 88 unit audio system from *Videorama* sells at 39½gn. and consists of amplifier/record-player, and two loudspeaker enclosures. The Stereo 99 system has three units, too, but the record-player section also contains an f.m. radio tuner. The units are finished in teak veneer and the output is 5W per channel. The price of the Stereo 99 is 69½gn. ■

CODAR CR.70A

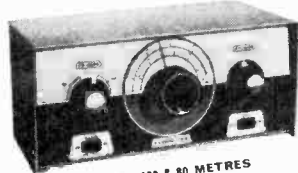
Communications Receiver 540-10 metres



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 3/4" 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.

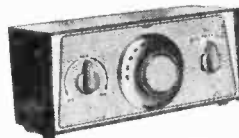
Carriage 7/6 extra
 *Ideal for SWLs *5 valves (inc. two twin triodes) giving 7 valve line-up *Excellent on amateur and shipping frequencies *Calibrated signal strength meter (illuminated) *Automatic volume control *Separate B.F. oscillator for morse and S.S.B. signals *Two speed vernier tuning *Separate output for recording etc.



T22 RECEIVER FOR 160 & 80 METRES AMATEUR BANDS
 bandspread 1.8-2Mc/s and 3.5-4Mc/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 bandspread. *3 slow motion drives. *Output 3 watts spread. *Valves ECC81, EL84, EZ80, for 213 ohm speaker. *CODAR-KIT CR.45K with 3 coils Size 12" x 5 1/2" x 7". (10-28, 25-75, 60-176 metres). £9.15.0. Carr. 6/-, or ready built CR.45 £11.19.6. Carr. 6/-. Extra coils 5/4 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. 6.3 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.30K £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 £2.4.6. Carr. 3/-. Extra coils 5/4.

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
 £.....

NAME

ADDRESS.....

☐ Ad stamp enclosed
 for leaflets

POST ORDER FORM TODAY

MAINLINE

ELECTRONICS LIMITED

Service with the personal touch

Mainline Electronics is a new Service for users of electronic equipment and components in the field of experimental work.

Backed by one of Europe's leading Distributors and enjoying the support of the Industry, Mainline Electronics specialises in quality components from leading manufacturers. These products are characterised by excellent materials and workmanship, proved reliability and known performance. Service is the watchword of Mainline Electronics' activities. The company not only supplies the right components at the right price but, also supplies the necessary data through the data service published in the component guide.

Your Complete Professional Guide to Components and Prices



Send today for Europe's finest, most up-to-date and most comprehensive Price List of Semi-conductors and associated components, with details of manufacturers full application data.

4/-
Post Free

Get this invaluable reference now — to RCA — IR — SGS — Emihus — Semitron — CCL — Plessey — Morganite — Litesold to name but a few.

A DOZEN OF THE BEST

RCA

Si

SGS

C.C.L. LTD.

Morgan

Litesold

HIVAC

IOR

KEYSWITCH RELAYS

70 Watts of Audio

Mainline introduce a trio of amplifiers featuring the Mainline '12', Mainline '25', Mainline '70'.

The design of these audio amplifiers was the result of **SGS** and **RCA** combining their tremendous resources to produce these quasi circuits.

Each Kit complete with circuit diagram contains all semiconductors — resistors — capacitors and printed circuit board.

Mainline 12A — £7.0.0.
Prices: Mainline 25A — £8.5.0.
Mainline 70A — £10.10.0.

TRANSISTORS etc.

AC107	3/-	OC35	7/6
AC126	2/-	OC44	2/0
AF115	3/-	OC45	2/0
AF116	3/-	OC70	2/3
AF117	2/9	OC71	2/-
BFY18	4/8	OC72	2/2
BFY51	4/-	OC73	2/3
GET113	2/6	OC75	2/2
OA5	1/8	OC81	2/-
OA9	1/8	OC81D	2/-
OA47	1/9	OC82D	2/3
OA81	1/8	OC140	5/-
OA85	1/8	OC169	3/6
OA91	1/8	OC170	2/2
OC23	6/6	OC171	2/2
OC25	5/-	OC202	4/6
OC26	5/-	TK22C	1/6
OC28	6/6		

SILICON DIODE

RECTIFIERS		
BY100 800 piv	2/10	
New 500 mA		
250 piv	1/9	
Avalanche 1A		
1200 piv	4/-	
Six Amp Series		
BYZ13 800 piv	3/6	
BYZ12 600 piv	4/6	
BYZ11 900 piv	5/6	
BYZ10 1200 piv	5/-	
Mullard Stack FW		
Bridge		
12A 100 piv 30/6	(3/-)	
THYRISTORS		
5 amp series	7/6	
100 piv	9/-	
200 piv	10/6	
300 piv	12/-	
400 piv	25/-	
800 piv	10/-	
10 amp series	12/-	
50 piv		
100 piv		
100 amp series prices		
available on request.		

Midget Electrolytic

Conds. Wire Ends		
At 6d. each		
0.8µF	25 volt	
4µF	150 volt	
640µF	2.5 volt	
At 9d. each		
2µF	350 volt	
4µF	15 volt	
8µF	12 volt	
16µF	16 volt	
30µF	10 volt	
100µF	6 volt	
125µF	4 volt	
At 1/- each		
16µF	250 volt	
50µF	10 volt	
100µF	12 volt	
100µF	25 volt	
200µF	10 volt	
320µF	10 volt	
2000 MFD. 30V	4/6	
1500 MFD. 30V	4/6	

Crystal Diodes—6 for 2/6 (7d.).

Additional Transistors—AF147 and AF150, 24v. Larger envelope, 4 leads, collective current 10mA, gain 70—4/- each. AF149—gain 225—4/6 each. Also 5µF 350V 1/2, 25µF 25V 1/3 and 50µF 50V 1/9. Other electrolytics in current list. Postage, Packing and Insurance all above 1/- up to 12 and over charges paid.

2 GANG VAR. CONDENSERS: Mod., auto spaced, .0005 ea. sec. 5/- (1/-).

SUB-MIN TRANSFORMERS: Output (3p for OC72 etc.): 2/6. Driver 2/9 (up to six, 1/-).

MULTIMETER: 20,000 Ω/V D.C., 10,000 Ω/V A.C. 0-5/25/50/250/500/1K volts D.C.

0-10/50/100/500/1K volts A.C. 0-50µA/2-5mA/250mA D.C. 0-6K Ω/5 meg Ω.

10µΩ PF—0.01mfd/1mfd. 0—20 to +22dB. Complete with test leads and instructions.

Over-load protected 1969 model with every refinement. 24.7/6 (2/6). JUNIOR MODEL

at 47/8 (2/6) 1000 Ω/V described in free list.

SOLDERING IRON, Slim Mod. British High speed, 8in., all parts replaceable, fully

used for professional, radio and general D.I.Y. use. 12/6 (1/6).

DIAMOND STYLUS: Replacements for BSR TC8L TC8/8 and TC8LP/STEREO.

COLLARO "O": RONETTE BF40LP; GARRARD GC2LP and GC8LP; ACOS GP65/67;

all at 7/6 each (1/-). ACOS GP91 ST/LP; BSR ST4 and ST9; BONTONE 9TA and

9TABC; PHILIPS AG306, 3060 (3063, 3066, 3301, 3302, 3304) state whether long or

short type, all at 13/6 (1/-).

SAPPHIRE all the above 7/8 types only, also ACOS GP37 at 3/3 each (1/-). ACOS GP91

at 8/9 (1/-). No other types at present, and no 78 rpm available in any type.

PICK-UP CARTRIDGES, all fitted Stylus and Standard fittings. Mono GP67/12, 13/6.

Stereo Compatible—Mono which also plays Stereo records monaurally with min. wear,

GP91/8C, 16/6. Latest Stereo GP93, 23/-. Ceramic Stereo, top quality for expensive

outputs, GP94, 38/6 (all 1/-).

FP3 ELIMINATOR (A.C.), 17/8. (1/6). TWO STATION TRANS. INTER-COM. Excellent

baby alarm. Instant, easy fitting with leads, plugs and battery. All you require 52/6 (3/-).

TRANSISTORISED AMPLIFIERS, 3 watt, 9V operation, 45/6 (1/6); 7½ watt, 6 trans.

24V operation, 67/6 (2/6).

Extra High Torque MINI-MOTOR, 4½ to 12V, 1½ x ½in. 5/- (1/-). 9,000 r.p.m.

SUBSTITUTION BOXES, Capacitance 24/9 (1/6). Resistance 22/6 (1/6). Both full range and

complete. Full details in list.

TEST PRODS: Flexible, unbreakable 24" Red and Black leads, thin 4½" prods, 1½" plugs

4/9 (1/-). Plated Croc. Clips 6d. each, 5/- doz. (1/-).

RECORDING TAPE: Finest quality British Mylar. STANDARD: 5in. 600ft. 7/3, 5½in.

850ft. 8/9, 7in. 1200ft. 11/3. LONG PLAY 5in. 900ft. 10/-, 5½in. 1200ft. 11/3, 7in. 1800ft.

18/- (1/3 reel). Still the finest quality and value obtainable.

DIAPHRAGM MICROPHONE, Desk, 15/8; MIC4, curved hand grip 17/8; Stick

"60" 20/8; Stick "39" 26/8 (1/6 each type). Cream plastic hand type 7/8, or with "strut"

stand, switch and 2 leads with 2.5 and 5.5 plugs 11/-. 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 15/8 (1/6). MS10 50K Ω, 3½ x ½in. with Base,

Adaptor and Neck Cord 57/8 (2/6). ME11, similar, but fixed on flexible Swan neck to switch-

fitted base 42/6 (2/6). DM132 Uni-directional, 50K/600 ohms imp, stand adaptor, very

high quality 6½ x 2 x 1½", 25.9/8 (5/-).

CARDIOM DYNAMIC OMNI-DIRECTIONAL: Two highly successful mikes "SQUARE"

208, 55.10.0. "BALL" type, 209, with built-in vol. control, switch 50K/600 ohms imp.,

55.17.6 (either type 5/-). Full details in list.

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

SPRINGER, 12in. round, fitted Tweeter, 6W, 3 or 15 Ω (state which), 35/6 (5/6); 2½in. 3/6

6/6 (1/-); 6 x 4 heavy duty 3 Ω 14/8 (3/6) or for Stereo 34/6 pair (charges paid); 3 Ω, 3/6

(1/-). Limited quantity powerful 2½in. PM transistor replacement speaker, high ohms,

excellent, 5/6 (charges paid). HEADPHONES High Res. 2000 Ω ea. earpiece 18/6 (1/6);

Stereo Dyn 8-16 Ω, 63/- (3/-). EARPIECES with lead etc., Min. Plug Magnetic 1/6;

Crytal 4/9 (either, up to the, 1/-).

AERIALS, Car Types: Telescopic, vandal proof, locks retracted, 2 keys and all fittings,

22/6 (2/6). Motor driven, 12V, 5 section, complete 27.10.0 (5/-).

FOR ALL PORTABLES and P.M. SETS. 7-Section 5½-32in., no swivel, screw hole in base,

6/6. 10-section 6½-47½in., no swivel, screw hole in base, 12/6. DISAPPEARING 8 section,

swivel fixing assembly, 6½/33in 10/- New 6 section 6½/25in, screw hole in base, no swivel

4/- (1/- all sizes).

SWITCHES: Standard toggle, metal, 250V 2A. One hole fixing: SPST 2/3, SPDT 2/3.

DPST 3/-, DPDT 3/3. Slide types. 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 additional). Rotary

Switches etc. in list.

VIBRATORS: Famous makes only. 12 volt 4 pin non-async 2/6. 12 volt 7 pin synch 10/-.

6 volt 7 pin synch 10/- (1/- each, all types).

MAINS NEON TESTER: Fly leads 2/-, Pocket screwdriver type 3/6. PLUGS: Std. Jack,

plastic body 2/3. Screened 3/-. Sockets 1/6. VALVE HOLDERS: B7G or B9A, Moulded

6d. (all above, 1/- up to three). CONNECTING WIRE: 5 coils astd. 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, 1/8 yd. (6d. up to 6 yds.,

over 6 yds. post free). TWIN MIKE CABLE: 1/8 yd. SINGLE MIKE CABLE: 7d. yd.

Both flexible, screened and sheathed. FEEDER CABLE: Twin r.f. bal. "Hg. 8", 80 Ω

or flat 300 Ω transparent polythene insulated, either 6d. per yd. (all cables up to 3 yds

8d., each additional yard, 1d. extra).

R.F. INDICATOR, 5-Band, with meter antenna, monitoring crystal earpiece 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 ft., 4/6; 12 ft., 7/9. With phono plug one end, phono socket

at other, 6ft., 6/-, 12ft., 8/6 (1/- each all types).

CAR RADIO: Splendid new All-British dash-mounting radio using Mullard transistors

and circuit M. and L. wave. Separate speaker and baffle. Absolutely complete, for + or

- chassis. £11.10.0 (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 equip-

ment, 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 Aug. 31st.

FELSTEAD ELECTRONICS

(PW24) 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 air or surface mail extra at cost, plus 3/2 registration or insurance fee. S.A.B. please for enquiries, otherwise regret cannot be replied to

practically wireless

commentary by HENRY

with guest writer FRANK P. YOUNG

No. 62

Rally Round
the Can Boys

CHARLES Curran warns us that the long-term future for radio in this country lies with v.h.f. . . . last year's total of v.h.f. receivers manufactured exceeded 119,000 . . . there are v.h.f. radio stations now in eight cities . . . we are all high-band minded. But what about the low band?

Just because the GPO allows Private Mobile Radio to operate in this country between 87.5-88MHz and cross-modulate our entertainment, we must not imagine we have entered the sophisticated world of open communications. As an example of what could happen, let's take a look at the States, where the Citizens' Band is open to all, up to about 40 miles coverage per set at maximum 5 watts on 27MHz, with up to 23 potential channels.

Our guest writer tells Henry that the women in USA have dropped their telephones and picked up microphones: 'They never could resist a party line,' says Frank Young, an American resident of Bristol, who sorely misses his CB facility. Now read on . . .

"Joe to Willie, Joe to Willie. Do you read me? Over . . ."

"Willie to Joe, receiving you five-by-five, over."

"Willie, they're moving up over the hill now, heading east pretty fast . . . circle around that lower road . . . don't let 'em spot you until you're ready to fire."

"Roger, Joe, keep your heads down—over and out."

The Dieppe Raid? Anzio Beach? Breaching the Siegfried Line? No. Deer season in Potter County, Pennsylvania.

It is walkie-talkie time in the woods, America's last stronghold of the male on the airwaves. Its khaki webbing is worn and batteries are increasingly hard to get, but the war surplus instrument is lovingly coddled by its master. Once a year, he contributes to the language by re-enacting—and thus preserving—the strange tongue of the Ardennes, circa 1944.



They're coming up the hill fellows—run for it!

He does this, to the infinite delight of all rifle-toting, back-at-the-lodge beer-swilling old soldiers, courtesy of the Federal Communications Commission. This is the same outfit that a few years ago, via an Act establishing Citizen's Band Radio, brought women into our preserve.

Time was when Amateur Radio was a comradely all-male secret society, with its own cabalistic language and signs. The whole thing was carried on in private seances in little back rooms, full of black boxes and huge dials and coils and throwswitches, all making peculiar noises and bakelite smells and bitty sparks. Every man was his own Merlin, staying awake long hours into the deep night in commune with fellow-wizards.

Citizen's Band was welcomed at first. It meant more wizards—a lower class, of course, but nevertheless. We men were wrong. It was a classic case of turning over the cauldron to the Sorcerer's Apprentice. The Apprentice, in this case, was Mum, and she simply didn't fit in.

To begin with, she wanted to talk, too. It was a novelty at the start, but you all know how women are. They never shut up. 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.

Then she said it would be better



Every man was his own Merlin.

as a sewing room. The radio would look nice in the kitchen, right next to the Super-Six-Burner-Over-And-Under-Oven Mark VII All-Automatic Stove, with its IBM computer console for making tea. She figured that just because we were too stupid to figure out the stove, we couldn't work our radio, either.

Now they're making the damn things in mauve and pink cases to match refrigerators. I don't know how long we'll last out here in the woods. My buddy, Charlie, bought it last week when his wife zeroed in on the lodge with her auto receiver, and caught him calling the beer truck for an extra delivery.

But we're working on evasive action. We've invented a new gadget that can't be picked up by any radio. All it takes is two used bean cans. Then you take a piece of fishing string, see, and . . .

**INTERNATIONAL AUDIO
FAIR 1969**

AT OLYMPIA . . .

**... LOOK OUT FOR THE
"PRACTICAL WIRELESS"
STAND—No. 73**

OCTOBER 16th—22nd

MEDIUM WAVE

DK

RECEIVER

D. GIBSON G3JDG

LAST month, in part one, we discussed the theoretical aspects of the receiver and considered various alternative front ends. In this part, we will be concerned with the construction and alignment of the unit.

It is not imperative that the layout shown be strictly adhered to. Experienced constructors, the type of person who might build this receiver, will have their own ideas. Providing the layout follows a sensible pattern and the rules of common sense are adhered to there should be no difficulty. Short leads carrying signal voltages and other obvious rules of construction must be observed.

The case is a bought item and is made of steel. The front panel is aluminium. The only hard work is making a cut-out for the loudspeaker in the steel side of the case. A neat group of holes would be the easiest way out. The writer made such a hash of this simple task that it was necessary to cover the resultant scars with a plastic fret gleaned from a "surplus" store.

The front panel is enamelled and although reasonably hard can still be scratched. It is best to make a template of paper marking out the position of the individual controls. These centre marks can then be transferred to the panel by laying the paper template in position and pressing with a sharp-pointed scriber. The meter cut out is made using a hacksaw while the other holes can be drilled.

Tuning Drive

The dial must be positioned carefully in order to line-up with the spindle of the tuning capacitor. Any inaccuracy here will result in undue strain on the spindle of the tuning capacitor, which is very undesirable. The hole for the drive was cut with a B9A cutter. Fortunately, the dials are supplied with a paper template, and this can be laid on the front panel and the position of the holes marked quite accurately. The writer's somewhat cowardly method was to pitch the main spindle hole a little high and then to pack the tuning capacitor with brass washers under the small aluminium plates which hold it to the chassis.

All controls, with the exception of the dial plate and "S" meter, should be mounted and the panel then bolted to the chassis with four bolts. The chassis

was cut from aluminium to form a final shape 10in. wide by 5½in. deep. The back drop is 2in. and the front lip is bent upwards forming a ½in. strip to which the front panel is bolted.

The wiring is in a modular form, this being an easy way to build most complex projects. The front end is wired up on its small plain Veroboard "chassis" which, when completed, is bolted to a cut out in the main aluminium chassis by four 6BA bolts. This Veroboard holds the mixer, oscillator and buffer stages.

The r.f. stage is wired separately and the pins of the r.f. coil are used as anchoring points for the discrete components. This has the advantage that the entire r.f. section is under the chassis well away from the mixer. The chassis affords excellent screening and the physical distance combines with this to ensure that undesirable feedback and instability due to the stages "seeing" each other are eliminated. Constructors varying the layout should bear this point in mind when deviating.

The layout shown offers several advantages. Placing the r.f. coil and components as shown ensures the shortest possible leads from aerial to input. Again, the positioning of the Veroboard strip and i.f. strip allows short leads between mixer and i.f. input.

The i.f. strip is also a bought item. It was thought that many constructors would not have access to sophisticated test equipment and that the building and alignment of a strip with a half lattice crystal filter would present difficulties. Constructors with both test gear and confidence might consider building their own i.f. section.

Filter Matching

If one of the transistor front-ends is used, then the extra i.f. transformer is needed, coupling being via a small capacitor. If this capacitor is made too large in value, then the filter characteristics will be impaired because of the heavier loading effects.

As an experiment, the collector of the mixer was connected direct to the input transformer on the strip which amounted to a large mismatch of impedances and consequent distortion in the shape of the filter



Top view of the completed receiver.

passband. However, surprisingly enough results were still quite passable and the tuning remained tolerably sharp, although the filter passband shape was not viewed on an oscilloscope which might have told a harrowing story. Brave men with suitable 'scopes proceed with caution.

If the f.e.t. front end is used and the extra i.f. transformer is to be used, then a simple modification is well worth while and is shown in the diagram. This modification is very easy and ensures a higher impedance load to the f.e.t.

The a.f. section follows the same pattern of construction as the front end. It may be built on its Veroboard "chassis" and tested before bolting it to the main aluminium chassis. Heavy decoupling was found necessary due mainly to the high gain of the amplifier. The two 1,000 μ F decoupling capacitors were mounted by means of a small aluminium plate which in turn was bolted to the back-drop of the main chassis. A single 2,000 μ F 15V capacitor would be equally suitable providing it will fit into the space available.

The 200 μ F loudspeaker "coupling" capacitor C18 is more usually some ten times this value. However the value was gradually decreased to 200 μ F with no apparent effect on performance and thus this value was used since it takes up a very much smaller volume.

The complementary pair output transistors have small slip-on heatsinks. These were drilled and cleaned with emery cloth and bolted to the chassis with 6BA bolts thus utilising the main chassis as a heatsink. Although probably not strictly necessary, it does afford a neat layout and an additional safety factor.

The two batteries are wired in series to give a 12V line. They are held in position with a length of 4BA brass studding bolted to the chassis at one end, while the other end is pushed through a hole in a strip of Paxolin which traverses the length of both batteries. This method is hardly elegant and constructors might consider making a small aluminium bracket or some form of more secure housing for them.

When the wiring of the two Veroboards is completed and these are bolted in position the various interconnecting wiring may be completed.

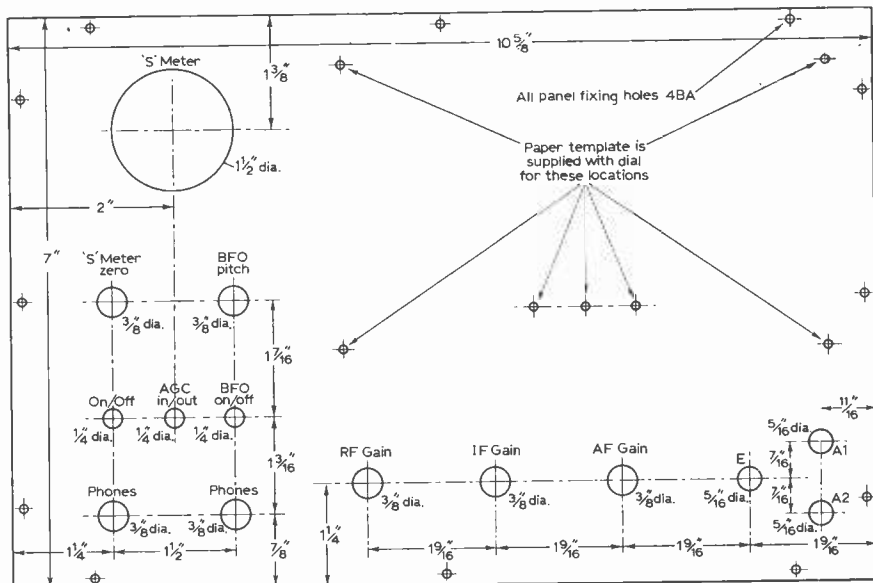


Fig. 7: Front panel drilling and layout.

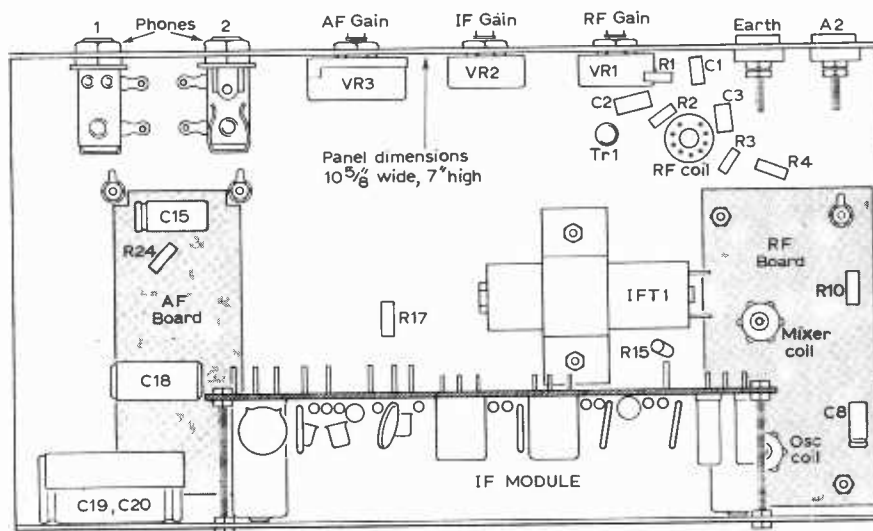
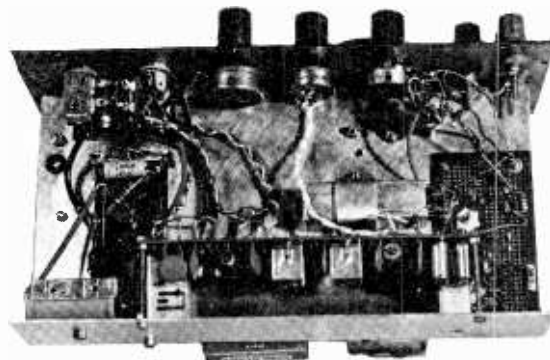


Fig. 8: Layout of components on the underside of the chassis.



Underside view of the receiver. Compare this with Fig. 8.

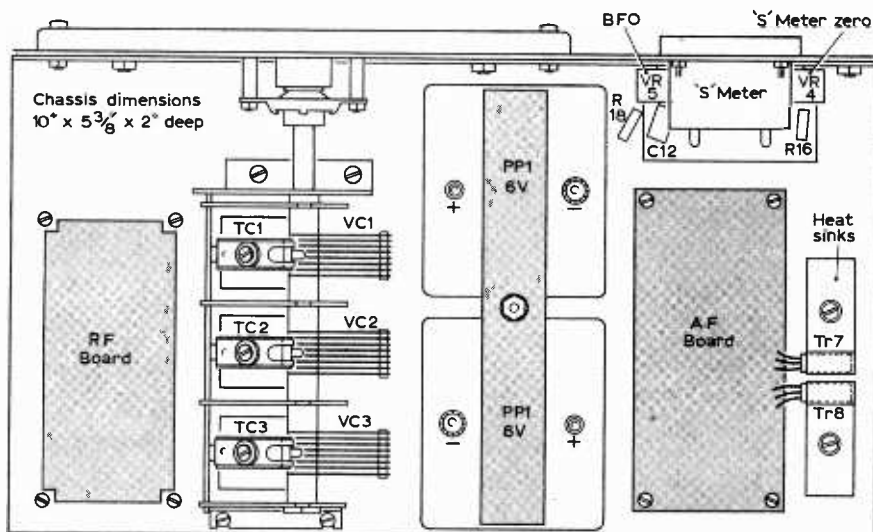


Fig. 9: Layout on the above side of the chassis.

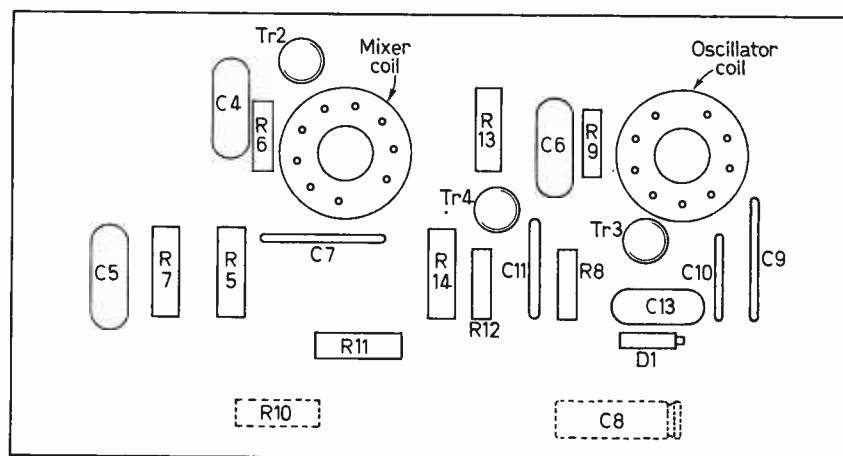


Fig. 10: Layout of components on the r.f. board.

The "S" meter should now be mounted and wired in last. This has a plastic front which is easily scratched as is the dial cover which is not fitted until after final calibration of the dial itself.

The circuit which the manufacturers show for the i.f. strip depicts a resistor in series with the meter, nominally 1kΩ. In the prototype this resistor was found to be unnecessary and was thus omitted. The "meter zero" front panel control provided adequate adjustment of the meter.

After all wiring has been completed it is prudent to re-check the entire receiver. In the front end the coils used are Denco miniature transistor plug-in types, the surplus pins being used as anchoring points. Check that the wiring around these coils is correct as it is extremely easy to make an error here.

With both n-p-n and p-n-p devices, and possibly f.e.t.s used in the design, it is also all too easy to make a mistake. Check wiring of all devices, including the zener diode.

For proper alignment a signal generator is imperative. Lucky types who possess a 'scope and wobbulator will have a decided advantage.

First, check the a.f. section. Touching the "live" terminal of the a.f. gain control should produce a violent hum in the speaker with the gain turned three-quarters up.

The values shown in the amplifier were adjusted on test mainly with an eye to battery conservation. If the circuit as shown is strictly adhered to, then, under no-signal conditions, the a.f. section on its own will draw approximately 8mA. On peaks of signal this will rise to 100-150mA. Although the circuit will, in theory, produce around 1W of audio, turning up the a.f. gain fully does introduce noticeable distortion. It was found in practice that with half this amount belting out of the loudspeaker, volume was more than adequate. Perhaps "fiddling" the circuitry for low-standing current together with ruthless pruning of components brings distortion as the price to be paid, however, this is only noticeable when the gain is fully up.

Once the a.f. section is functioning the i.f. strip may be checked roughly. Touching the

pins of the crystals with a finger will produce an agonising cacophony of pure audio bedlam from the speaker.

The front end is by far the most difficult section to check and align and extreme care is required. The trouble-taking in alignment here will dictate whether the receiver is a communications type or just a sophisticated m.w. receiver.

Alignment

The signal generator should be adjusted throughout the lining-up procedure for minimum output voltage at all times. It should be connected via a capacitor to the circuitry, a value of 0.01μF is suitable. For alignment, it will be assumed that the constructor has only a signal generator. This can be conveniently used in conjunction with the "S" meter which gives an indication of the signal level and can thus show when a peak is reached.

The signal generator output is applied via a 0.01μF capacitor to the input side of the extra i.f. transformer. A 1.62MHz signal must be produced

which is accurate in frequency. This is a "must" because the filter will strongly attenuate anything outside its passband which is set at around 2kHz. If there is any doubt here, check the frequencies of the individual crystals. These will be stamped on the top of each crystal case and the signal generator should be adjusted to fall midway between these two frequencies.

Adjust the generator output so that the "S" meter reads about $\frac{1}{4}$ deflection. Now carefully adjust the bottom core of the first i.f. transformer on the strip. **Note**, only the bottom core should be adjusted and it will only require small variation. The top core of this transformer is carefully set by the manufacturers and should on no account be touched. The bottom core only is gently adjusted for peak reading on the "S" meter. Following this, the cores of the extra i.f. transformer should be adjusted for peak meter reading.

The generator is now connected, via the capacitor, to the aerial terminal. The input arrangement will vary here depending on the type of aerial to be used. If it is to be a balanced 80 Ω input, then the aerial leads will go to the two connections on the input winding of the r.f. coil. If, as in the prototype, a long wire aerial is to be used, then one side of the winding will be earthed and the aerial taken to the other end of the winding, which is the place to inject the signal generator voltage.

The signal generator should be set to 0.515MHz and the tuning capacitor fully meshed. The core of the oscillating coil is now adjusted for peak signal on the meter.

Set the generator to 1.545MHz and fully open the tuning capacitor. The oscillator trimmer is now adjusted for peak signal. These two steps, at either end of the tuning range, are repeated until no further adjustment is necessary.

Now adjust the cores in the extra i.f.t. again and repeat the high and low frequency alignment to check that this still holds. If there is any slight deviation, these steps should be repeated.

Re-tweak the bottom core of the i.f.t. on the i.f. strip. This adjustment will be very fine so care should be exercised. Now repeat the high and low frequency checks for peak reading on the meter.

This procedure will take time and patience but is very necessary if the receiver is to function at its best.

The generator is now set to 566kHz, which is the l.f. tracking point, and the signal tuned-in with the tuning capacitor, again for peak meter reading. The tuning capacitor should be around 20° from the fully-meshed position. The cores of the mixer and r.f. coils are now adjusted.

Set the generator to the h.f. tracking point, 1,390kHz, and tune-in the signal. Here, the tuning capacitor should be approximately 15° from minimum. The mixer and r.f. trimmers are now adjusted for maximum response.

The method of "mounting" the trimmer capacitors is not really satisfactory. It would be far better

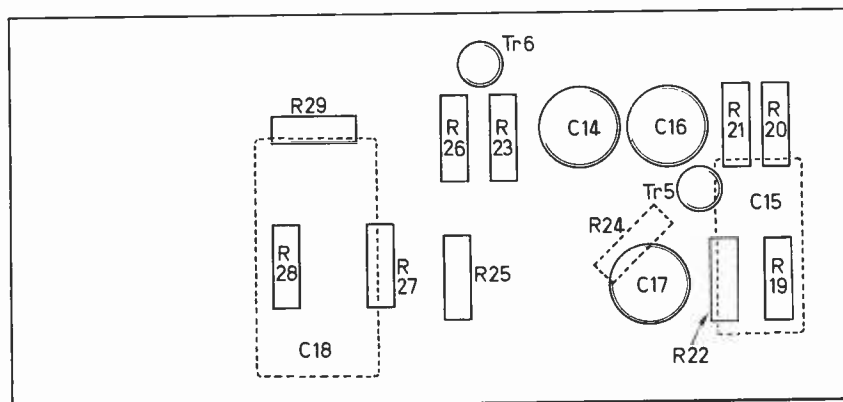


Fig. 11: The layout on the a.f. board.

to obtain a copper strip and bolt this along the upper length of the tuning capacitor, soldering the trimmers to this. A strip of this sort will offer far superior support to the trimmers than the length of 16s.w.g. tinned copper wire used in the prototype which tends to buckle very slightly when the trimmers are adjusted and requires a very light touch if tuning and alignment is not to be affected. Again, beehive trimmers may well prove better than the postage-stamp types used.

Once the alignment has been successfully carried out the main dial may be marked in. A crystal frequency marker giving 100kHz points would be useful here, otherwise stations with known frequencies might be used. Two dials are included when purchased and one has five blank scales plus a logging scale marked 0 to 100. Thus one scale might be marked in kHz or MHz, while the others can be left blank or used to pinpoint stations.

"S" Meter

The "S" meter would need to be calibrated if a meaningful report is to be furnished. In this case it would be necessary to know the exact output from the signal generator so that a signal of known strength could be fed in. This is left to individual constructor's discretion and those possessing a signal generator of this calibre will not need the whole procedure outlined. Even uncalibrated, the meter offers a very useful comparison of signal strengths comparing one station with another.

The a.v.c. may be switched in and checked, thus ensuring that the switch is wired-in correctly. The b.f.o. may also be checked and will produce a definite indication of its presence. The b.f.o. pitch may be altered some ± 5 kHz of centre frequency. A stability of better than 0.002% is claimed.

The i.f. strip has a product detector and an a.m. detector, the correct one being automatically switched via the b.f.o. switch. The i.f. gain control provides some 50dB of gain control and the a.g.c. is quite remarkable on strong signals affording some 6dB increase in output for 80dB increase in input when receiving s.s.b. On a.m., the i.f. strip sensitivity is such that a 10 μ V 80% modulated (400Hz) signal will produce 180mV ± 3 dB across the a.f. gain control. The crystal filter is immediately apparent when tuning across the band. Bandwidth is 2kHz min. (6dB) and 5kHz at 60dB down.

—continued on page 534

P.W. GUIDE TO COMPONENTS

PART 11

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

DIODES are essential components in most electronic circuits and have been available since the early days of radio. Indeed diodes were the first useful thermionic devices. They are used for power rectification and in signal paths for rectification and transmission.

Zener diodes however are of fairly recent origin and have only been available since the general use of transistors. This is mainly due to their reliance on modern semiconductor materials and processes. They are used as voltage reference elements and for specialist applications in transistor circuits. The circuit symbols for both diodes and zener diodes are still not completely standardised and they are shown

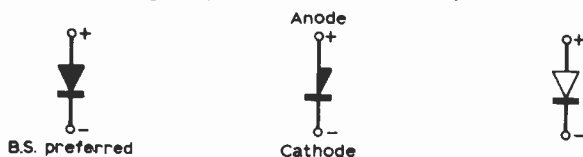


Fig. 1: Commonly used diode circuit symbols.



Fig. 2: Circuit symbols for zener diodes.

in Figs. 1 and 2 respectively. In both cases the British Standard preferred symbols are indicated. In Fig. 1 the polarity indicated is for conduction through the diode and in Fig. 2 for the zener reference voltage.

Diode Characteristics

The ideal diode would have zero voltage drop in the forward conducting direction and zero current flow in the reverse or non-conducting direction. In practice these conditions are not fully met, although modern semiconductor diodes closely approach the ideal for most practical purposes, as can be seen in the forward and reverse characteristics of a silicon diode shown in Figs. 3(a) and 3(b) respectively. In contrast to the early metal rectifiers—which used semiconductor properties—the modern rectifier has a considerably smaller voltage drop in the forward direction. The voltage drop is 0.5 to 1V for silicon diodes and 0.2 to 0.7V for germanium diodes. Hence the power dissipation ($V_f \times I_f$) is lower, and smaller devices can be used. From the reverse characteristic it can be seen that a small reverse current flows and

can be as low as 1nA or 10^{-9} A in certain silicon diodes. The reverse current in germanium diodes is considerably larger and can be as much as 0.5mA. In order to illustrate how closely the silicon diode approaches the ideal a combined forward and reverse characteristic, using normal transistor circuit values, is shown in Fig. 4.

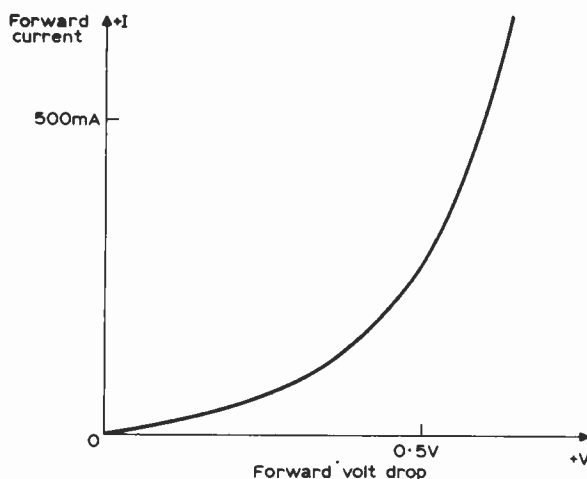


Fig. 3(a): Silicon diode forward characteristic.

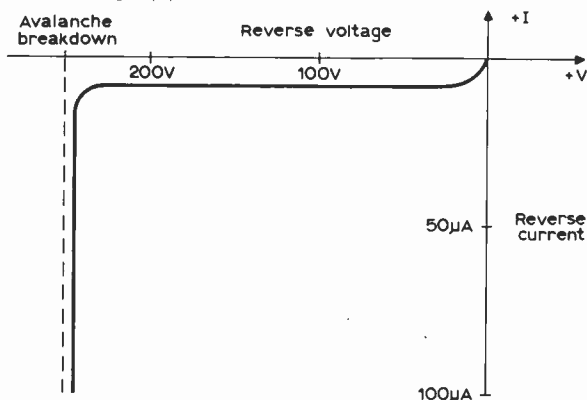


Fig. 3(b): Silicon diode reverse characteristic.

The reverse current and forward voltage drop at a maximum forward current are given by manufacturers as diode parameters. Both the voltage drop and reverse current are considerably affected by changes in temperature. The forward voltage drop reduces with increased temperature by between 2 and 2.4mV per °C rise in temperature, resulting in a re-

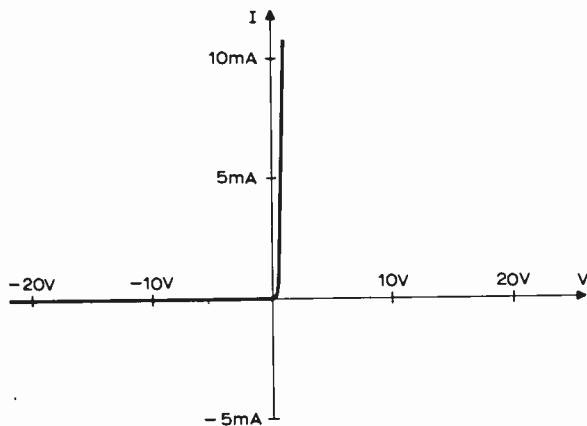


Fig. 4: Silicon diode characteristic curve drawn using normal circuit current and voltage values.

duction in forward voltage drop from say 0.7 to 0.46V for a 100°C rise in temperature. The reverse current increases with temperature but the increase is of little importance in most applications utilising silicon diodes. Due to the structure of the semiconductor junctions the practical maximum operating temperatures of the junctions are +85°C for germanium diodes and +175°C for silicon.

A further significant diode parameter is the maximum reverse voltage which it can withstand, and this is determined by the avalanche breakdown point shown in the reverse characteristic. At this point the current suddenly increases rendering the diode useless as a blocking component. Ranges of diodes are produced with differing maximum reverse voltages and a comparison of cost for differing reverse voltages and forward currents is given in Table 1.

Table 1: Rectifier cost comparison

Forward current (A)	Maximum reverse voltage	Prices from	Encapsulation
1	50	£ 1 6	Plastic or metal
1	1,000	5 0	Wire ended
5	50	7 0	Stud mounting
5	1,000	15 0	metal Fig. 9(b)
25	50	7 0	Large stud mounting
25	1,000	2 0 0	
100	50	1 0 0	Large stud mounting
100	1,000	10 0 0	
250	50	1 5 0	Large stud mounting
250	1,000	12 0 0	

age in a given range but zeners up to 100V are available. The normal tolerance ratings are 5% and 10% but 1% ranges and special purpose zeners of 0.1% tolerance are available.

The ideal zener characteristic shown dotted in Fig. 5 would provide a constant voltage reference over a wide range of current, whilst the practical characteristic illustrates two main divergences from this ideal. First, there is the knee of the characteristic, at which point the voltage changes rapidly and non-linearly with current; following this there is the useful range, which is linear as the voltage changes proportionately with current. To eliminate the effect of the knee of the characteristic the zener diode is biased with a standing current—usually 5mA—which biases it into the working range where the voltage change with current is linear. But unlike the ideal this is of finite resistance and is known as the slope or dynamic resistance. This resistance determines the usefulness of the device as a voltage stabiliser and the aim should always be towards the ideal of zero resistance.

The temperature coefficient also affects the usefulness of the zener as a voltage stabiliser. As we have seen the temperature coefficient varies from negative below 6V to positive above, with 5.6V as the almost zero coefficient value. However at 5.6V the range of temperature coefficient is wide and a more generally zero coefficient can be obtained by matching a diode and a 6.2V zener as shown in Fig. 6.

The maximum current which can be passed through

Table 2: Standard zener diode values (5% tolerance range)

2.4	6.2	16	43
2.7	6.8	18	47
3.0	7.5	20	51
3.3	8.2	22	56
3.6	9.1	24	62
3.9	10	27	68
4.3	11	30	75
4.7	12	33	82
5.1	13	36	91
5.6	15	39	100

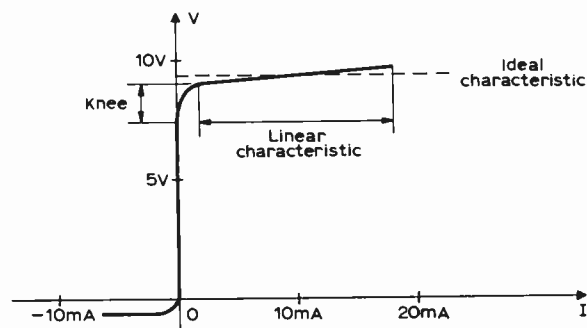


Fig. 5: Zener diode characteristic.

Table 3: Selected zener diode characteristics (400mW range)

Zener voltage (V)	Maximum zener current (mA)	Slope resistance $R_Z(\Omega)$	Mean temperature coefficient % per °C	5% Tolerance voltage limits (V)
3.3	85	75	-0.060	3.1- 3.5
3.6	80	75	-0.055	3.4- 3.8
3.9	75	75	-0.050	3.7- 4.1
4.3	68	62	-0.040	4.0- 4.6
4.7	60	55	-0.020	4.4- 5.0
5.6	50	25	+0.005	5.3- 6.0
6.8	42	6	+0.030	6.4- 7.2
7.5	38	5	+0.045	7.1- 7.9
9.1	31	7	+0.060	8.5- 9.6
10	28	10	+0.065	9.4-10.6
12	23	14	+0.080	11.4-12.7
15	19	22	+0.085	13.8-15.5
18	15	32	+0.090	16.8-19.0
22	13	40	+0.090	20.8-23.0
27	10	52	+0.090	25.4-28.6
33	8	60	+0.090	31.3-34.5

a zener diode is limited by the maximum power of the device. Since the power dissipation is fixed by the construction, and for each device is given by the zener voltage multiplied by the current through it, the maximum current reduces as the zener voltage increases. As an illustration a 300mW range of zeners is capable of carrying 100mA maximum at 3V zener voltage (100×3) or 10mA maximum through a 30V zener (10×30). Power dissipation up to 10W is commonly available.

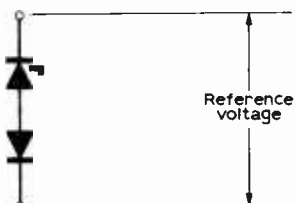


Fig. 6 (left): Use of an ordinary diode and zener diode combination to provide a zero temperature coefficient assembly.

Table 3 illustrates a typical 400mW range of zener diodes and only selected values have been incorporated. From the parameters shown it can be clearly seen that the 5.6V zener is almost of zero temperature coefficient whilst the 7.5V zener has the lowest slope resistance. The current decreases rapidly with zener voltage and is somewhat lower than expected due to allowance for elevated ambient temperatures and tolerances.

Let us now consider the construction of modern semiconductor diodes. The early metal oxide semiconductor rectifiers have been neglected since they are used only in special applications. In general zener diodes are manufactured by diffusion processes in the same way as diodes, except that impurity concentrations are varied to give the required reverse characteristics.

Point Contact Diodes

* Point contact diodes were an early form of miniaturised diode. They are manufactured from germanium wafers usually of n-type impurity mounted on a header and connected to a lead-out wire as shown in

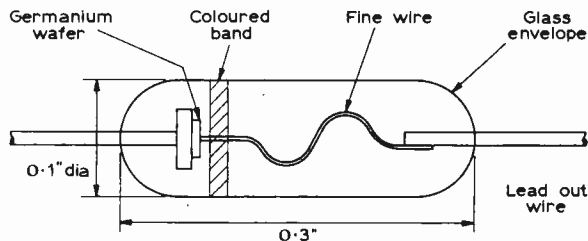


Fig. 7: Typical point contact diode.

Fig. 7. The contact is formed by a fine wire attached to the second lead-out wire so that the fine wire is sprung with a point contact to the wafer. The glass envelope encapsulation maintains the contact which is also stuck to the wafer. The actual junction is formed by passing a high current pulse through the device and this forms a junction at the point contact. The diode is then identified by coloured bands or numerals, and the cathode indicated by the proximity of the bands.

The main advantage of this form of construction is that the junction area is small so that the junction capacitance is low (about 1pF) and as a result operation at high frequencies is possible. The point contact diode is therefore particularly suited for use as a signal diode at v.h.f. and for switching circuits. A further advantage is that it is cheap to construct and point contact diodes are available at between 1s. and 5s. each.

Disadvantages with this form of construction are that the maximum forward current is low ($<100\text{mA}$) and the reverse current relatively high—typically 10-50 μA at ambient temperature and 25-250 μA at elevated temperatures. The forward voltage drop is also high, a drop of 0.5V at 1mA is common. Also the mechanical structure is not as robust as other forms, although perfectly sufficient for all but the most stringent requirements.

Junction Diodes

The title junction diode usually refers to the alloy junction construction shown in Fig. 8. The alloy junction is formed by alloying a pellet of impurity material at high temperature on to a p- or n-type wafer.

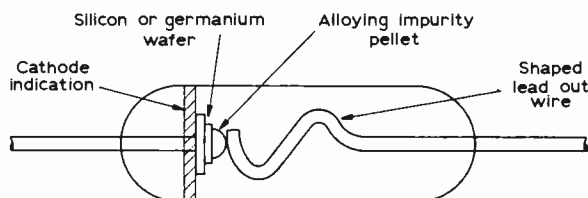


Fig. 8: Alloy junction diode construction.

One lead-out wire is connected directly to the wafer whilst the other is connected via an "S"-shaped metal connection. This shape is sprung to the junction prior to bonding in order to allow latitude in alignment and after encapsulation to prevent damage to the glass encapsulation or junction by expansion of the materials. The glass encapsulation is often paint coated and designation numerals or coloured bands are used to indicate the device type. The cathode is indicated by a coloured band.

continued on page 534



PREVIEW OF AUDIO FAIR

This is not intended to be a comprehensive description of the exhibits to be seen at Olympia—there are some 80 exhibitors, most of them with large ranges of equipment and some (notably importers) with several manufacturers' ranges to display. This supplement, then, may be taken as a guide to some of the more interesting exhibits known to the compiler at the time of going to press serving as a general impression for those unable to get along and as an appetite-whetter to those fortunate enough to be Olympia-bound for the Fair.

Come and see P.W. on stand 73!

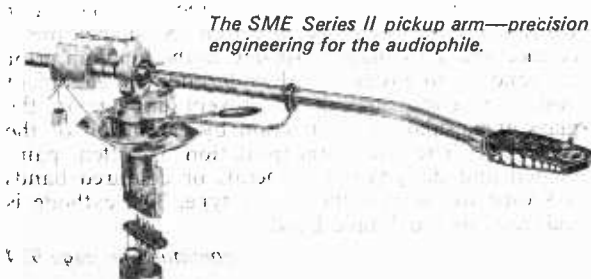
Pick-ups and Players

Pick-ups are not the simple things they used to be. The modern arm is a futuristic-looking device, slender and tubular, and hung with an assortment of weights, wires, levers and other attachments. This has spread to even the cheaper models, and stylus pressure adjustment, cueing devices, bias compensators and lifting systems are becoming almost standard. To set up a modern pick-up arm on installation is nowadays an engineering exercise.

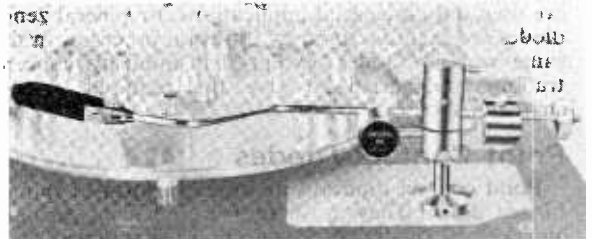
This section of the hi-fi field is dominated by British manufacturers. Perhaps the first of the modern precision pick-ups was introduced in 1962; its descendent can be seen on the **SME** stand in their Series II arm. Its features include very light gauge aluminium alloy arm carried on virtually frictionless knife edges, bias adjuster graduated to correspond with tracking force (sidethrust being compensated in the form of a weight on the end of a nylon thread running over a guide at the rear of the arm), a baseplate sliding on a graduated bed plate for precise tracking adjustment, pillar bearing with high precision ball races totally enclosed against dust. This unit has been described elsewhere as "the best pick-up arm in the world" and the price is £31 6s. 3d.

Another advanced design will be shown by **Transcriptors** who will exhibit their Transcriptor Fluid Arm, so called because of its unique pivot arrangement incorporating a fluid as a damping and supporting agent. Using a precision unipivot working down into a deep oil well, the arm beam assembly relies for its lateral support, stability and resonant damping, on the fluid by which the pivot is surrounded. The friction generated by the unipivot is claimed to be so low as to defy measurement. A secondary feature is the bias compensating device which produces a pure rolling motion. An adjustable bias weight, operating through a pulley, provides correction as the stylus moves to the centre of the record. The lowering (cueing) device is also noteworthy in that the whole assembly swings round the support tube, facilitating positioning. The fluid arm costs £22 16s. 4d.

Goldring are introducing a new transcription deck and pick-up arm. The GL69 unit follows the tradition of previous Goldring-Lenco turntables and features continuously variable speeds from 30-86 r.p.m. It is fitted with the new L69 arm, which is also obtainable separately, and which can be lowered



The SME Series II pickup arm—precision engineering for the audiophile.



Transcriptors fluid arm, another British precision product.

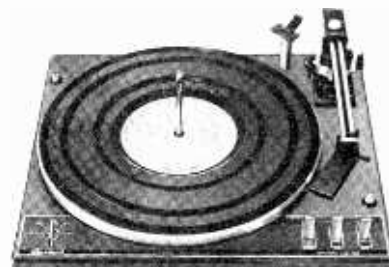


PREVIEW OF AUDIO FAIR

-2

on to the record by a viscously damped lowering device. Height of arm and position of stylus on the headshell can be adjusted for optimum tracing. Stylus pressure is adjustable by a sliding counterweight. The idler wheel is automatically disengaged from both turntable and drive as the unit is switched off. The GL69 costs £25 1s. 6d. and the L69 alone £9 5s. 9d. A lid and plinth are optional extras.

Another respected name on the British hi-fi scene is Garrard who will be showing four new additions to their well-known range of Synchro-Lab record playing units. Model SL95B is an automatic transcription turntable fitted with a Synchro-LAB motor which combines the best features of both induction and synchronous motors. Other points include automatic play of single records, cue and pause facilities, bias



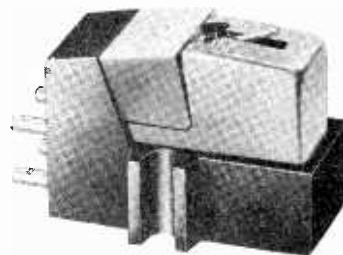
Three new high quality turntable units. Left—the Goldring GL69 fitted with the new L69 arm. Centre—the Leak Truspeed unit with isolated pickup platform. Right—the Garrard SL75B with Synchro-LAB motor and tab controls.

compensation and calibrated stylus force adjustment. A novelty is the low resonance pick-up arm of wood and aluminium which incorporates a resiliently mounted counterbalance weight and gimbal-type pivots. Like almost all the modern pick-up arms, a detachable cartridge carrier is fitted (this one slides in; others plug in). The SL75B, SL72B are similar in many respects and all have tab controls for easy operation. The fourth new one is the SL65B which offers the facility of combined record size and speed selection.

Also new from Garrard are two units based on the recently introduced "compact" mechanism of the CC10 4-speed autochanger. Features include automatic play of single records, single record repeat provision, automatic switch off at end of a single record.

The name of Leak is normally associated with amplifiers, but at the Fair the company is introducing a new transcription turntable. Operating at two speeds (33½ and 45 r.p.m.) it incorporates a 12-pole hysteresis motor with belt drive and has less than 1.15% wow and 0.02% flutter. A neoprene drive belt decouples the turntable and pick-up from motor vibrations

The Audio-Technica AT35, a typical example of the modern magnetic cartridge with detachable stylus assembly.



giving rumble levels below audibility. An isolated pick-up platform and balanced turntable mounting plate greatly reduces the effects of acoustic feedback and shock excitation. The Truspeed unit is fitted with a pick-up arm with raising and lowering device, bias compensation and adjustable counterweight. The frequency response of the cartridge is claimed to be free from resonances within the range 20-20,000Hz and the stereo separation is better than 25dB at 1kHz. Less plinth the price is £61 11s. 6d, with plinth £65 13s. 3d.

BSR, the world's largest manufacturer of record changers will include in their display many keenly priced units, including the latest models in the range—MA65, MA70 and MA75. They will

also feature the AA50 "minichanger", which weighs only 4½ lb. and is 35% smaller and 40% lighter than conventional record changers. Visitors will be able to see a display showing all the working parts of a BSR deck in action.

The modern trend in cartridges is decidedly towards the miniature magnetics with detachable cantilever systems and there is a lot of overseas competition here by companies such as Shure, Audio-Technica, Dual, Orbit, Audio Development, etc. On the Shiro stand, for instance, visitors can see the Audio-Technica cartridges such as the AT35 which features a V-shaped lightweight moving element supported by a wired damper mechanism. Specification figures include frequency response 10-25,000Hz, stereo channel separation 30dB at 1kHz, compliance 23 cu's, tracking force 0.5-2.5gm, tracking error less than 1.5°, output voltage 5mV. The AT33 is an economical version retaining many of the features but at very competitive price. While here, also note the AT1007 pick-up arm which has a direct reading stylus pressure control calibrated every 0.1gm, two balance weights to minimise dead mass, hydraulic arm lift and inside force cancellation device.

Loudspeakers

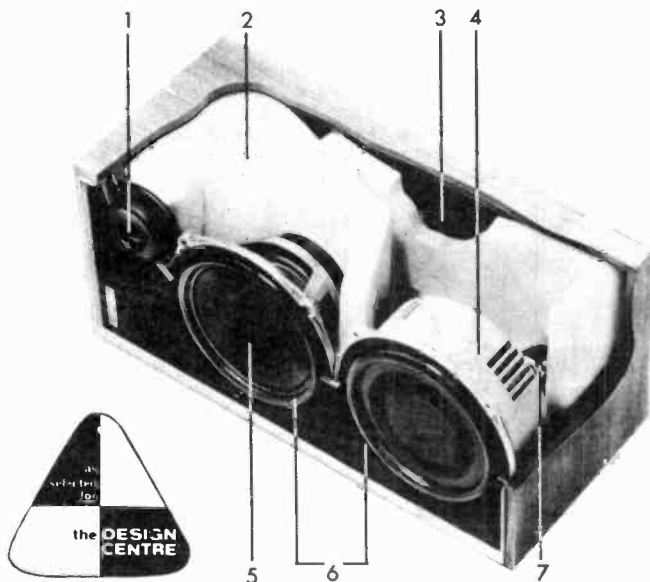
Just as there have been notable changes and improvements in pick-up and cartridge design, so has there been advancement at the opposite end of the audio chain. The old maxim of "the bigger the better" still holds a certain amount of truth but for average home listening this is not nearly so important today. A lot of research and development has gone into improved cone materials, enclosures and multiple unit assemblies, resulting in a veritable rash of shelf-mounting infinite baffle boxes, many of

them producing remarkable results considering their size (and price). There will be so many of these, both imported and home grown, that it would be pointless attempting a run through in this review.

There is, however, a current trend to offer kits of speaker assemblies to the home constructor, usually with instructions for mounting and making enclosures. P. F. & A. R. Helme, importers of the Peerless speaker kits (described recently in

Just what is this ABR, that makes such a vital difference to the 'DITTON 15'?

1. Studio quality high frequency unit (HF1300 Mk. 2).
2. Anechoic cellular foam wedge and lining eliminates standing waves.
3. High hysteresis panel loading material to eliminate structural resonances.
4. Auxiliary Bass Radiator (ABR)—plastic foam diaphragm of high rigidity and low mass having a free air resonance of only 8 Hz, double roll suspension allowing excursions up to $\frac{3}{4}$ " with virtual absence of distortion.
5. 8" bass unit, with free air resonance of 25 Hz, and massive Ferroba II magnet structure for optimum magnetic damping and cone treated with viscous damping layer to suppress resonances.
6. Units mounted flush to eliminate diffraction effects and tunnel resonances; covered by acoustically transparent grille cloth for maximum presence.
7. Full L-C Crossover network.



VISIT US ON STAND No. 2

and listen to the acknowledged 'DITTON' Hi-Fi Speaker Systems, and hear the vital differences.



international
**AUDIO &
PHOTO-CINE FAIRS**

OLYMPIA 16-22 OCTOBER 1969

**It's an interesting story—and worth enquiring about.
Send for details of the three Celestion 'Ditton'
Hi-Fi Speaker systems.**

Celestion

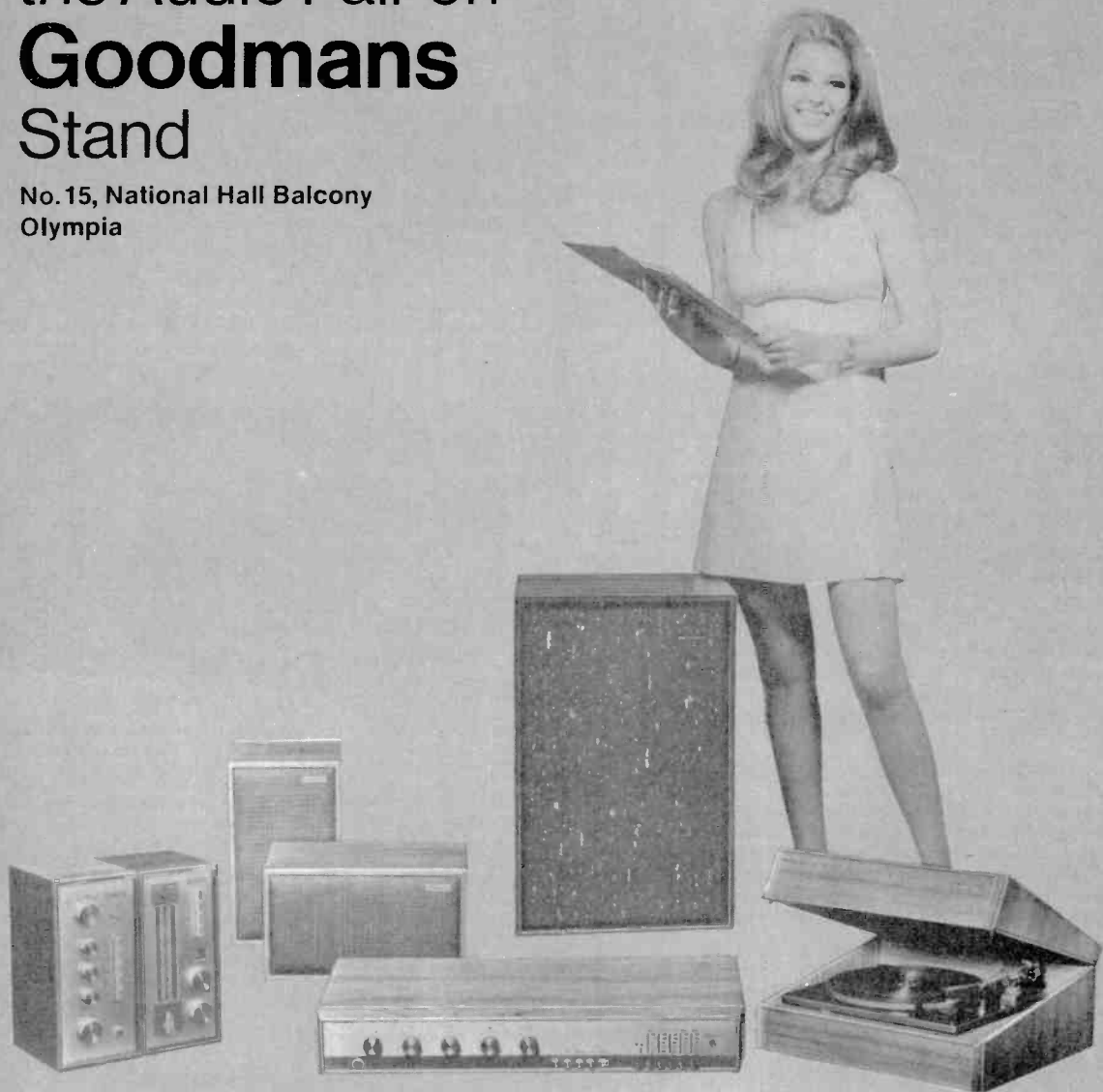
Studio
Series

**Loudspeakers for
the Perfectionist**

ROLA CELESTION LTD., Ferry Works, Thames Ditton, Surrey. 01-398 3402

Suite Music at the Audio Fair on **Goodmans** Stand

No. 15, National Hall Balcony
Olympia



We will be demonstrating our Audio Suite and the recently introduced Music Suite. See and hear Goodmans quality for yourself.

All the units in Goodmans Suites – amplifiers, radio tuners, tuner/amplifiers, record players and loudspeaker systems – are of course available separately.

You will be able to compare, too, our

famous 'M' range of loudspeaker systems. And see all our latest products.

We'll be waiting to welcome you each day from 10 a.m. to 9 p.m. October 16th to 22nd.

If you are unable to visit the Audio Fair, make an early call on your Goodmans dealer and find out about Goodmans High Fidelity. Or send the coupon for our free 28 page Manual.

Please send me a free copy of the
Goodmans High Fidelity Manual

Name

Address



Goodmans Loudspeakers Ltd
Axiom Works, Wembley, Middx.
Telephone: 01-902 1200 P W11



PREVIEW OF AUDIO FAIR

-3



Three of the latest in the Goodmans M range of IB enclosures—left to right, the Magister, the Magnum and the Mezzo.

News and Comment) will be showing a new one—the 4-30 KIT/12. This comprises a 12in. bass speaker, a 5 × 7in. mid-frequency unit, and two closed-back 2½ × 2½in. tweeters, with dividing network crossing over at 500Hz and 3.5kHz. The system frequency range is 30-18,000Hz and the power handling capacity 40W at 4Ω (8 or 16Ω available if required). Complete with mounting instructions and drawings for 1.75 cu. ft. cabinet, the kit costs £23 5s.

E.M.I. also have matched speaker kits. Set 215 comprises a 14 × 9in. bass unit with heavy ceramic magnet and new laminated glass reinforced cone, two 5in. mid-range units with preformed p.v.c. suspensions, a high frequency unit and panel-mounted crossover network with input terminals and "brightness" adjustment switches. Overall frequency range is 20Hz to 20kHz and the power handling capacity is 30W at 8Ω. Set 315 has a new 15in. bass unit capable of handling 35W with a bass resonance of 20Hz, two new 5in. mid-range high-flux units, two moulded chassis h.f. units and a switch plate/crossover network.

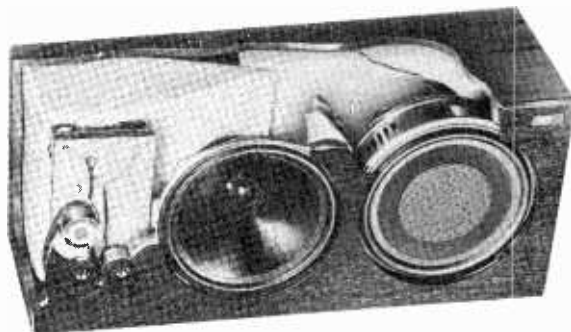
Rola Celestion will be demonstrating a full range of hi-fi loudspeaker systems and will also be running an interesting electronic demonstration designed to offer visual evidence of the way in which the auxiliary bass radiator functions. Also on display will be a range of Celestion high fidelity drive units for the home constructor, in addition to the well known range of Ditton enclosures.

Wharfedale will be showing their new Unit 3 hi-fi speaker kit. An 8in. unit of 48,000 Maxwells covers bass and mid-frequencies, leaving the h.f. to be dealt with by a pressure unit featuring the new Acoustiprene dome diaphragm with diffuser cap. With a suitable enclosure the system has a frequency range of 40-17,000Hz. Power handling capacity is 15W at 4-8Ω. The kit comes complete with crossover network, connecting wire, mounting bolts, acoustic wadding and instructions.

Another one for the home constructor is the new Heathkit Ambassador 3-way speaker system. Using ceramic magnet speakers a frequency range of 30-20,000Hz is obtained. There is a 15,000 gauss 12in. bass unit, a 5in. enclosed mid-range

unit and a 1in. dome direct radiator type tweeter (16,000 gauss). Crossovers are at 1kHz and 6kHz. The teak or walnut veneered infinite baffle cabinet is supplied ready-assembled, the front and rear being of high density chipboard and the frame lined with Celotex. Assembly time for the complete system is estimated at 3-4 hours. The kit costs £29 16s., plus 15s. carriage.

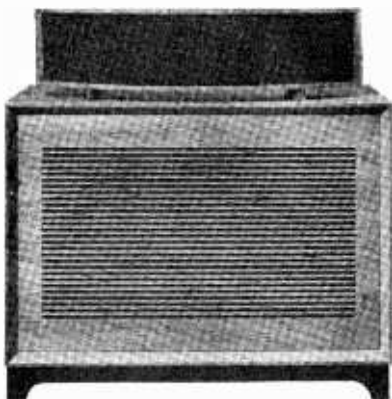
The electrostatic speaker, with moving elements some 200 times lighter than the diaphragms of m.c. speakers and freedom from cabinet resonances and coloration, are still popular with those seeking the ultimate in natural reproduction and have the cash to spare. The Quad model has a bandwidth of 48Hz to 18kHz with a rate of attenuation asymptotic to 18dB/octave. The speaker is enclosed within expanded metal grilles with polished wood end frames and feet and is designed for use in rooms of up to 500 cu. ft. per speaker. Impedance is 30-15Ω at



Interior view of the Rola Celestion Ditton 25, showing the advance in design of modern compact enclosures.

40Hz to 8kHz after which it falls; it is therefore important that this type of speaker should be used only with amplifiers designed for such applications.

To see what *can* be achieved in speaker design the visitor should seek out the Model 70 being shown by B & W Electronics. It is a hybrid comprising a new low distortion bass unit and enclosure, on which is mounted a 701 electrostatic unit. The latter is an 11-module assembly covering frequencies above 400Hz providing performance figures such as input distortion at 30W r.m.s. in the order of 0.5% and dispersion over a 60° arc showing a variation of not greater than ±1.5dB.



On the left is the B & W Model 70 hybrid monitor speaker system.

On the right is the new Unit 3 high fidelity speaker kit from Wharfedale.





PREVIEW OF AUDIO FAIR

-4

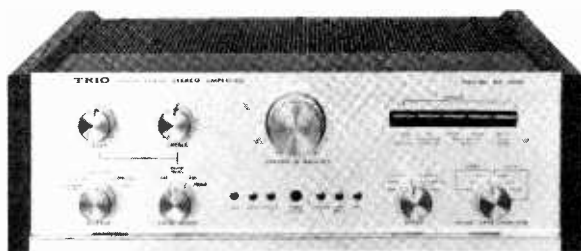
Amplifiers

Most of these are becoming so sophisticated, with their banks of controls, knobs, buttons and switches, that they look more like something from a Space Control Centre than an item of domestic equipment. Silicon and f.e.t. transistors are the order of the day, with quite a few incorporating integrated circuits, the ICs permitting considerable elaboration of circuit features in less space. Wattage (even real, r.m.s. ones) are creeping up and input and output facilities more comprehensive. Most are stereo.

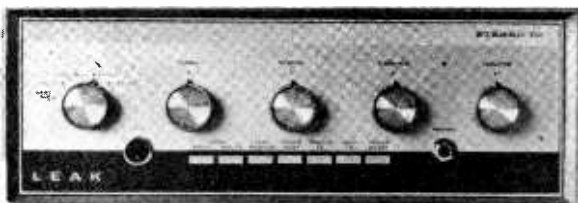
One magnificent amplifier to catch the eye is the **Grundig SV140**, which incorporates 51 transistors, 20 diodes and 3 rectifiers and delivers 50W per channel r.m.s., the output being monitored by two calibrated meters. No less than 5 tone controls are fitted, each operated by slider-type controls, the centre frequencies being 40, 200Hz, 3, 7.5 and 16kHz. Apart from the general versatility it is possible to use this system to form a type of presence control to bring soloists and vocalists, etc., more into prominence. The frequency response is 20-20,000Hz ± 1 dB with a power bandwidth of 10-50,000Hz measured at 1% distortion. The distortion factor at full rated output is less than 0.5% within 40-16,000Hz and 0.1% at 1kHz. Signal-noise ratio is 60dB (pick-up) or 86dB (tuner, tape) at full output.

Inputs are PU1, PU2, Mic, Tape, Tuner. Outputs are for speakers, stereo headphone, additional amplifiers. An electronic protection circuit disconnects the amplifier whenever the output load exceeds a predetermined level, responding to capacitive and inductive overload. A thermal cut-out is also provided to switch off the amplifier if excessive internal temperatures reach danger level. There are provisions for volume compensation through two contour buttons (1) up to 25dB bass lift at 30Hz, (2) up to 33dB bass lift at 30Hz and treble lift up to 10dB at 15kHz. Price not available at time of going to press.

Few companies are marketing Class A amplifiers, fewer are producing separate control units and companion main amplifiers. **J. E. Sugden** are doing both with their C51 and A51



Trio KA-6000 with 58W per channel r.m.s.



The new Leak Stereo 70 stereo amplifier.

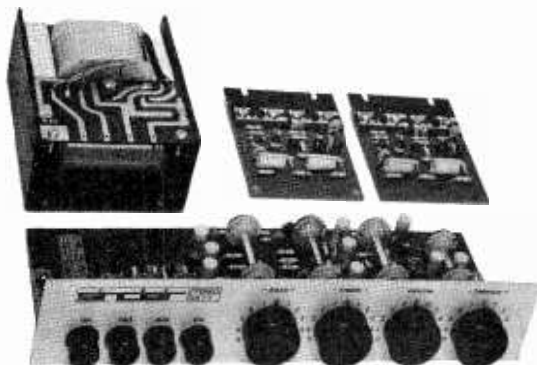
units released in time to show at the Audio Fair. The C51 control unit has inputs for magnetic, ceramic (2.5mV) and special (250 μ V) cartridges, all equalised to RIAA, plus radio, tape and auxiliary, with overload capabilities of 25dB for disc and infinite for other inputs. Total harmonic distortion is better than 0.1% (mainly 2nd harmonic) at rated output of 600mV. Frequency response is 30Hz to 20kHz ± 0.5 dB. Controls are provided for rumble filter, h.f. filter, h.f. filter slope, quiet (16dB at 1kHz). Price is £42. The companion Class A amplifier delivers 25 + 25W r.m.s. at clipping level into 8 or 15 Ω with a total harmonic distortion of better than 0.1% at 20 + 20W, better than 0.01% at 1 + 1W. Signal-noise ratio is 90dB and frequency response 30-20,000Hz ± 0.5 dB. Price is £65.

There are so many other fine amplifiers that it is hard to select representatives. The Trio KA6000, distributed here by **B. H. Morris & Co.** is, however, a good example of the more expensive imported item, selling at £105. Inputs are provided for magnetic pick-ups at 2mV, 0.5mV and 0.05mV, tape head, mic, tuner, tape play, and main amp. Features include a -20dB muting switch for momentary quietness (during telephone calls, etc.), high and low filters, 2dB step-type tone controls with tone mode switch, preamplifier outputs for use with another amplifier or multichannel system, speaker terminals for two sets of stereo speakers (A, B, A & B and phones selection by front control knob), automatic circuit breaker to protect power transistors, frequency response 20-50,000Hz ± 1 dB at high level input.

On the home front again, the latest **Leak** amplifier—**Stereo 70**—is less flamboyant but quietly efficient. With 35 + 35W r.m.s. output, it boasts specification figures such as 0.1% total harmonic distortion for all power levels up to 25 + 25W, total intermodulation distortion less than 0.5% for all power levels, overload distortion less than 0.1% for input signals up to 20dB above stated sensitivities, hum and noise 66dB below 30W output (tuner and replay), crosstalk between channels 50dB up to 1kHz, 30dB at 10kHz. Price is £69 10s, in cabinet.

Another adherent to the policy of separate control unit is, of course, **Quad**, who will be showing their latest range. The 33 control unit follows Quad tradition in comprehensive filter facilities. Push buttons provide selection of 5k, 7k and 10k filters, with separate variable filter slope control and a fixed filter to take out unwanted signals below 20Hz. The main amplifier, model 303, features symmetrical triples in the output stage to reduce distortion and to render the quiescent current independent of output transistor temperature. Output is 45 + 45W at 8 Ω with distortion less than 0.03% at 70Hz, 0.1% at 10kHz and the frequency response is -1dB at 1kHz reference between 30-35,000Hz. Hum and noise is 100dB below full output. Prices are £43 (33), £55 (303). A matching f.m. tuner costs £51.

New to this country is the range of **Nikko** equipment, marketed here by **Howland-West**. The TRM50 uses four silicon output transistors, the rest of the circuitry being built up around ICs. It gives 17 + 17W r.m.s. output with a frequency



Component units of the new Sinclair Stereo-60 audio module system—power unit, main amplifiers and control unit.



The Nikko TRM-50 amplifier built up around ICs.



PREVIEW OF AUDIO FAIR

-5

response of 10Hz to 70kHz ± 1.5 dB. Channel separation is better than 50dB and hum/noise at rated output is -65 dB (pick-up) or -75 dB (tuner, tape). Price is approximately £58. A budget-priced model from the range is the TRM40 retailing at around £35. On the same stand, the Dynaco SCA80 is worth inspecting. This is Dynaco's first integrated solid state amplifier; price not yet known.

Sinclair usually come up with something to talk about. This time it is their *Stereo-60* module system. The basic unit is the preamplifier/control chassis, providing bass, treble,

volume and balance facilities, push-button selection of three inputs (sensitivities up to 3mV, equalised to within ± 1 dB of RIAA). The unit drives two Z30 amplifier modules, each of which provides 15W r.m.s. output at 8 Ω with a frequency response of 20–30,000Hz ± 1 dB, 0.02% total harmonic distortion at full output. Silicon epitaxial planar transistors are used throughout. Alternative power supplies are the PZ5 (30V unstabilised) and the PZ6 (35V stabilised). Prices for the modules are control unit £9 19s. 6d., Z30 89s. 6d. each, PZ5 99s. 6d., PZ6 £7 19s. 6d.

Tuners and Tuner/Amplifiers

These reflect the same increasing sophistication as the amplifiers. Many facilities and controls—not always pure gimmickry—are common tendencies, all aimed at more rewarding listening and appreciation of good quality reproduction. Circuitwise, we again see the infiltration of FETs and ICs, with ceramic filters in the i.f.s and multiplex stereo decoders well established.

Of major interest is the new Leak *Stereofetic* tuner. It features FETs in the front end, ICs in the i.f. strip and decoder to increase rejection of ignition interference and to improve stereo separation, ceramic filters to improve i.f. selectivity and reduce stereo distortion, no less than three 19kHz and two 38kHz band stop filters to eliminate pilot tone whistles when using the tuner with a tape recorder and a double-action muting circuit to eliminate inter-station noise and reducing "in-and-out" tuning plops.

It has been designed as a dual-purpose tuner. For casual listening to local stations, by pressing the appropriate buttons, only signals above 12 μ V will be heard, with a.f.c. operative. For reception with minimum distortion, low noise and for long distance reception, input signals as low as 2.5 μ V will produce reasonably noise free and low distortion output. There is also a "Quasi Stereo" button which, when depressed, reduces noise on distant stereo signals without losing the stereo effect. This fine tuner costs £56 11s. (chassis only) or £63 14s. 5d. in wooden case.

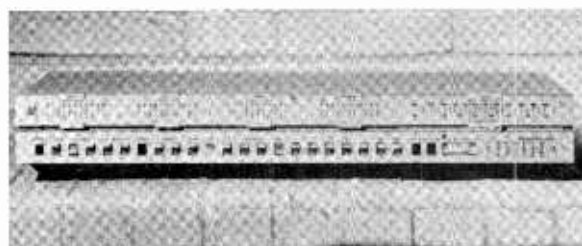
Bang & Olufsen will be displaying the latest *Beomaster* Model 3000/stereo tuner/amplifier. This clinical looking unit also incorporates FETs, ICs and ceramic filters in the tuner section, which provides instant selection of six f.m. programmes by means of panel keys. It is also equipped with a new tuning aid—a double finger wheel on the tuning slide (see photograph) which gives effective slow motion drive and a tuning indicator with two illuminated panels. On each panel is an arrow and the panel which lights more brightly indicates by its arrow which way the slide control should be moved for optimum tuning. A calibrated tuning meter is also provided. Comprehensive input and output sockets are fitted including the provision to individually switch each of two pairs of speakers to one of two programme sources. Power output is 30 + 30W r.m.s. with less than 0.6% distortion. Cost? £135 9s.

Another impressive new offering from Grundig is the TR100 stereo tuner, which incorporates 45 transistors, 35 diodes and 2 rectifiers. Coverage is LW, MW, SW1 and SW2 plus v.h.f.—f.m. The a.m. and f.m. circuits are entirely separate. Five auxiliary f.m. scales allow press-button selection of up to six stations and manual tuning is aided by a *Tunoscope* arrangement based on light-sensitive transistors which, like the B. & O. 3000,

shows the correct direction of rotation. On f.m. there are 17 tuned circuits (4 tunable, 11 i.f., 2 absorption); on a.m. there are 10 (2 tunable, 4 i.f., 2 i.f. with bandwidth selection, 2 absorption). The stereo decoder is fitted with level controlled mono/stereo changeover, the trigger level may be varied between 6 and 60 μ V. A low-pass filter controls the audio bandwidth, the narrow band reducing the a.m. bandwidth to 3kHz. The specification figures for this tuner as every bit as good as the recommended price of £171 7s. 11d. suggests.

Trio have an assortment of tuner and tuner/amplifiers. In the high price bracket, the KT7000 features three FETs, four ICs and two crystal filter i.f. stages, with interstation muting circuit, automatic stereo/mono switching with stereo beacon lamp, filter for eliminating noise on stereo signals, signal strength and tuning indicators and heavy flywheel tuning system. Usable sensitivity is 1.5 μ V and capture ratio 1.3dB. Price is £132. Also using ICs are a.m.—f.m. tuner KT3500 (£65) and a.m.—f.m. multiplex stereo tuner KR77 at £125.

Another tuner/amplifier using FETs(3) and ICs (3) is the Lux HQ555 shown by Shiro. The tuner f.m. section has five i.f. stages and a practical sensitivity of 2 μ V. The amplifier has



The Beomaster 3000 tuner/amplifier—an advanced design.



The HQ555, new from Lux, incorporates three FETs and three ICs.



PREVIEW OF AUDIO FAIR

-6

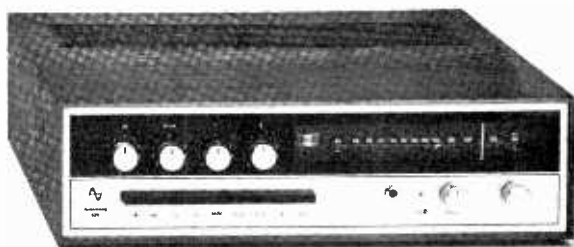
all the usual controls, filters and facilities including a loudness control and A/B speaker system selection. This one sells at £159 18s. 9d.

Also with an FET front end and ICs is the **Nikko STA301** tuner/amplifier, with 12 + 12W output and a frequency response of 20–50,000Hz ± 1 dB (IHF). Price is £99 10s.

From **Armstrong** are two additions to their recently introduced 500 Series of audio equipment—the 525 and 526 tuner/amplifiers. The 525 has inputs for magnetic and ceramic pick-ups and tape playback; outputs for tape recording and headphones. Features include tape monitor, f.m. interstation noise suppression, automatic stereo/mono switching on f.m. with stereo indicator, tuning meter. Price is £87 16s. 9d. The 526 is similar but has MW and LW a.m. coverage also and costs £98 15s. 6d.

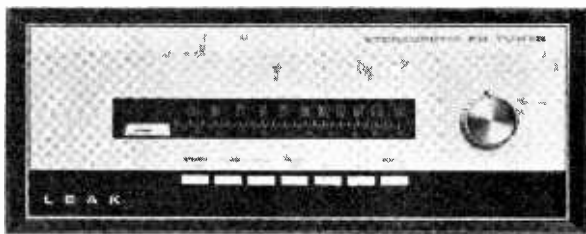
Heathkit add to their range with model AR-17, a stereo f.m. tuner/amplifier using 28 transistors and 7 diodes. It has many points of interest, such as 6-position source selection switch, pre-aligned f.m. front end, a clutched volume control allowing simultaneous or independent adjustment for each channel, automatic stereo indicator lamp, adjustable phase control for optimum stereo separation, stereo headphone socket, output of 5W r.m.s. per channel and a frequency response of 25–35,000Hz ± 1 dB. This adds up to good value at £36 10s. for the kit, with full constructional details.

Brush Cle vite will be showing a large range of Sansui products, from which we select the new 800 a.m.–f.m. stereo tuner/amplifier as of considerable design interest. It provides



Above—the 525 tuner/amplifier, latest in the Armstrong range.

Below—the new Leak Stereofetic f.m. tuner.



28 + 28W r.m.s. output at 8 Ω and has a frequency response of 15–50,000Hz ± 1 dB at normal listening levels. Features include FET front end, a 4-stage i.f. section and 3-stage limiter (3dB capture ratio and 50dB selectivity), a new style noise limiter, muting switch to suppress interstation mush, a sophisticated switching matrix system giving stereo separation above 35dB and keeping distortion down to 1% at 1kHz, automatic stereo/mono switching, ceramic filter in a.m. section i.f. protection circuit for output transistors, two-system speaker selection, multiplex separation adjuster, tape monitor and stereo headphone sockets, and comprehensive filters and input facilities. Another expensive one, the Model 800 sells at £145 19s. 7d.

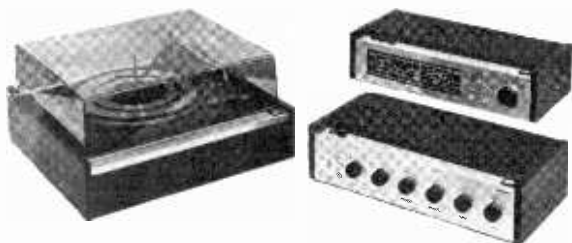
Unit Systems

For those who find the out-and-out hi-fi installations fascinating but out of reach financially, the now popular audio budget systems present a way to build up gradually to a worthwhile hi-fi ensemble. **Goodmans** is one company showing such a system of matching units—their recently introduced *Music Suite*, comprising stereo tuner/amplifier 3000, record player unit 3025 and loudspeaker enclosures 3005, which add up to just under £140 of merchandise. Five f.m. tuning scales are provided, the station being preset by push-and-turn knobs; sensitivity is 3 μ V for 26dB signal/noise ratio and limiting level better than 10 μ V. The amplifier delivers 15 + 15W output with total harmonic distortion less than 0.5% at 1kHz and frequency response of 30–20,000Hz ± 3 dB.

Following the successful launching of the Ferguson Unit Audio range, **British Radio Corporation** are entering the hi-fi market with their new HMV units, both ranges being

shown at Olympia. The HMV High Fidelity is a package deal consisting of a record player, a tuner/amplifier and a pair of speakers. **Philips** will be showing their Audio Plan units, a very comprehensive range of equipment in which the various bits and pieces can be permuted virtually to suit almost any pocket from the modest to the affluent.

Bush will be showing their Sound System units, eight pieces in all: A746 amplifier (35 gns.), A747 tuner (35 gns.), A749 record player (28 gns.), A758 tuner/amplifier (67 gns.), A762 equipment trolley (16 gns.), A764 shelf speakers (32 gns. pair), A763 column speakers (29 gns. pair), A765 floor standing speakers (58 gns. pair). All equipment is stereo.



Above—audio units from Bush: A746 amplifier, A747 tuner and A749 record player.

Right—the latest unit system: HMV High Fidelity.



Peerless

PEERLESS FABRIKKERNE A/S
Gladsaxe Ringvej 11 · 2860 Copenhagen · Denmark



This is the new PEERLESS kit system 20-2, one of many high quality speaker kits available. Kit 20-2 has a power input of 30 watts and a level response over a range of 40-20,000 Hz. Peerless Fabrikkerne A/S have been dealing with acoustics for more than 35 years and are the largest loudspeaker factory in Scandinavia. Send NOW for full details of kits and chassis speakers.

Sole distributors for the U.K.:

P. F. & A. R. HELME, SUMMERBRIDGE, HARROGATE, YORKS.

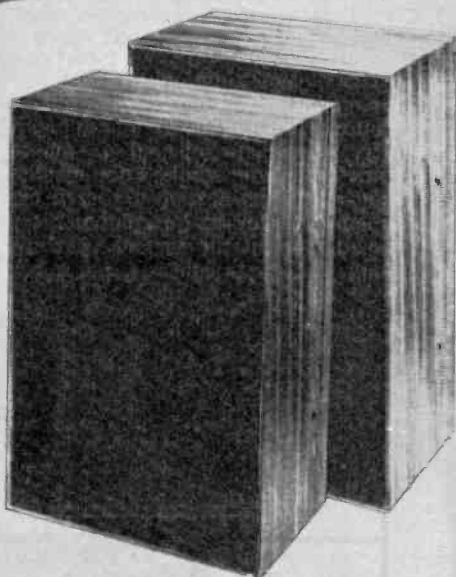
Heathkit Present The 'Compact' Sound of the 70's



'COMPACT' AD27



'COMPACT' AD17



AMBASSADOR SPEAKERS

See what's New in the
World of sound from Heathkit
at the Audio Fair 1969, Olympia

Daystrom Ltd. will be exhibiting the latest Heathkit Hi-Fi Stereo Amplifiers, Tuner-Amplifiers, F.M. Tuners, Stereo 'Compacts', Loudspeakers, etc. A selection of these will be on demonstration in the Audio Studio on our stand.

New models include two stereo 'compacts' models AD-17 and AD-27. The AD-17 comprises a BSR MA65 Turntable with Shure M44-MB magnetic cartridge and a 10 watt (rms) per channel stereo amplifier all mounted on a teak or walnut plinth. The AD-27 is similar but uses the MA70 turntable and includes an FM stereo tuner. In this case the 'plinth' is better described as a small cabinet. It has a 'roller shutter' lid and is available in teak or walnut.

A new loudspeaker has been added to the Heathkit range. The 'Ambassador' is a first-class hi-fi loudspeaker. The cabinet comes ready assembled and finished in teak or walnut to match other current Heathkit equipment. It uses three loudspeaker units—a 12" bass unit, a 5" mid range and a small tweeter.

See these and
other New Hi-Fi
models in the
Latest
FREE
Catalogue!

To: DAYSTROM LTD., GLOUCESTER GL2 6EE
Please rush me details of the
latest Heathkit Hi-Fi models

NAME _____
ADDRESS _____
P.E. 11



DAYSTROM LTD.
HEATHKIT DIVISION
GLOUCESTER GL2 6EE

Telephone: GLOUCESTER 29451

Telex 43216

Compacts

The modern version of the "radiogram" is the audio compact, presented in various forms but basically consisting of an amplifier or tuner/amplifier with record playing deck in the same shelf-mounting cabinet. Of considerable interest to P.W. readers are the two new ones shown for the first time at the Fair by Heathkit.

The AD-27 has a stereo f.m. tuner with a sensitivity of $5\mu\text{V}$ and a 27dB channel separation. Capture ratio is 4dB. The amplifier delivers an output of $10+10\text{W}$ r.m.s. and the harmonic and intermodulation distortion throughout the system are both less than 1%. Frequency response is $12-60,000\text{Hz} \pm 1\text{dB}$ at 1W. The playing deck is a BSR MA70 fitted with a Shure M44-MB cartridge. The complete kit costs £82, plus 13s. carriage.

The AD-17 is a similar compact without the f.m. radio section and is provided with a BSR MA65 deck and Shure magnetic cartridge. Price is £54 plus 13s carriage.

A large range of "portable phonographs" and "home music systems" will be shown by Dual Electronics in addition to audio "separates". The HS33 comprises an automatic player deck with cue and pitch control mounted atop a 6W per channel stereo amplifier with loudness/contour control, and two separate



PREVIEW OF
**AUDIO
FAIR**

-7

speaker enclosures. It sells at £87 10s. A similar model but with more advanced turntable is an intermediate version between the HS33 and the expensive (£165) HS35.

This incorporates a 9W per channel r.m.s. amplifier with a frequency response of 20Hz to $20\text{kHz} \pm 3\text{dB}$, power bandwidth of $30-20,000\text{Hz}$, S/N ratio of better than 55dB and crosstalk damping at 1kHz of better than 20dB (pickup), 40dB (tuner, tape). It has 17 semiconductors. The HS35 is fitted with a type 1209 turntable unit which features 4-pole high-torque synchronous motor, anti-skating device which can be set even during playing, pitch control (range approx. 1 semitone), silicone-damped cue control, elastically damped counterbalance with calibrated increments of 0.01 gram, maximum tracking error of $1\frac{1}{2}$ gram. A Shure M71 magnetic cartridge is fitted.

Tape Recorders

Readers will not need reminding that tape recorders are proliferating in a bewildering manner. We can only pick out one or two of particular interest that will be seen at the Audio Fair.

The compact cassette, still looked at rather condescendingly in some quarters, continues to gain ground and with the introduction of the Teac A20, shown by B. H. Morris takes another stride forward. For this machine has been designed as a high quality machine. This stereo model features a 4-pole hysteresis synchronous motor, twin VU meters, easy cassette loading and unloading and other refinements, and sells at £78.

Bosch are showing several new Uher recorders. Most interesting are the models 23 (2W output) and 63 (6W output) Variocords and their stereo counterpart model 243. Common features include interchangeable head mounts (changing from 2 to 4 track simply), optional modification to automatic recording level, a new tape tension comparator in which the tape tension is determined by the tension of a coil spring enabling thin tapes to be used without danger of looping during braking. Also shown is a model aimed at the budget hi-fi market—the 714, which can accommodate up to 7in.

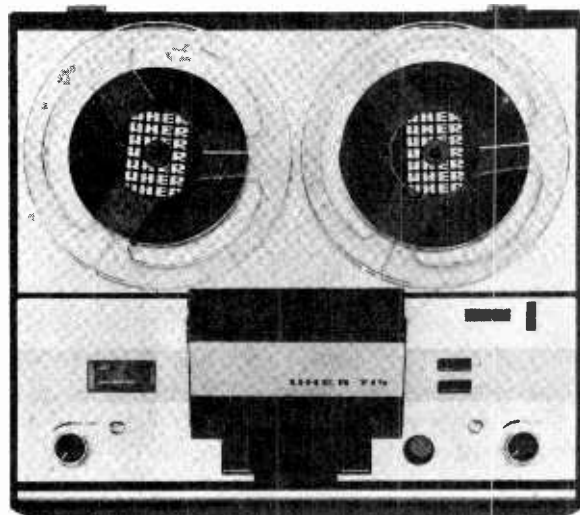
spools and features a recording level meter calibrated in dB, a 4-digit counter, monitoring facilities via loudspeaker or headphones, automatic end-of-tape shut off, silicon transistor circuitry, three inputs, frequency response $40-15,000\text{Hz}$ (at $3\frac{1}{2}$ i.p.s.), wow and flutter better than $\pm 3\%$, signal/noise ratio 48dB. All this for £49 17s. 8d.

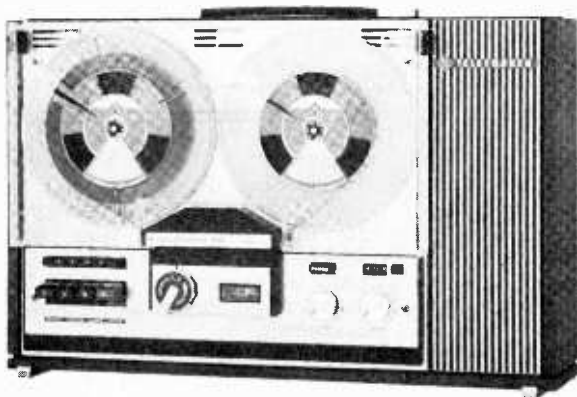
High quality equipment shown by Brenell will include a new stereo tape recorder ST200 (or ST400 for 4-track operation). This is a 3-speed, 3-motor machine with a hysteresis synchronous motor for capstan drive, and all-silicon transistor circuitry including a quasi-complementary output stage producing 6W r.m.s. per channel. Push buttons select record mono upper track, record mono lower track, record stereo, monitor during mono recording, replay mono (either track) into both speakers, combine both tracks for playback through both speakers, replay stereo tapes. Low and high level inputs are fitted and three pairs of output sockets for driving an external hi-fi amplifier, for monitor outputs (headphones) or for driving an external amplifier requiring a higher input level, and for feeding external speakers (which automatically switch out the internal speakers).



Left—
high quality
from Brenell, the new
ST400.

Right—one of the new tape recorders from Uher, the budget-priced Model 714.





The first automatic recorder from Telefunken, Model M202.

From **Bang & Olufsen** there is the new *Beocord 2400* which features hyperbolically ground tape heads which present a smaller contact area to the tape and thus improve frequency



PREVIEW OF AUDIO FAIR

-8

response and dynamic range. Also, with the stronger magnetic field, and coupled to the result of using silicon transistor circuitry, the signal/noise ratio has been improved to better than 60dB using low noise tapes. The 2400 has four pairs of slide potentiometers to adjust independently the levels for mic, radio, gram and line inputs, a fifth slider being used to adjust output volume. The sliders give independent adjustment to the left and right channels and the two VU meters show the level in dB. Together, these facilities provide professional style mixing, with eight mono or four stereo channel inputs. In addition to the conventional metal foil system, the 2400 uses a thyristor controlled auto stop.

Accessories

Colton & Co., apart from their standard lines of replacement styli, record storage racks and record carrying cases, will be showing a fascinating range of accessories including a series of pick-up arm raising and lowering devices which can be used with any arms—the *Precise*, the *Varilift* and the *Magnalift*. Quite new is the *Cueoptic*, an optically enlarged vernier slide for groove cueing, contact of the cue feeler with the pick-up arm being registered by a neon light. It reads clearly to 0.004in., the average pitch of an l.p. groove. Also new is a *Tape/Slide Synchroniser*, a purely mechanical device operated by paper stickers attached to the tape causing the switch to open and shut at the preset intervals on electrically operated slide projectors. Being mechanical, it does not tie up a track for impulse recording and thus leaves both tracks clear for stereo sound. Colton also show a $\times 50$ *Microscope*, a pen-like microscope for examining small parts such as stylus tips, the new *Variscale* stylus timer, a range of precision circular bubble levels, plus antistatic fluids, antistatic turntable mats and cleaning cloths, etc.

A lively business is done these days in the accessory field, due to the fact that the more one gets interested in audio, the more involved it becomes. Our old friends the Bib Division of **Multicore Solders** have catered proudly for us over the years with tape slicers, tape cleaning kits, instruments, cleaners, wire strippers and the like. They have now come up with a *Stylus and Turntable Cleaning Kit* comprising 30c.c. bottle of

antistatic cleaner, a cleaning brush with a suction cap end (so that it can be kept conveniently near the turntable) and an absorbent, washable, cleaning cloth. The cleaner is non-flammable and cannot harm styli, cartridges or records. On a card with instructions it costs 6s. 10d.

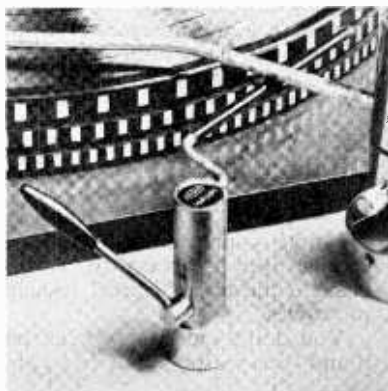
A novelty from **Diamond Stylus Co.** is their *Record-Matic* which, in their words, is a "self-flipping album browser". It looks like a flat tray, into which l.p. records are stacked vertically. A flip of the first record sets the stack flipping forward until the required record is extracted at which time the motion stops, and so on. The makers claim "no strings, no magnets, no motor".

Highgate Acoustics will be showing a new range of Schweizer record cleaning accessories. The *Record Grip* is a special circular pad used to hold the record correctly and safely during handling (5s. 9d.). The *Record Service* is a cleaning cloth and stylus cleaning brush package (17s. 6d.). There are also two record cleaner brushes—one is a hand-operated brush with reservoir of cleaning fluid, the other is an automatic cleaner with infinitely adjustable degree of moistening from a container holding enough fluid to clean 150 l.p. records. (Prices 9s. 6d. and 65s. 6d.). There is also a new record stacking system which can be built up as required, each flexible section holding from 5–7 records and costing 5s. 6d.



Useful stylus microscope from Colton gives $\times 50$ magnification.

The new *Varilift* from Colton, one of several lowering devices which will be seen at the Audio Fair.



New record stacking system introduced by Schweizer.

LETTERS

The Editor does not necessarily endorse the views expressed by correspondents

More Stereo

As a long established reader of your magazine I am suggesting that you start a campaign through your editorial column concerning the BBC's failure to provide stereo reception THROUGHOUT the UK. I am prompted to suggest this to you after reading *Broadcasting in the Seventies* just released. I quote the second paragraph from the sub-heading "Stereo":

"There is, however, an insistent demand for stereo to be extended to other networks and to more parts of the country. It would be idle to pretend that, at present, there is much chance of this, but it would be relatively simple to equip local radio stations to transmit in stereo and we are studying other ways of doing more to meet one of radio's long-term priorities."

Note particularly the second sentence which seems to indicate that the BBC simply do not care about stereo north of Manchester, nor about the equipment such as stereo recorders, stereo radios, decoders, etc., that have been purchased in anticipation of stereo reception.—J. B. Morris (*Glasgow*).

The BBC replies . . .

The BBC is well aware of the demand for more stereo transmissions and we have for some time been installing new equipment in studios and modifying recording channels to enable us to increase the stereo content of Radio 3.

We want to extend stereo to other parts of the country and to other networks, but this involves the manufacture and installation of new networks of special radio links suitable for the distribution of the stereo signal to the transmitters. It is not possible at this time to give any dates for these developments, since much depends on our financial situation and on the availability of technical manpower and equipment.—H. T. Greatorex (*Assistant Head of Engineering Information Department*).

Some notes on early radio

I thought some notes on Early Radio may be of some interest to readers.

I obtained my first licence in 1920 direct from the PMG

London after obtaining a reference from my local magistrate and the local postmaster who inspected the position of the proposed aerial. This licence was to operate a crystal set *only*.

Owing to radio components being very difficult to obtain, I constructed this set from cardboard lino tube formers, a section from my father's wooden grocery counter and phones from two old wall telephones. After completing the construction of this set, I listened many nights for nearly three months without receiving a signal of any type! Eventually Eiffel Tower was heard on a long wavelength (after silencing my watch to hear the very feeble signal).

In 1921 a revised licence was obtained together with necessary permits to purchase a valve and other components suitable for this new set. I may add that John Scott Taggart, Leslie McMichael and Peto Scott were just a few of the early suppliers of diagrams and components. I also had a mobile licence which enabled me to carry out experiments within 15 miles of the fixed station. These experiments were tried out with the use of a kite aerial which gave much improved reception.

I well remember hearing Madam Melba singing on 5th June, 1920, when I laid the phones in a china hand basin to enable three more members of my family to listen.

In 1924 I built a 4-valve portable receiving set with a frame aerial in the lid and the whole set complete with batteries weighed 28lb. In 1926, a 4-valve preset receiver with push-button control was my favourite and now I own a modern a.m./f.m. receiver from which I get many hours of enjoyable listening.—F. Towndrow (*Newquay, Cornwall*).

Oh dear, so this is progressiveness!

I note your comments on the change over by PRACTICAL WIRELESS to the term "Hertz" instead of "cycles".

You don't sound very keen on it and your reason is not very con-

vincing either. I can't help wondering what the powers that be would have done, had the name of the gentleman who first noticed the alternating effect had had a name like Pong for instance! (apologies to all Pongs of course).

Likewise we have the idiocy of the recent official announcement that in future it will be obligatory to drop red as the "live" lead in an a.c. circuit and use brown.

It seems to me that the only gains are made by manufacturers who will have a glorious time supplying new equipment to replace that rendered obsolete by these moves.

The adopting of a decimal currency based upon the division of the £1 into 100 parts when it was only necessary (if at all) to decimalise the pence column, using the 10s. and decimalised pence for day to day stuff and retaining the £ for the bankers (bless their cotton socks) if they couldn't cope without it—everyone else could. Regarding temperature measurement, I understand that on the Continent, Fahrenheit is used now for cold store plants, being a more sensitive calibration.

The fairly obvious one, namely inches or millimetres, is equally stupid. Any engineer who cannot work either in inches or millimetres is hardly worthy of the name.

As in most of the "changes for the best" these days, they are merely changes for the sake of change, and so that someone can trot around and say how clever he has been. Honestly, because some of our rulers appear to have gone barmy, do we have to quietly acquiesce and let them mess everything up?—J. T. Harold (*Oxford*).

[Amen.]—Editor.

PRACTICAL WIRELESS and PRACTICAL TELEVISION FILM SHOW

CAXTON HALL, CAXTON STREET,
LONDON S.W.1.
FRIDAY, MARCH 6th., 1970

POWER SUPPLY

A VERY SMALL STABILISED POWER SUPPLY USING AN UNUSUAL METHOD OF REGULATING AND MAKING USE OF A SPECIAL TRANSFORMER NOW AVAILABLE.

THE circuit to be described was designed to fulfil the need for a low-voltage supply unit which may be used to power radios, tape-recorders, and other transistorised equipment in the workshop where continual supplies of batteries would prove expensive.

Design criteria were that an output similar to that of the large layer batteries (e.g. Ever Ready PP9) should be provided, furthermore this output should be stabilised and have low ripple current and also be short-circuit proof without the annoyance of fuses. Miniature dimensions and low cost with reliability were further requirements.

The circuit shown (Fig. 1) uses as few components as possible to fulfil the specification, and is consequently as small, reliable and as cheap as possible; the prototype costing about 30s.

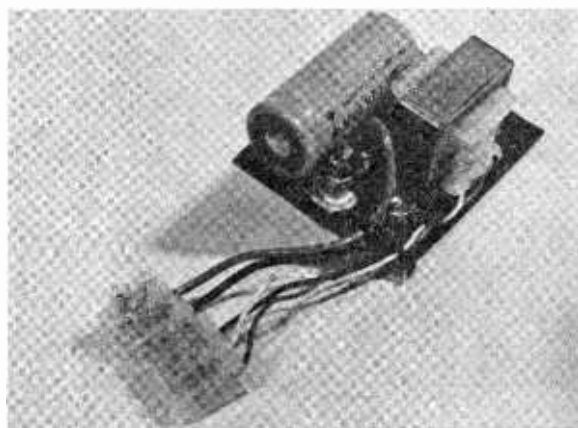
The Circuit

A.C. mains is fed to the primary of T1, a sub-miniature transformer and 12V a.c. is generated across the secondary. The centre tap is not used. The inter-winding screen may be connected to mains earth.

The secondary is connected to a bridge rectifier consisting of four miniature silicon rectifiers and the pulsating d.c. output of this bridge is clipped to the required voltage by ZD1. The excess voltage between the bridge output and the zener diode when it is conducting is dropped in the secondary winding of the transformer which is wound with resistance wire. A small proportion of this voltage also appears across the diodes D1-D4. Explanatory waveforms are shown in Fig. 2.

The clipped pulsating d.c. across ZD1 is then applied to an electrolytic capacitor and the resultant d.c. is taken to the output terminals. The internal resistance of the transformer secondary limits the short-circuit current to about 300mA maximum and the output may be shorted for fairly prolonged periods without damage. This low short-circuit current prevents further damage to any faulty equipment that is connected to the power supply and its intrinsic safety in this respect makes it ideal for powering prototype circuits.

A 9V output was required from the prototype and thus ZD1 is a 9V type. The output voltage remained very close to the zener voltage when drawing currents up to 100mA (the maximum recommended current to be drawn from a PP9 battery) and reduced gradually to zero when 300mA were drawn. However, for different output voltages ZD1 can be



The completed power supply.

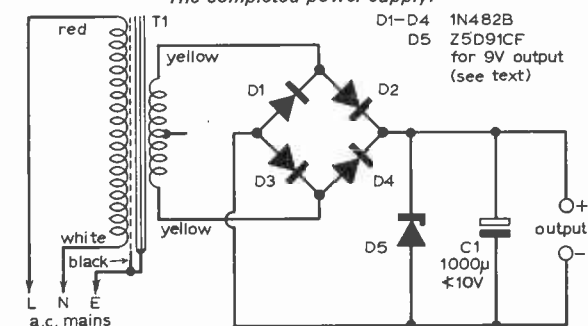


Fig. 1: The circuit of the p.s.u. See text for explanation of the stabilising method.

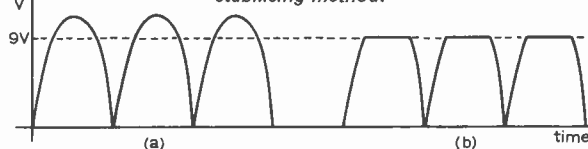


Fig. 2: a) The waveform at the output of the bridge rectifiers. b) The waveform after being clipped by D5 but before smoothing by C1.

★ components list

Transformer, subminiature mains type, primary 240V, secondary 12V, available from Bell, 59 Fairfield Drive, West Monkseaton, Whitley Bay, Northumberland. at 13s. 6d.

Capacitor, C1, miniature electrolytic 1,000µF 12V.
D1—4 silicon rectifiers 1N482B or similar; ZD1, Z5D91 CF; Veroboard 2-3 by 2-0 ins.

(A complete kit of the above, including Veroboard is available from Bell, address as above for 30s)

chosen for any voltage between 6 and 12V. The maximum stabilised current will be less with a 12V zener and greater with a 6V one.

Construction

The unit is constructed on a small piece of Veroboard and details of this are given in Fig. 3. Only two breaks are necessary in the copper strip and three holes must be drilled for the transformer mounting screws and the zener. Use a large nut for securing ZD1 so that it contacts strips 1, 2 and 3 and hence has an adequate heatsink.

The Veroboard on which the unit is constructed may be the same as an amplifier, radio etc. is built on its small size making it suitable for use as a "built-in" unit.

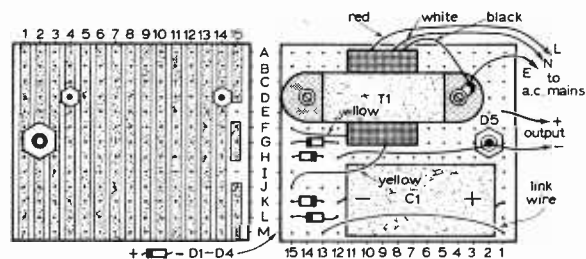


Fig. 3: The component layout.

In the interests of safety the primary should not be taken to the circuit board but rather via flying leads, as shown in Fig. 3.

Uses

If the power unit is to be used on the workbench it may be conveniently mounted in a plastic box from some household product and will take up very little room. If required as a battery eliminator it should be noted that the prototype is half the size of a PP9 battery and can easily be fitted with press-stud connectors and fitted into the battery compartment.

PRACTICAL GIFT FOR A PRACTICAL MAN

A full year series of PRACTICAL WIRELESS issues delivered by post each month would be an ideal Christmas present. Why not give a subscription to a friend. He would certainly find the magazine just as interesting as you do, and each issue would remind him of your good wishes.

But don't think too long—Christmas is very close. Just fill in both parts of the forms below, and post it with your remittance (£2 20 United Kingdom and overseas) to:
Subscription Manager, Practical Wireless, Dept. X
Tower House, Southampton Street, LONDON W.C.2.

We will despatch first copies to arrive in time for Christmas, and send an attractive Christmas greeting card in your name, to announce your gift.

To: Subscription Manager (Practical Wireless) Dept. X.
Tower House, Southampton Street, W.C.2.

MY NAME
ADDRESS

I enclose P/O/MO/ Cheque (made payable to IPC Magazines Ltd.) for the sum of (.....) for a Christmas Gift subscription of 12 issues of PRACTICAL WIRELESS.

It should be sent to:

NAME
ADDRESS

To avoid disappointment, make sure of your own copy by placing a regular order NOW with your newsagent.

THE MW COLUMN

With longer nights rapidly approaching, the medium waves will start to provide good DX listening. For those who want to try this hobby a few notes on aerials are given.

WHICH type of aerial is best for MW DXing? Is it essential to have an outdoor aerial? These questions, put to the writer on numerous occasions, have left the impression that many potential MW DXers are deterred simply because they lack the facilities for erecting an outdoor aerial.

An ordinary TV aerial will give good results on the medium waves. Unplug the coax cable from the TV and connect the outer conductor (braiding screen) to the aerial socket of the MW receiver. Join a good earth to the receiver earth terminal and the TV aerial plus downlead will now act as a vertical aerial. If electrical interference is troublesome connect the inner conductor to the receiver aerial terminal and the outer screen to earth. A reader of this column who lives in Hull used his TV aerial last season to receive a number of US stations including WJR (760) Detroit and WCFL (1000) Chicago!

One of the best MW aerials is the loop; the writer does most of his DXing on one. The loop is an indoor antenna based on the popular frame aerial used in the early days of radio. Its main advantage is that it is directional. There are two nulls—directions of little or no pick-up—pointing in opposite directions at right angles to the plane of the loop. These nulls are very useful indeed for dealing with the crowded conditions prevailing on the medium waveband in Europe, many stations become audible simply by rotating the loop until interference is at a minimum.

The writer's loop consists of 7 turns of plastic covered hook-up wire of about 22s.w.g. wound in the shape of a square of 40in. side. The supporting framework is made of two pieces of wood joined to each other to form a letter X. The turns are wound on to spacers fitted to the ends of the frame and are joined to a 500pF variable capacitor mounted at the centre of the cross-shaped frame. An additional single turn acts as a coupling winding and is wound beside the main turns. This is joined to the MW receiver via a short length of coax cable or 300 ohm feeder which terminates on either the dipole inputs or the aerial and earth terminals. The loop is fixed to a stand so that it can be rotated on its vertical axis. Constructional details of a MW loop appeared in the November 1966 issue of PRACTICAL WIRELESS.†

To operate the loop, tune-in a station on the receiver, peak it with the 500pF variable on the loop and rotate the loop until interference is at a minimum. Interference-free reception of more than one station on the same frequency is often possible by rotating the loop until one of the nulls points in the direction of the station to be suppressed. Although the pick-up of a loop is less than a long wire aerial the signal-to-noise ratio is superior as a result of the loop's directional properties; consequently a clearer signal can frequently be obtained, even in the absence of interference.

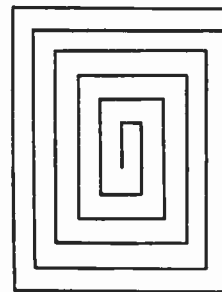
CHARLES MOLLOY

† Unfortunately now out of print—Ed.

BASIC SEMICONDUCTOR TECHNOLOGY

PART SIX

by M.F. DOCKER, M.Sc.



THIS month some other types of transistor will be discussed. The reason for manufacturers producing different types of transistor is the fact that it is difficult to meet all possible requirements with a single type. One user may require an audio amplifier with low distortion and high power handling capacity at low cost, another may require a transistor which is good when used as a switch, and yet another may require a device which will amplify signals at v.h.f.

Surface barrier transistors

In order to increase the frequency range in which transistors can be applied it is necessary to reduce the time that the injected current carriers spend in the base region. This can be done in two ways. First the width of the base can be reduced and secondly the velocity of the carriers can be increased. The surface barrier transistor exploits the first method.

They are essentially p-n-p or n-p-n transistors with very thin bases. In order to produce these devices a germanium dice is etched on both sides to produce two depressions opposite each other as shown in Fig. 1. In this way it is possible to produce a base

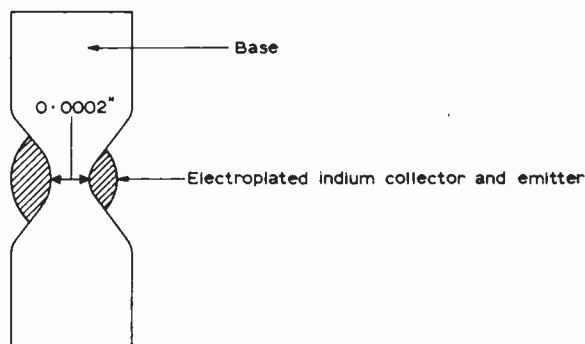


Fig. 1: Structure of a p-n-p surface barrier transistor.

which is only one ten-thousandth of an inch across. After this etch collector and emitter regions are added by electroplating a suitable metal such as indium on to the depressed regions.

The current gain for this type of transistor is lower than for the p-n-p alloy junction device because they have a lower injection efficiency and because the combination of small base width and high resistivity leads to the device having a low punch through voltage. Finally the small collector size limits the maximum power dissipation of the device. These all lead to limitations on the use-

fulness of the device, the only real applications being low power, high frequency amplifiers.

Micro-alloy transistors

A second type of surface barrier transistor is the micro-alloy transistor, or the MAT as it is commonly called. This is produced in a similar way to the SBT. However instead of using a low melting point solder to attach leads to the metal electrodes as is done in the SBT a higher melting point solder is used together with suitable dopants. The electrodes are then melted and micro-alloy junctions formed. In this way a very low emitter resistance can be obtained leading to a much higher injection efficiency than can be obtained with the SBT. Also higher punch through voltages and higher current gains can be achieved.

A third type of surface barrier transistor is the micro-alloy diffused base transistor, or MADT for short. This again uses a similar process in manufacture but instead of starting by etching directly into a high resistivity base slice, a thin layer of low resistivity material is formed by diffusing in phosphorus (a donor impurity). Etching is then carried out in the same way as before, but with this technique the collector is etched more deeply than the emitter. This leads to a base region which has a graded impurity concentration, resulting in a higher collector-to-base breakdown voltage because of the higher resistivity of the collector base junction region. A higher punch through voltage and a lower base resistance result from the low resistivity material near the emitter-base junction.

Another important fact which results from the variation in the impurity concentration in the base region is the drift field which is developed across the base region. This accelerates carriers across the base region from the emitter to the collector resulting in an increased frequency response (this is in fact the second method of increasing the frequency response mentioned previously).

Severe disadvantages of all the surface barrier transistors is that they have a low emitter-to-base breakdown voltage and a rather low injection efficiency.

Diffused transistors

It has been shown how very carefully alloy junction transistors have to be prepared in order to get a narrow base region. It is necessary for the emitter and collector to penetrate a distance of one mil into the dice from each side and they have to stop at a distance of about one-hundredth of a mil from each other. Naturally the difficulties of achieving this accuracy are very great and this

There are Catalogues AND Catalogues!

Ours is THIS kind...



... the kind that's

INDEXED THOROUGHLY. For instance "Aerials Telescopic" under "A" and "Telescopic Aerials" under "T".

PLANNED LOGICALLY. Having over 8,000 items it *needs* to be! Components are listed alphabetically in logical sections.

ILLUSTRATED PROFUSELY. Over 1,800 pictures. Some are photos, some are drawings, but all clearly show the features you look for.

PRINTED CLEARLY. No eyestrain here. Large easy-to-read type, on 330 sensible-size pages—9½ x 7½ in. (ignore our artist's enthusiastic exaggeration!)

BOUND SECURELY. This catalogue is bound to receive long and frequent use. Glossy laminated covers don't show fingerprints, don't tear easily.

PRICED REASONABLY. Just 8/6d plus 3/6d for post, packing and insurance. Folk tell us it's worth twice the price! We quite agree.



Yes — the Home Radio Catalogue is a pleasure to buy and to use

By the way, every Catalogue contains six Vouchers, each worth 1/- when used as directed, and we supply free a 30-page Price Supplement, a Bookmark giving electronic abbreviations and, of course, an Order Form.

POST THIS COUPON NOW
with cheque or P.O. for 12/-



The price of 12/- applies only to catalogues purchased by customers residing in the U.K.

Please write your Name and Address in block capitals

Name _____

Address _____



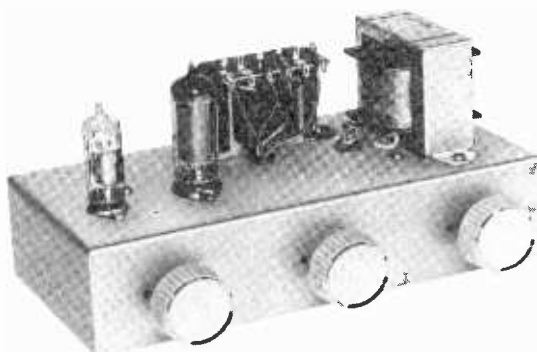
HOME RADIO (COMPONENTS) LTD., Dept. PW,
234-240 London Rd., Mitcham, Surrey, CR4 3HD

THE RADIO CONSTRUCTOR

FREE IN THE OCTOBER ISSUE

WORKSHOP PLANS

FOR THE NEOPHYTE AUDIO AMPLIFIER



The plans contain large scale point-to-point wiring diagram: drilling plans: tables etc. The amplifier is a practical easy-to-build project especially commissioned.

PLUS

SIMPLE COLOUR PRINTER

"CIR-KIT" PERSONAL PORTABLE SUPERHET ETC. ETC.

ALSO EXCLUSIVE MOTORING OFFER

THE RADIO CONSTRUCTOR

ON SALE NOW 3/-



over
16,000
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. 22s 6d post paid

THE RSGB AMATEUR RADIO CALL BOOK

1970 edition

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

Obtainable from:

RADIO SOCIETY of GREAT BRITAIN
35 DOUGHTY STREET, LONDON, WC1

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 technical specification*
- ★ *Attractive appearance*
- ★ *Modest cost*

Housed in Teak veneered Cabinet, Switched selection of Mic., Magnetic P.U., Ceramic P.U., Radio Tuner, Tape Recorder.

Available from your local Hi-Fi Dealer

Wholesale and Retail enquiries to Manufacturers

FUTURISTIC AIDS LTD, 103 Henconner Lane, Leeds 13

SEND S.A.E. FOR FULLY DESCRIPTIVE LEAFLET

results in the devices having a large spread in their characteristics.

It was soon recognised that diffusion processes were far easier to control than the alloying processes. Alloying takes place at about 500°C and this temperature has to be maintained accurately for about ten minutes. Diffusion takes place over a much longer period, perhaps an hour or so, and during this period the temperature can be far more easily controlled. This means that the characteristics of the devices made this way are far more reproducible. The basic process of diffusion has been described in the section dealing with the doping of semiconductors but more details are required to understand how the transistor can be prepared in this way.

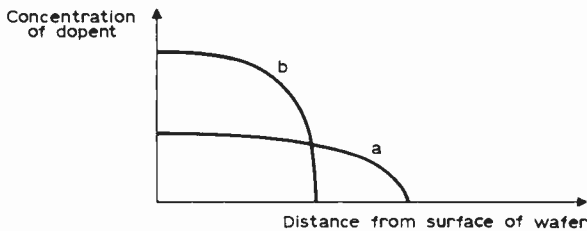


Fig. 2: Concentration of different dopants at different distances from the surface of the semiconductor wafer.

When an impurity is diffused into a dice it does not form a doped region of uniform concentration but rather the sort of distribution shown at *a* in Fig. 2. Different dopants have different rates of diffusing into the dice; thus for example gallium diffuses faster than does phosphorus. In Fig. 2 the concentration of gallium is represented by curve *a* and that for phosphorus by curve *b*.

Early diffused transistors

The first diffused transistors were formed by a single diffusion. For example an n-type wafer of germanium could be used to make a p-n-p transistor in the following way: First the wafer would be cleaned by etching in a suitable acid and washed in de-ionised water to remove all surface defects which would result in degradation of the transistor performance. The wafers would then be put in an atmosphere containing the appropriate dopants and heated to a high temperature for sufficient time for the impurity atoms to diffuse into the wafer. This results in an n-type base region with p-type emitter and collector regions. The wafer is then cut up to give single transistor chips.

The diffused base, alloyed emitter transistor

In this device a p-type dice has a region of n-type material produced on one surface by diffusion of phosphorus. The p-type material acts as a collector and the n-type region as the base. The emitter is produced by alloying an aluminium strip into the base as an acceptor impurity to give a p-type region. A gold wire doped with antimony is also alloyed into the base to provide an ohmic junction which acts as the base contact. In order to reduce the area of the emitter and collector junctions the device can now be etched to produce the shape seen in Fig. 3. The structure is called a mesa transistor

because of the similarity between the shape of the transistor and a mountain plateau.

The diffusion process produces a graded impurity

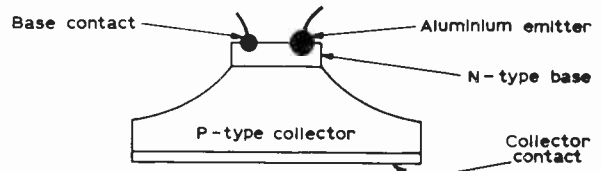


Fig. 3: The structure of the diffused base, alloyed emitter mesa type of transistor.

concentration in the base region which of course introduces the advantages mentioned during the discussion of surface barrier transistors.

The diffused base, diffused emitter transistor

In the diffused base, diffused emitter transistor a similar approach is used in producing the base region as just described. However instead of alloying the emitter a second diffusion is used. After the base region has been prepared a layer of silicon dioxide is grown over the surface of the wafer. A mask of wax is prepared over the surface and a small hole cut into it where the emitter is to go. The oxide layer, which is resistant to the diffusion process, is then etched away in the area of the hole in the wax, the wax preventing the oxide being etched away elsewhere. A second diffusion, this time of a p-type dopent, is then carried out to produce the emitter.

Using this technique higher emitter-to-base and collector-to-base breakdown voltages are obtained and higher power ratings at high frequencies can be obtained.

The alloy diffusion transistor

Another process frequently used to produce transistors is the alloy diffusion process. This uses a combination of alloying and diffusion in order to produce a very thin base region with the built-in field characteristic of the graded junction. The emitter is produced by alloying a lead-antimony-gallium button on to a thin n-type layer which has been produced on a p-type dice. This mixture is allowed to diffuse into the n-type skin and because of the different diffusion coefficients of antimony and gallium a separation of the dopents occurs leading to the production of a thin n-type base region. Contact with the base is made by diffusing an n⁺-type region into the base, through emitter, and a lead is subsequently soldered to this. Using this technique high frequency devices with relatively high power capabilities are available.

Phototransistors

The phototransistor is similar in operation to the ordinary transistor. A reverse biased junction is provided between the collector and base. However it is possible to dispense with the emitter junction! The depletion layer of the collector-to-base junction is exposed to the light and this light liberates current

continued on page 530

MONO-STEREO

JAMES HOSSACK AMPLIFIER

Part 2

As its name implies, this amplifier was designed with the experimenter, rather than the sound enthusiast, in mind. For this reason, it was thought desirable to make it not only adaptable to a variety of experimental stereo arrangements, but also capable of fairly easy modification should the need arise.

Figure 2 shows the complete wiring diagram. It should be emphasised at the outset that this is merely a detailed guide to the under-chassis wiring, rather than a blueprint in the strictest sense of the word. The position of cut-outs for valve-holders, transformers, sockets, etc. will depend on the size of the individual components which are available. As this is the case, no precise dimensions are given for preparing the chassis. It is recommended that the larger components are first of all collected, and a cardboard template made up, to simulate the chassis, of the approximate dimensions indicated in Fig. 2, or perhaps $\frac{1}{2}$ in. larger all round. Sketch in on this template the required cut-outs, together with holes for fixing bolts and chassis lead-through wiring. *Make sure that these holes will not later be obscured by the components mounted above the chassis.* Figure 3 shows the position

which this top wiring will be likely to occupy, and can therefore be used as a guide at this stage.

The wiring operation will be simplified if the position of valveholders and tagstrips, which carry most of the smaller components, corresponds approximately with that shown in Fig. 2, but this will depend to some extent on the size of the two output transformers. The actual spacing used in the amplifier was, in fact, slightly closer than that shown. Tagstrips carrying additional tags can, of course, be employed if desired, since the spare ones will provide handy anchoring points for additional wiring should modifications to the original circuit be contemplated later on.

Having decided on the exact position of the valveholders and all the larger components, and prepared a suitable chassis, the main components can now be mounted in position, making sure that the valveholders have their terminals facing in the correct direction. Commence with the wiring to the valve heaters. For the sake of clarity, the full heater wiring is not included in Fig. 2. If unbalanced heaters were adopted, it is probable that hum, picked up from the single heater wire, and chassis

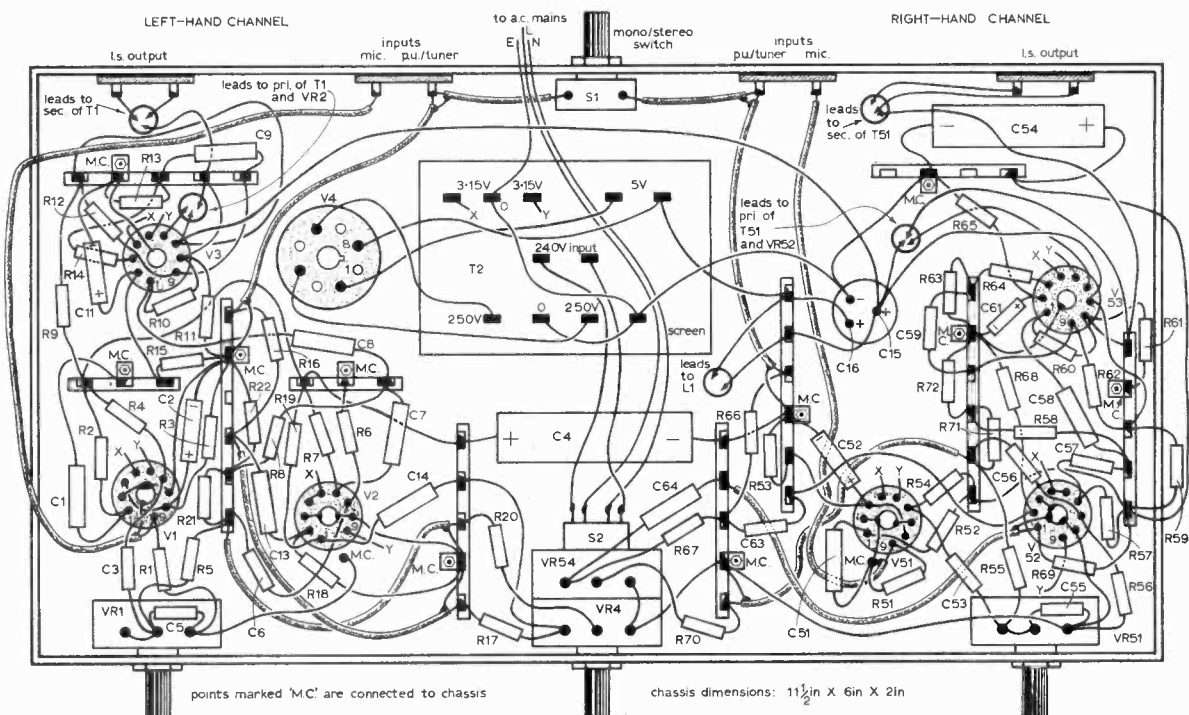


Fig. 2: Chassis underside wiring.
The interconnection of valve heaters have been omitted in this diagram. Refer to the text for details.

INCREASE YOUR KNOWLEDGE



MANY COURSES TO CHOOSE FROM incl.
 RADIO & TV ENGINEERING & SERVICING,
 TRANSISTOR & PRINTED CIRCUIT SERVICING,
 CLOSED CIRCUIT TV, ELECTRONICS,
 NUMERICAL CONTROL ELECTRONICS,
 TELEMETRY TECHNIQUES, SERVOMECHANISMS
 PRINCIPLES OF 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.

RADIO TELEVISION ELECTRONIC ENGINEERING

MEMBER OF THE ASSOCIATION
OF BRITISH CORRESPONDENCE COLLEGES

THERE IS AN **ICS** COURSE FOR YOU

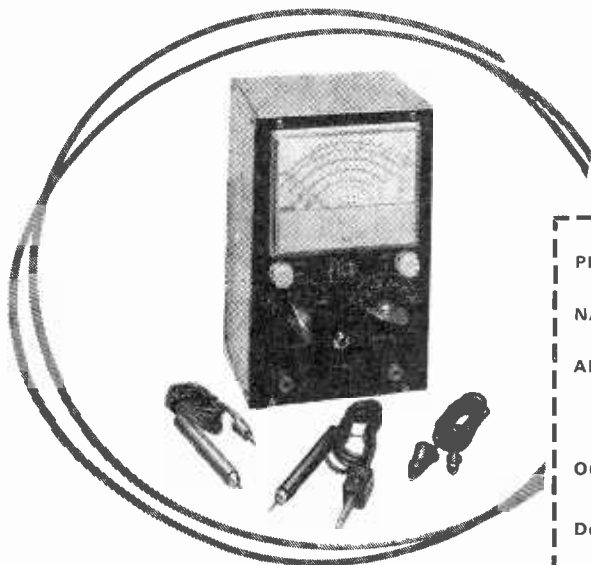
Whether you need a basic grounding, tuition to complete your technical qualifications, or further specialized knowledge, ICS can help you with a course individually adapted to your requirements.

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
11/69

Bargain—Car Radios. Our Price 9 gns. Negative or positive earth (switched) fully transistorised (12v) medium and long waves. Speaker and fitting kit supplied at no extra cost. P/P 5/-.

Sonotone 9TA and 9TA/H.C. Diamond Cartridge brand new, boxed in manufacturers' carton 49/6 + 2/6 p/p. Acos GP 91-1 and GP 91-3 stereo compatible cartridges, new in sealed manufacturers' cartons 22/6 + 2/6 p/p.

BASF TAPE 25 % OFF

5" 600ft. 14/- 900ft. 19/- 1200ft. 30/-
5½" 900ft. 19/- 1200ft. 24/- 1800ft. 39/-
7" 1200ft. 24/- 1800ft. 35/- 2400ft. 57/-

P. & P. 2/- per reel.—over £5 FREE

HI-FI SPEAKER K12TC—12in. 12 watt

Offers an exceptionally smooth and extended response, with very low level of distortion from the specially designed twin diaphragms.

Frequency Response: 30-16,000Hz.

Impedance: 15-160Hm.

OUR SPECIAL PRICE 97/6
PLUS P. & P. 6/6

Bargain—Speakers, Hi-Fi—The Baker Selhurst Stalwart. 12in. round, 15 watt rating, 12,000 lines gauss, 15 ohms, response 45-13,000/c/s. Bass resonance 40-50c/s, solid aluminium chassis. Our price £5.9.6.

p/p 6/6

DULCI HI-FI UNITS

The Dulci range of tuners and amplifiers offer exceptional quality at a sensible price.
Amplifiers: 207 and 207M. Tuners: FMT7 and FMT7s.
SEND NOW FOR FULL DETAILS

TRIO Stereo Moving Magnet Cartridge
Model AD76K. Diamond Stereo LP Stylus. Frequency response 20-20,000 c/s output. 7mv tracking pressure 2 grammes ± 0.5 gm. Fully guaranteed. Price 85/- p/p free.

Bargain—Changer decks at lowest prices ever

GARRARD
Beautiful teak 1025 £8.0.0.
plinth and perspex 2025 £8.10.6.
cover to suit AT60 Mk. II £12.19.6.
these units SP25 Mk. II £12.0.0.
5 Gns. P. & P. Free 3500 with Son 9TA.HC diam. cart. £10.19.6.

Add 10/- p/p for each Garrard unit

SPEAKER ENCLOSURES

Type: INFINITE BAFFLE
Model 8: 8" plus 3" tweeter
Model 138: 13" x 8" EMI
Both £4.19.6 each
Model 1012: 10" or 12" plus 4" tweeter
£7.19.6

All enclosures are in oiled teak, fully built.

Please add 8/- p. & p. on each enclosure

Bargain — Speakers, Hi-Fi — The Baker Selhurst Guitar Group 25, 12in. round, 25 watt rating, 12,000 gauss, 15 ohms, response 30-10,000 c/s, solid aluminium chassis, heavy duty cone. Our price £5.9.6.

p/p 6/6



The greatest HI-FI Budget system to-day—can't be beaten—price or quality anywhere—look at these great features—then compare.

Teleton F2000 tuner amp. AM-FM with multiplex decoder and A.F.C.—2 x 5w channels R.M.S.

Bass Volume Treble Balance controls, a truly outstanding unit £ 43 1 0

Garrard SP 25 Mk II Transcription deck 15 11 11

Teleton SA 1003 matching speaker enclosures 9 5 0

Sonotone 9 TA Diamond Cartridge 4 2 0

Plinth and Perspex cover 7 0 0
£78 19 11

Exclusively offered by **WALDON** at the remarkably low price of 63 gns.

E.M.I. HI-FI SPEAKERS

SET 450: 13 x 8 with two built-in tweeters and cross-over unit. Our Price 69/6. 3 or 15 ohm. 10w, 40-13,000 Hz.

SET 850: 6½" bass plus 3½" tweeter and cross-over unit. 8 ohm, 10w, 65-20,000 Hz. 79/6.

SET 250: 5" heavy duty bass plus 3" tweeter and cross-over unit. 8 ohm, 6w, 80-20,000 Hz. 65/-.

Add 5/6 p/p for each speaker set

WALDON ELECTRONICS 707 Blackburn Road, Bolton, Lancs. Bolton 54280.

PLEASE FILL IN THE COUPON FOR

★ FREE FLOG LIST No. 4

★ A FEW EXAMPLES !

TRANSISTOR RADIOS. Large 11 waveband AM/FM Radios many refinements, limited number. Recommended list price over £60. Many Others Listed from only 49/-!

39 GNS.

★ QUANTITY DISCOUNTS !

AMPLIFIERS. 10 watt high quality. Type AC 106 Transistorised. Bass and Treble Controls. Complete with built in Mains Power Pack. Many Others Listed from only 49/-!

9½ GNS.

★ GUARANTEED ! NEW GOODS !

AM/FM STEREO TUNER AMPLIFIERS with Stereo Multiplex. Famous make. 10W output. Full length S.M. scale. "Rosewood" case. Recommended list price over £40. Absolutely complete in sealed case.

25 GNS.

LOUDSPEAKERS. Bookshelf size in Heavy Veneered "Rosewood", Teak or Mahogany. Infinite Baffle Cases with most attractive Tygan Fronts. Size 12 x 8 x 6in. High compliance "Piston" wide frequency. 8 ohms Drive Unit (8 watts USA). Most excellent reproduction for the price. Ideally matched for the above Tuner Amplifier.

6 GNS.

POST NOW FOR FREE "FLOG LIST"

To Technical Trading Co., Park Crescent Place, Brighton
Please send free "Flog List", without obligation, to

NAME
Block Capitals Please
ADDRESS

PW11.69

TECHNICAL TRADING

ANNUAL STOCKTAKING

AUTUMN SALES

INCLUDING
"FLOG LIST" ITEMS
NOW ON AT ALL
BRANCHES

CALLERS AND ENQUIRIES
WELCOMED WITHOUT OBLIGATION

★ LONDON: 10 Tottenham Court Road Tel: MUS 2639

★ PORTSMOUTH: 350-352 Fratton Road Tel: 22034

★ BRIGHTON: Devonian Court, Park Crescent Place

★ SOUTHAMPTON: 72 East Street Tel: 25851

★ BRIGHTON: 6 Queens Road Tel: 23975

All Mail Orders to Devonian Court (Orders Recorded 24 hours—Brighton 680722)

AND 100's MORE !!!

★ Power Packs
★ Cartridges
★ Record Player Decks
★ Tape Recorders
★ Stereo Headsets
★ Valves
★ Tools
★ Microphones
★ Test Equipment

★ Tuners
★ Amplifiers
★ Transformers
★ Transistors
★ Potentiometers
★ Cabinets
★ Aerials
★ Speakers
★ Etc., Etc.



★ TAPES ★

We offer you fully tensilised polyester/Mylar and PVC 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		Long	
3in. 150ft.	2/3	3in. 225ft.	2/9
4in. 300ft.	4/6	4in. 450ft.	5/6
5in. 600ft.	7/6	5in. 900ft.	10/6
5½in. 900ft.	10/6	5½in. 1,200ft.	13/-
7in. 1,200ft.	12/6	7in. 1,800ft.	18/6
Double		Triple	
3in. 300ft.	3/-	4in. 900ft.	13/-
4in. 600ft.	8/-	5in. 1,800ft.	25/-
5in. 1,200ft.	15/-	5½in. 2,400ft.	34/-
5½in. 1,800ft.	19/-	7in. 3,600ft.	44/-
7in. 2,400ft.	27/-	Quadruple	
		3in. 600ft.	8/6

Postage 1/- reel.

Post free less 5% on three reels.

Quantity and Trade enquiries invited.

NOTE. Large tape stocks at all branches.

earth return, would find its way to the input circuits, and be amplified by the remaining stages. To prevent this it is recommended that the valve heaters be wired as follows: Obtain several feet of stiff twisted twin flex of fairly heavy gauge, and run this from the 6.3V output on the mains transformer to V3, V1 and V2 in that order, soldering one lead to the "X" valveholder terminal and the other to "Y". Now do the same for V53, V51, and V52, starting with fresh wire from the transformer. These twisted leads should be routed as close to the chassis as possible.

Now, go back and complete all the earth connections to each valveholder including the centre spigots—refer to Fig. 2. Finally, run a fairly heavy piece of single insulated wire between all the tagstrip and valveholder earths, not forgetting the soldering tags which, in some cases, are mounted below the valveholder fixing nuts, and take this wire by the shortest route either to the point marked "screen" on the mains transformer, or to the centre-tap of the h.t. winding. Neither this "bus-bar" nor the twin heater wiring already mentioned are indicated in Fig. 2, but their inclusion can lead to a marked reduction in hum level, particularly when operating the EF86 stage at high gain.

The wiring proper of Fig. 2 can now be tackled, completing one valveholder at a time, and keeping leads, as short and direct as possible. Although not indicated—again in the interests of keeping the main diagram as clear and uncluttered as possible—the following leads should be screened and the screen braiding earthed: (1) all four leads from the coaxial input terminals; (2) the connections to S1; (3) the connection between R16 and R17; (4) the connection between C64 and R69; (5) the connection between R20 and R21; and finally that between R70 and R71.

After completing the valveholder wiring, proceed to the power supply connections.

All wiring should be carefully checked over, and an ohmmeter connected in circuit across the h.t. line to ensure that no short or low-resistance path exists here. If all is well, plug in the valves for one channel (V1-V4), connect a loudspeaker, and, with the amplifier on its side, turn the balance to mid-position and all other controls to

minimum. Switch on and, after a few seconds, check for valve glow and hum from the loudspeaker. The latter should be easily audible, since there is, as yet, no negative feedback to counteract it. Touching terminal 3 on V3 valveholder with the blade of an insulated screwdriver should result in a loud buzz from the speaker, proving that the output stage is functioning. If a high-impedance voltmeter is available, a careful check is recommended at this stage, which should reveal a voltage pattern similar to the figures indicated in Fig. 1.

Switch off, and temporarily solder the unconnected "A or B" arrowed lead above chassis (Fig. 3) to one side (either A or B) of the output transformer secondary, and, with the set switched on again, touch the unconnected feedback lead below chassis to the *opposite* wire leading from the transformer (if the A and B wires through the chassis are distinctively coloured, identification of the correct connection is simplified). The occurrence of positive instead of negative feedback on doing this will then be indicated by a loud squeal from the speaker, while, if feedback is in the correct phase, a noticeable reduction of hum should be heard. If the phase is incorrect, simply reverse the two connections.

With the mono-stereo switch in the stereo position, feed an audio signal, from a pick-up, etc., into the high-level input for the appropriate channel, and advance the ganged volume control, VR4/VR54. Check that bass and treble controls are satisfactory. The balance control should provide a fair degree of attenuation of the signal without having too much interaction with the bass control, but some effect is unavoidable for the reasons already discussed. Now, inject a signal of a few millivolts from, for example, a microphone, into the low-level input, advance VR1, and check that mixing and general stability are satisfactory when both inputs are applied simultaneously.

All the above tests refer to one channel. Insert the valves for the second channel and repeat the above procedure exactly as outlined. Finally, with S1 in the "mono" position, both speakers connected, and a suitable high-level input, test the range of the balance control over both channels, and verify that its mid-position gives approximately equal outputs to both speakers.

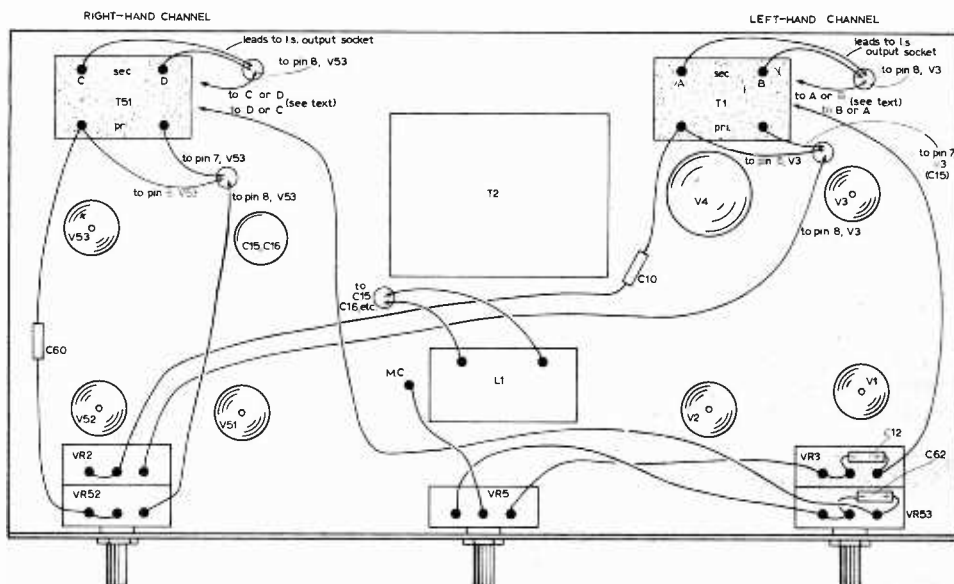


Fig. 3: Above chassis layout and wiring of the mono-stereo amplifier. The actual positions of the larger components—transformers—will depend to some extent upon their size.

SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT • Frequencies in kHz

THE BROADCAST BANDS

Malcolm Connah

THERE has been a great deal of discussion of late on the subject of countries' lists. Every DX organisation seems to have its own definition of what constitutes a "country" and hence its own, individual countries' list.

Most organisations recognise the different states of the USSR as separate countries because they form part of a federation and each can, theoretically, leave the Union at any time.

Biafra was part of the Federation of Nigeria until it seceded and by the same reasoning that applies to the USSR, Biafra should count as a separate country. Hardly any of the DX organisations, however, recognise it as such. (Biafra was taken as an example not for political reasons but because it is one of the countries which are, or were, part of a federation that have a Broadcast Bands transmitter within their boundaries.)

This is only one example of the dozens of anomalies that exist in this field. What is needed is an international agreement between all the DX organisations on a common list of DX countries. The *European DX Council (EDXC)* has already begun the work of compiling such a list but, unfortunately, Britain is not, as yet, represented on this body. Britain is one of the foremost countries in the field of DXing and it is surely time that one of the British based clubs thought of joining the Council.

PROPAGATION FORECAST

The predicted smoothed sunspot number for the month of October is 93 (Switzerland Calling) and as we are still in the equinox period the bands that I predicted last month are still the most suitable.

The comments that I made about propagation last month may have confused newcomers to the hobby so I will try to clarify the situation.

World-wide reception of shortwave broadcasts is possible because of the existence of ionised layers in the atmosphere; one of these layers, the F layer, is the most important to DXers. Under certain conditions this layer reflects the electromagnetic radiation from the transmitter and returns it to the earth. A series of hops from the earth to the layer and back again can cause the signal to travel round the world.

The highest frequency that can be reflected from the F layer is determined by the level of ionisation in the layer. The higher the level of ionisation the higher the frequency that can be reflected.

The ionisation is caused by radiation from the sun hitting the atmosphere and exciting the molecules of the air. The level of ionisation obviously depends on the length of time that the layer is exposed to the sun's radiation.

An area which is in daylight is exposed to the radiation and the level of ionisation increases but when darkness falls the source of the radiation is removed and the level falls gradually until the sun reaches the area

again. If a transmission path is entirely in daylight the Maximum Usable Frequency (MUF) is high but as soon as darkness falls on any part of the path the MUF is reduced. This is because the layer has a lower level of ionisation and can only reflect lower frequencies.

AFRICA

Angola: *A Voz de Angola* has been heard at 0530 in Portuguese on the new frequency of 5,960; this was in parallel with the usual frequency of 9,660.

Ivory Coast: *Abidjan* has an English transmission on 11,920 from 1830 to 1900. There is also a programme in local languages from 1900 to 1930 and in French from 1930 to 2400.

ASIA

Kuwait: Since the last article the *Kuwait Broadcasting Service* has altered some of its frequencies. The English programme from 0400 to 0600 is now on 15,370 and the Arabic programme from 0900 to 1100 has been heard on 21,525 and 21,590. The English programme for Europe at 1600-1900 has changed frequency from 15,405 to 15,345.

Pakistan: The Home Service from *Karachi* in English at 1500 uses the new frequency of 9,513 in parallel with 17,935. The European Service of *Radio Pakistan* uses the new frequency of 15,240 for its English transmission from 1945 to 2030.

EUROPE

Finland: *Radio Finland* has changed frequency from 9,550 to 9,590 for its English programme at 1800.

Sicily: It may have escaped the attention of some of the "country chasers" among our readers that there is a Broadcast Bands transmitter on the island of Sicily. Most of the DX organisations regard this as a separate country although the transmitter is part of the *Radio-Televisione Italiana (RAI)* network.

The programme broadcast is *Notturmo dall'Italia* from 2306 to 0459 which consists of continuous "piped" music. The main distinguishing feature of the programme is the fact that news is given in English and Italian on the hour and in French and German on the half-hour. The station is situated at *Caltanissetta* and broadcasts on 6,060 and 9,515 with a power of 5/25kW.

Switzerland: The *Swiss Broadcasting Corporation* made the following frequency changes on the 7th September: the old frequency of 17,795 from 1715-1915 for Africa became 21,540 and 15,305 to North America from 0130 to 0300 became 6,120.

SOUTH AMERICA

Columbia: *Radio Nacional in Bogota* has been heard at 0300 on the frequency of 6,030, this frequency is given as inactive in the *World Radio TV Handbook*.

73s and good DXing until next month.

Quality Transistor Radios to build yourself

backed by our
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 600 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. First grade components. 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 S.W. listening. Socket for Car Aerial. Powerful push-pull output. Seven transistors and two diodes including Micro-Alloy R.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. First grade components. 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

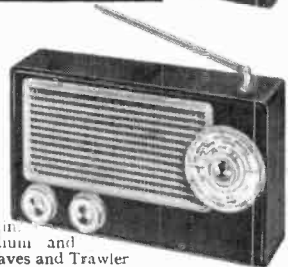


NEW! trans eight

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 5½ x 2½in. 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. All top grade components. 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.

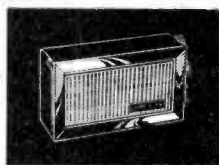
Total building costs **89'6**
P & P 5/6



pocket five

MEDIUM WAVE, LONG WAVE
AND TRAWLER BAND (to 50
metres approx.) PORTABLE
WITH SPEAKER AND EARPIECE

Attractive black and gold case. Size 5½ x 1½ x 3½in. Tunable over both Medium and Long Wave with extended M.W. band for easier tuning of Luxembourg, etc. All first grade components—7 stages—5 transistors and 2 diodes, super-sensitive 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 (to 50
metres approx.) PORTABLE
WITH SPEAKER AND EARPIECE

Attractive case with red speaker grille. Size 6½ x 4½ x 1½in. 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. All first grade components. Easy build plans and parts price list 1/6 (FREE with parts).



Total building costs

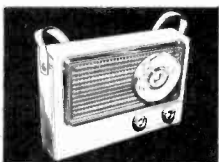
47'6

P. & P.
3/9

roamer six

SIX WAVEBAND PORTABLE
WITH 3in. SPEAKER

Attractive case with gilt fittings. Size 7½ x 5½ x 1½in. Tunable on Medium and Long waves, two short waves, Trawler Band Plus an extra M.W. band for easier tuning of Luxembourg, etc. Sensitive ferrite rod aerial and telescopic aerial for Short waves. All top grade components—8 stages—5 transistors and 2 diodes including Micro-Alloy R.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	☐	ROAMER SEVEN	☐
TRANSONA FIVE	☐	TRANS EIGHT	☐
POCKET FIVE	☐	ROAMER SIX	☐

Parts price list and plans for

Name

Address

PW11

* Callers side entrance Stylo Shoe Shop

* Open 10-1. 2.30-4.30 Mon-Fri. 9-12 Sat

Fully guaranteed Individually packed VALVES

PERSONAL CALLERS WELCOME

Open 9-12.30, 1.30-5.30 p.m. Thursday 9-1 p.m.

MANY OTHERS IN STOCK include Cathode Ray Tubes and Special Valves. U.K. Orders up to 10/-, 1/-; 10/- to £1, 2/-; over £1, 2/- per £1; over £3 post free. C.O.D. 4/- extra



ALL valves
guaranteed

CY31	7/6	ECL80	8/6	KT66	21/-
DAF90	7/6	ECL82	6/-	KT88	29/-
DF96	7/6	ECL83	10/9	N78	15/-
DF92	9/-	ECL86	8/6	OA2	6/-
DK96	7/6	EP36	3/6	OB2	6/-
DL82	4/6	EP37A	9/-	PABC80	7/6
DL84	6/6	EP39	6/-	PC86	10/9
DL86	8/-	EP40	9/-	PC97	9/-
DM70	6/-	EP41	10/9	PC900	7/6
DM71	7/6	EP42	13/6	PC884	8/6
DY86	6/-	EP80	4/6	PC889	9/6
DY87	6/6	EP83	9/6	PC8189	10/9
DY892	9/9	EP85	6/6	PC892	17/-
EABL20	6/-	EP86	6/6	PC890	15/-
EAF42	9/8	EP89	5/-	PCF82	6/6
EB91	2/-	EP91	3/-	PCF84	9/8
EB93	3/-	EP92	2/6	PCF86	9/8
EB94	9/8	EP95	5/-	PCF200	15/6
EB98	6/6	EP183	6/6	PCF201	15/6
EBF80	7/6	EP181	7/-	PCF801	9/8
EBF83	8/6	EP800	21/-	PCF802	9/8
EBF89	6/-	EP812	15/6	PCF805	14/-
ECC81	6/-	EFL200	15/6	PCF806	14/6
ECC82	5/6	EH90	7/6	PCF808	14/6
ECC83	6/6	EL34	10/8	PCF200	15/6
ECC84	6/-	EL41	10/8	PCF81	6/-
ECC85	5/6	EL42	11/-	PCF82	7/-
ECC86	6/-	EL84	4/9	PCF83	13/-
ECC88	7/-	EL85	7/6	PCF84	8/6
ECC189	9/8	EL86	5/8	PCF85	9/8
ECC94	12/6	EL500	17/-	PCF86	8/6
ECF80	6/6	EL503	17/-	PLF200	
ECF82	6/6	EM31	5/-		
ECF83	12/6	EM80	7/-	PL36	18/-
ECF801	12/6	EM84	7/-	PL81	9/8
ECF802	12/6	EM87	11/-	PL82	8/6
ECF803	12/6	EY51	7/6	PL83	7/-
ECF84	7/6	EY86	6/6	PL84	6/6
ECH35	11/-	EY88	8/6	PL500	13/6
ECH42	10/-	EZ40	8/8	PX4	14/-
ECH81	5/6	EZ80	8/8	PX26	12/6
ECH83	10/9	EZ81	5/-	PY38	10/9
ECH200		GZ34	11/6	PY81	5/6

TRANSISTORS, ZENER DIODES etc.

OA5	2/6	OC16	15/-	OC83	5/-	AC176	7/6	CR81/20	9/6	MPF102	11/-
OA10	3/-	OC22	10/-	OC88B	4/6	AC178	4/6	CR81/30		MPF103	9/6
OA70	2/-	OC25	7/6	OC139	7/6	AD140	13/-	CR81/35	11/6	MPF104	10/-
OA71	2/-	OC26	5/-	OC140	9/6	AF117	5/-	CR81/40	12/6		
OA79	1/9	OC29	15/-	OC170	5/-	AF118	10/-				
OA81	1/6	OC35	10/-	OC171	6/-	AF124	7/6				
OA200	1/9	OC38	8/6	OC172	7/6	AF127	5/-				
OA202	2/-	OC44	4/-	OC200	7/6	AF139	10/-				
OA210	7/6	OC45	2/6	IN21	3/6	AF178	12/6				
OA211	9/6	OC71	2/6	IN21B	5/-	AFY19	22/6				
OA220011/-		OC72	4/6	IN25	12/-	ASV26	5/6				
OA280110/-		OC73	11/-	IN43	4/-	ASV28	5/6				
OA2802	2/6	OC75	6/-	IN70	5/-	BC107	7/6				
OA2206	8/6	OC76	5/-	2N1306	6/6	BFY51	5/-				
OA2207	9/8	OC81	4/-	2N1307	6/6	BFY52	4/6				
OA2208	2/6	OC81D	3/-	28303	10/-	BBY27	5/-				
OA2213	6/6	OC81DM	3/-	AC126	6/6	BY213	5/-				
OA2223	2/6	OC82	5/-	AC127	7/6	BY216	15/-				
OA222510/-		OC82DM	3/-	AC128	7/6	CR81/10	6/6				
PY82	5/9	U404	6/-	VR105/30	6/-	5B255M					
PY83	7/-	U801	19/6	VR150/30	6/-	5R4GY	10/6				
PY88	7/-	UABC80	6/-			5U4G	4/6				
PY800	9/6	UAF42	10/6			5V4GT	7/6				
Y801	9/8	UBC41	9/8			5Y8GT	5/6				
Y802	13/6	UBF80	6/6			5Z4	14/-				
QVQ33-10		UBF80	9/6			5Z4G	7/6				
QVQ6-40		UCH42	10/6			6AB7	4/6				
QVQ6-40A		UCH81	7/-			6AC7	8/-				
QVQ6-40A		UCL82	7/6			6AG7	8/-				
QVQ6-40A		UCL83	10/8			6AH6	5/6				
QVQ6-40A		UP41	10/6			6AK5	5/-				
QVQ6-40A		UP80	7/-			6BK6	8/6				
QVQ6-40A		UP89	6/9			6BJ7	7/-				
QVQ6-40A		UQ14	11/6			6AL5	3/-				
QVQ6-40A		UQ15	7/-			6AL5W	7/-				
QVQ6-40A		UY41	7/-			6AM5	2/6				
QVQ6-40A		UY41	7/-			6AM5	11/-				
QVQ6-40A		UY85	5/9			6AN5	20/-				

29/41ft. AERIALS each consisting of ten 3ft. 1in. dia. tubular screw-in sections. 11ft. (8-section) whip aerial with adaptor to fit the 7in. rod, insulated base, stay plate and stay assemblies, pegs, reamer, hammer, etc. Absolutely brand new and complete ready to erect, in canvas bag, £3.9.6. P. & P. 10/6.

METERS Full list of our very large stock of meters on request.

6K6GT	8/-	12BE6	6/-	866A	15/-
6K7	6/-	12BH7	3/6	954	4/6
6K7G	2/-	12C8	3/-	955	2/6
6K7GT	4/9	12E1	17/-	956	2/6
6K8G	4/9	12K6	10/-	957	5/-
6K8GT	7/6	12K6GT	7/6	991	6/-
6K25G	18/-	12Q7GT	5/6	1622	17/-
6L6	14/6	128G7	4/8	2051	5/-
6L6GA	9/8	1487	15/-	3505	13/-
6P25	13/-	19A25	5/9	5676	10/-
68A7	7/-	19G3	60/-	5678	10/-
68A7GT	6/6	19G6	20/-	5726	7/-
68C7	7/-	19H4	70/-	5933	22/6
68C7GT	5/-	20P4	20/6	6057	10/-
68C7	6/-	30C15	15/-	6060	7/6
68C7GT	6/6	30C17	15/-	6064	7/-
68C7Y	6/6	30C18	15/-	6065	8/-
68K7	7/-	30F5	16/-	6080	27/6
68L7GT	6/6	30FL1	15/-	6146	28/-
68N7GT	6/6	30FL12	19/-	9001	3/-
68Q7GT	6/6	30FL13	9/3	9002	4/6
68V8	7/6	30FL14	16/6	9003	8/6
68V8GT	6/6	30FL15	17/-	9004	2/6
68V8	6/6	30L17	17/-	9006	2/6
68X4	4/9	30P12	16/-	O.B. Tubes	
68X5G	5/6	30P19	14/-	E4504/B16	
68X5GT	5/6	30PL1	14/-	70/-	
68Y6	3/-	30PL13	18/6	OJ7	75/-
68Z4	5/6	42		VCR97	32/6
68Z4	5/6	50CD6G		VCR139A	
68Z4	5/6	50EH5	27/6	VCR1750	30/-
68Z4	5/6	7C8	6/-	VCR157B	
68Z4	5/6	7H7	5/6	55/-	
68Z4	5/6	7Y4	9/8	78	5/-
68Z4	5/6	9D6	2/6	80	7/6
68Z4	5/6	11B2	30/-	85A2	7/6
68Z4	5/6	12A7	4/6	813C	25/-
68Z4	5/6	12AT7	4/6	907	9/-
68Z4	5/6	12B7	4/6	913	75/-
68Z4	5/6	12C7	4/6	932A	45/-
68Z4	5/6	12AX7	6/-	68K25	45/-

ALL OVERSEAS ENQUIRIES AND ORDERS

Please address to

Colomor (Electronics) Ltd.
170 GOLDHAWK ROAD, LONDON W12.

Tel.: 01-743 0899

Books from Pitman ...

Transistor Electronic Organs for the Amateur

Alan Douglas and S. Astley
Second Edition

20s net

This second edition leaves the basic tonal design of the organ unaltered but the authors have exploited many of the changes in transistor circuitry that have taken place since the original organ was built and have corrected errors and omissions.

Radio Communication

J. H. Reyner and P. J. Reyner
Second Edition

60s net Paperback 45s net

Here is a book covering the work required for the City and Guilds Telecommunications Technician's Certificate (Radio Subjects) to final year.

"... this book should be of help to both the student and the practising engineer."

—Proceedings of the Institute of Electronic and Radio Engineers.

PITMAN PUBLISHING

39 Parker Street, London WC.2

Kinver for Integrated Circuits

LINEAR INTEGRATED CIRCUITS FOR ALL YOUR REQUIREMENTS

G.E. type PA230 Low Level Amplifier	21/-
G.E. type PA234 1 Watt Audio Amplifier	25/-
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 1/2 Watt Wide Band Amplifier	32/-
RCA type CA3028A Differential/Cascade Amp (12 OHMx)	20/-
RCA type CA3029 Operational Amplifier	55/2
RCA type CA3035 Ultra High Gain Amplifier	30/-
Mullard type TAA263 A.F. Amplifier	15/9
Mullard type TAA293 General Purpose Amplifier	21/8
Mullard type TAA310 Record/Playback Pre-Amplifier	32/-
Mullard type TAA320 MOS L.F. Amplifier	18/5
G.E. type 2N3606 Darlington Pair	11/6
G.E. type D13T1 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.

KINVER GIFT TOKENS

Value £1. or multiples of £1. The ideal gift for the amateur radio and electronics enthusiasts.
FREE catalogue, value 2/- with every gift token purchased.

PROFESSIONAL COMPONENTS AT REALISTIC PRICES!

Send NOW for our COMPONENTS CATALOGUE, at only 2/- post free. This catalogue is packed with information on a host of up-to-the-minute electronic components by leading manufacturers. Included are International Rectifier Products, Resistors, Capacitors, Veroboard, Plugs and Sockets, switches etc. Please note that all goods supplied by us are brand new and guaranteed to fully conform to the manufacturer's published specifications.

DISCOUNTS: Order value of £5-10%; Order value over £10-15%. Cash with order please. Post and packing 1/6 post order.

ELECTRONICS LTD
Kinver

STONE LANE KINVER
STOURBRIDGE WORCS
Telephone: KINVER 2099

THE AMATEUR BANDS

David Gibson, G3JDG

FOR those who are firm followers of the occult, the prediction that conditions are calculated to be improving will come as no surprise. For ordinary mortals not blessed with prophetic powers, the news of these improvements, particularly on the h.f. bands, will come as a pleasant surprise.

This is the time of year when the summer doldrums of propagation and freak skip conditions fade out and give way to the autumn and winter happy hunting grounds for the DX enthusiasts. A period when old-timers fondly polish gleaming 807 p.a. bottles and the student of solid state pays his last instalment on an innocent looking transistor assured by the manufacturers to offer at least 30 watts of r.f. at up to 50MHz.

This is also a good time to check over the gear, ensure that the dial calibration is accurate etc., and get ready for the long winter evenings when all that lovely frosty DX will play sweet music on each headphone simultaneously.

Ten metres should prove an interesting band to monitor this autumn. The summer has produced mostly African signals with an occasional burst from Oceania. A dipole for the band is only some 16ft. 6in. and could be suspended vertically from the eaves of the house thus taking up no room at all. Give it a whirl and let me know how you got on.

S. Norris (Suffolk) queries the JW prefix which, according to my little black book is Spitzbergen. Stan also mentions that he's heard a whisper that Lord Howe Island and Bouvet Island will be active later this year. Anyone else heard anything on this?

THIS AND THAT

Important. If you send in a log to The Amateur Bands, please send it direct to my home QTH. This will avoid the delay in mail being sent on via the magazine's London office. Only logs to: 5 Edward Close, St. Albans, Herts. Any other mail to PW in London please. The deadline for logs is such that they must reach me before the 18th of each month, otherwise, no matter how good they are, they miss the boat and are out of date by the following month and thus cannot be used.

C. J. Morris, G3ABG, sends word of the Worked All Britain award (WAB) but more interesting is a parallel award for s.w.l.s called a Heard All Britain award (HAB). He claims 43 UK stations took part in a recent Sunday afternoon WAB net on 7MHz s.s.b. A special book is available which contains 114 sheets of foolscap and gives full information on the awards. The price is 10s. and is available from G3ABG, The School House, 24 Walhouse Street, Cannock, Staffs. Those requiring any further information should drop John a line, but don't forget the s.a.e.

J. Moore (Leicester) complains of the static and general noise level on topband. This should improve now, with a bit of luck. John also informs that Polish stations are beginning to use a 3Z prefix beside the more usual SP call signs. 3Z5CJT was heard to remark that although the new prefix attracted attention, contacts took twice as long because of explaining the new 3Z5 tag. How about everyone using their call signs backwards—just to be with it?

E. Marner (Swansea) has taken me up on the "radio

maps" idea. He suggests that a useful exercise might be to monitor the various beacon stations which are liberally sprinkled throughout the r.f. spectrum. Provided the receiver is always set up exactly the same each time this would seem a good idea. Some (in fact most) "S" meters are affected by the setting of the gain controls, usually the r.f. and i.f., so these would need to be set the same when each reading was made. Needless to say, everything must remain constant, the same aerial, earth etc., otherwise the readings and logs would be inaccurate.

THE OTHER

On topband—GM3VIO/A, GM3YCB, GW3DZJ, GW3YGH. The aerial is a 60ft. end fed and on 3.5MHz —CN8AW, CR6IV, F9RY/FC, 3V8NC. On 7MHz s.s.b. —PYICAD, UW9AF, YV1PR. The receiver is a CR100/2 and on 14MHz s.s.b.—CE3FI, CE0AE, EA8FE, ET3ZU, F0HI/FC/M, FL8MB, HC2RZ, HV/SJ, 11BUP/P (DXpedition to Tremiti Is.), K6MHO. KF7BSA (Scouts Jamboree station in Idaho), HG6AAY KL7EBK, LG5LG, LI2B, LU3FAN, OX5BA, OY9LV, PY6OA, TF2WLW, TI2AD, VE1RA, VE3BPV, VE7AZT/KL7 (Ice Is. 84.5°N 123.6°W), VE8RCS, VK2ADJ, VK7AZ, VP7NN, VU2BX, W6VQD, W7JRT, WA5YRG/P/VE8 (Baffin Is.), WA9LXG/P/KP4, XE1IX, YN2JS, ZL1AV, 3V8NC, 3Z3PS, 9G1DY. The listener is J. Moore (Leic.), and on 28MHz he logged—CR6AR, EA8CL, HG8QF, LU3DTV, PY1BKQ, PY1BOR, PY1DBE, UP2PG, 5A1TN, 5H3MA, 9J2DT.

A. Watson (Dartford) has recently wrapped his lucky digits around a new Star 200 receiver. Another addition is a 100ft. long wire. A tentative eavesdrop on 80 disclosed—HV3SJ, PY1NBF and 5A2TR the latter in a DX net with GW3AX in the chair.

Twenty proved more fruitful with sigs from—CT1SQ, DU1AA, F0OX/FC, HB0XWS, HC4WM, HZ1AB, JA4ZA, JX3DH, KP4BBN, OD5FB, PY2DOS SV0TE, TF2EA, VE3FOR, VK3MO, WA3HIA/AM, 5H3LV, 5Z4LW, 6Y5SR, 9N1MM.

Many logs unhappily, did not qualify this month because they weren't in alphabetical order or did not have signal reports. Please, slaves, dates, times, frequencies, standard RST (and not some weird mixture of SINPO and Arabic) and, most important, alphabetical order, it makes life so much easier this end.

NEWS AND CONTESTS

October proves to be quite a busy time for Hams. October 5th, 1296MHz contest; 5th, Scottish mobile rally in Aberdeen; 11th-12th, 28MHz telephony contest (quick, get that dipole cut); 12th, Peterborough mobile rally, talk-in stations on topband, 4 and 2 metres; 25th-26th, 7MHz c.w. contest; 25th-26th, CQ WW contest (phone section); this should be a good one to log a few of those extra zones.

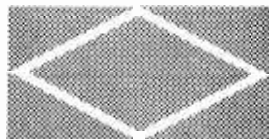
On November 3rd, there's the 2 metre s.s.b. contest and on November 8th-9th, the phone section of the 7MHz contest.

Jamboree-on-the-air

The twelfth annual opportunity for Scouts to participate in amateur radio will take place on the weekend of 18/19 October. The Jamboree will start at 01.00 Saturday morning, and conclude at 23.59 Sunday night. This event is not, incidentally, a contest but a chance for Scouts in all countries to exchange news and establish international friendships. Information on how to help Scout troops during the event can be obtained from G3BHK, Katoomba, Tyneham Close, Sandford, Wareham, Dorset.

a beginner's TRANSISTOR CAPACITANCE BRIDGE

KEITH JOHNSON



PART 2

CONSTRUCTION

The unit is built up on a Cir-kit board measuring 5in. × 3in. Switches, batteries, meter, and the main potentiometer, VR1, are located on a separate front panel. The Cir-kit system results in a very presentable and easily made printed circuit, with the copper channels consisting of adhesive strip pressed into position on the underside of the board, following the diagram of Fig. 7. This figure also shows the component layout on the upper side of the board. Commence operations by drilling $\frac{1}{16}$ in. holes for all components and wires leading into the board. The approximate positions for these holes are shown by small crosses, the exact positions depending on the precise size of the transformer and other components used. Now, cut and press the Cir-kit strip into position, piercing this with a pin where it overlays each hole. Finally, place all resistors, capacitors, etc. in position, and thread the wire ends through to the copper strip side of the board, finally soldering them into position on the strip. Place a drop of solder,

also, at each strip junction (marked J in Fig. 7) where pairs of copper strips overlap.

The flying leads to the battery connectors, meter, VR1, etc. and the capacitor bank can now be inserted from the top of the board. If fairly long wires are necessary, e.g. the battery leads, a useful tip is to cover the wire with a piece of thick sleeving (unless the sleeving round it is already fairly thick), leaving a small wire end protruding to pass through the hole and solder on to the copper strip. It is most important that no component is left held loosely by the copper to which it is soldered, as the latter will inevitably come adrift from the board, and, with the flexing of the connecting leads, eventually break. For the same reason, no components should be soldered directly to the copper strip side of the board (except temporarily for experimental purposes), the only exceptions being the five jumper wires, marked W in Fig. 7.

The two holes at the front of the panel are for small metal brackets to hold the front panel to the p.c. board. Drilling details for this panel are given in Fig. 8. After drilling, scribe a line 1in. from the bottom, and bend the top portion of the panel back to make an angle of approximately 130 deg. with the

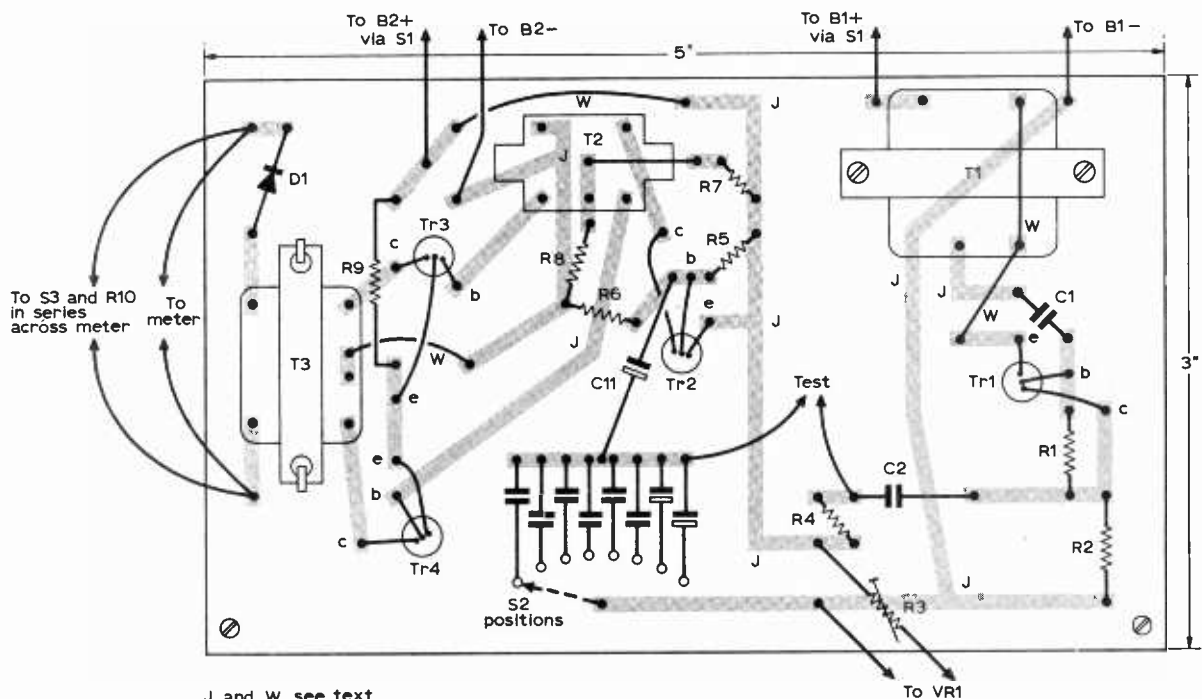


Fig. 7: The Cir-kit wiring board layout used by the author.

60 r.p.m. Geared Motor. This is a powerful unit, driven by a mains motor of similar type to, but rather larger than the average Tape Deck or Record Player motor. The gear boxes may be detached. It is, in fact, a unit measuring approximately 3 1/2 x 1 1/2 in. thick. The final drive shaft is 1/2 in. wide, 1 1/2 in. long. 35/-

A Micro Meter Bargain. Limited quantity only, centre zero 60-0-60 micro amperes. This is a Weston Meter enclosed in clear perspex case for flush mounting. Dial size approximately 2 1/2 in. wide. The scale is not engraved but has a red part in the centre and a green part to the left of centre. Scale could be cleaned off and re-written to suit your particular requirements. Regular price probably over £5 each, our price 29/8 each.

Battery Record Player. Made by Collaro. This is made up on a unit plate with speed selector and pick-up. The turntable is a heavy one and measures approximately 9 1/2 in. Pick-up is fitted with the famous "Studio" cartridge. Price 69/8, postage and insurance 6/6.

E.H.T. Condenser. 28Kv. 0-0011 mfd. Suitable for transmitting test conditions 6A at 300K/c. Bakelite case. 18/8 each.

86 Watt Tubular Element. Very well made unit. The element is wound on a porcelain former then encased in a brass tube terminated with beaded leads 12 in. long. Normal mains voltage. Price 5/- each or 54/- per doz.

Press to Make Switch. Double pole, 5 amp contacts or can be used as single pole, 10 amp, contacts 250 volt working. Single hole fixing. 2/6 each, 24/- dozen.

Door Switch. Contacts open when plunger is depressed. Prevents lights being left on. 15 amp contacts, 230 volt working. Made by Arrow. 3/6 each, 36/- per dozen.

Rotary Appliance Switch. 16 amp, 230 volt on moulded ceramic base. Operated by pointer knob (not supplied). 2/- each, 18/- per dozen.

1/40th h.p. Motor. Made by the French (Casor) Company. This is an excellent totally enclosed motor, powerful enough to operate small lathe, drilling machine, washing machine, etc. It's speed is 1,450 r.p.m. Made for normal 50 cycle, 230/250 volts mains, totally enclosed, size 2 1/2 x 4 in. dia. with 1 1/2 in. of 1/2 in. spindle. Price 19/8 plus 4/6 postage and insurance.

Burglar Alarm Kit. Protect your home and family by frightening away the intruder. With our circuit a mains operated bell rings loudly directly the door or window is opened. Kit comprises 12 reed switches, 12 magnets, relay, mains transformer and bell with circuit. Price 49/8.

NICAD RECHARGEABLE BATTERIES
3-6V 500mA size 1 1/2 x 1 1/2 in. dia. type ref DK7500. Really powerful, will deliver 1 amp for 1 hour. Regular price 32/6. Our price 17/8 each. New and guaranteed. Other voltages available, single cell 1-2V 6/8. 5 cell 6V, 29/8.

ELECTRIC CLOCK WITH 25 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 39/8, less than the value of the clock alone—post and insurance 2/9.

INDICATOR LAMP
Panel mounting, consists of neon lamp in red Plastic lens with resistor in leads for mains operation. 2/6 each. 24/- dozen.

BECKASTAT
This is an instant thermostat, simply plug your appliance into it and its lead into wall plug. Adjustable set. Ideal for normal air temperatures. 13A loading Will save its cost in a season. 19/8. Post and insurance 2/9.

SOLDER GUN
A must for every busy man. Gives almost instant heat. Also illuminates job. 100 watt 220/240V. 39/8 (saves you 30/-), post & ins. 4/6. BIG JOB 250 watt model 99/8 (saves you over £3.10.0), post & ins. 6/6.

FLEX BARGAINS
Screened 3 Core Flex. Each core 14/0076 Copper PVC insulated and coloured, the 3 cores laid together and metal braided overall. Price £3.15. per 100 yds. coil.
15 Amp 3 Core Non-kink Flex. 70/0076 insulated coloured cores, protected by tough rubber sheath, then black cotton braided with white tracer. A normal domestic flex as fitted to 3 Kw. fires. Regular price 3/6 per yd. 50 yd. coil £4.10.0, or cut to your length 2/6 per yard.
10 Amp 3 Core Non-kink Flex. As above but cores are 28/0076 Copper. Normal price 2/6 per yd. 100 yd. coil £7.10.0, or cut to your length 1/8 yd. 6 Amp 2 Core Flex. As above, but 2 Cores each 23/0076 as used for Vacuum Cleaners, Electric Blankets, etc. 39/8 100 yd. coil.



ELECTRIC TIME SWITCH

Made by Smith's these are AC mains operated, NOT CLOCKWORK. Ideal for mounting on rack or shelf or can be built into box with 13A socket. 2 completely adjustable time periods per 24 hours, 5 amp changeover switch circuit on or off during these periods. 59/8, post and ins. 4/6. Additional time contacts 10/- pair.

The Full-Fi STEREO SIX



The amplifier sensation of the year

You will be amazed at the fullness of reproduction and at the added qualities your records or tuner will reproduce. Built into metal cabinet elegantly styled and teak finished to blend with modern furnishings, this amplifier uses an integrated solid state circuit with an output power of 6 watts R.M.S. split over the two channels. The amplifier is ideal for use with normal pick-ups and tuners, it has a double wound mains transformer and ganged volume and tone controls—also switching for Mono to Stereo, tuner or pick-up. Other controls include "treble lift and cut", "balance" and separate mains on/off switch. Price is 29.9.0. plus 7/6 post and insurance. Speakers (with tweeters) in oiled teak finish cabinets to match amplifier, 28.8.0 per pair.

CONTROL DRILL SPEEDS

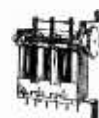
DRILL CONTROLLER

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. 19/8 plus 2/6 post and insurance. Or available made up 29/8, plus 2/6 post.



THIS MONTH'S SNIP

'Gladitor' 2 wave band transistor radio
7 transistor, 2 wave band (medium and long) pocket radio with carrying handle and earplug. These radios use a ferrite slab aerial and a conventional superhet circuit with built in moving coil speaker. Completely built up, ready to play. Offered at less than importers price due to bankrupt purchase. A remarkable bargain. 39/8 plus 3/6 post and insurance.



3 STAGE PERMEABILITY TUNER

This Tuner is a precision instrument made by the famous "Cydon" Company for the equally famous Radiomobile Car Radio. It is a medium wave tuner (but set of longwave coils available as an extra if required), with a frequency coverage 1620 Kc/s-625 Kc/s and intended to operate with an I.F. value of 470 Kc/s. Extremely compact (size only 2 1/2 x 2 x 1 1/2 in. thick) with reduction gear for fine tuning. Snip price this month 19/8, with circuit of front end suitable for car radio or as a general purpose tuner for use with Amplifier. Post Free.



DISTRIBUTION PANELS

Just what you need for work bench or lab. 4 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 plug. Similar advertised at £5. Our price 39/8, 4/6 P & I.



VARYLETE

Will dim incandescent lighting up to 600 watts from full brilliance to out. Fitted on M.K. flush plate, same size and fixing as standard wall switch so may be fitted in place of this, or mount on surface. Price complete in heavy plastic box with control knob 33.19.6.

BUY TIME SLOT METERS

If you hire out equipment such as TV sets by the hour then these slot meters are what you require. We have 3 types, 8d. an hour, 1/- an hour and 1/6 an hour. Brand new. Made by the famous Weston Company. Price 23.19.6, postage and insurance 6/6.



THERMOSTAT WITH PROBE

This has a sensor attached to a 15A switch by a 1 1/2 in. 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.

HI FI BARGAIN

FULL F1 12 INCH LOUDSPEAKER. This is undoubtedly one of the finest loudspeakers that we have ever offered, 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 11,000 gauss—Total Flux 44,000 Maxwells—Power Handling 15 watts R.M.S. Cone Moulded fibre—Freq. response 30-10,000 c.p.s.—specify 3 or 15 ohms—Mains resistance 60 c.p.s.—Chassis Diam. 12in.—12in. over mounting lug—Baffle hole 1 1/2 in. diam.—Mounting holes 4, holes 1/2 in. diam. on pitch circle 1 1/2 in. diam.—Overall height 5 1/2 in. A £6 speaker offered for only 33.9.8 plus 7/6 P. & I. Don't miss this offer. 15in. 30 watt £7.19.6. 18in. 100 watt £24.10.0.



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

REED SWITCHES

Glass encased, switches operated by external magnet—gold welded contacts. We can now offer 3 types:

Miniature. 1in. long x approximately 1/4 in. diameter. Will make and break up to 1 amp up to 300 volts. Price 2/6 each. 24/- dozen.
Standard. 2in. long x 3/16 in. diameter. This will break currents of up to 1 amp, voltages up to 260 volts. Price 2/- each. 18/- per dozen.
Flat. Flat type, 2in. long, just over 1/16 in. thick, approximately 1/4 in. wide. The Standard Type flattened out, so that it can be fitted into a smaller space or a larger quantity may be packed into a square solenoid. Rating lamp, 200 volts. Price 6/- each, 23/- per dozen.
Small ceramic magnets to operate these reed switches 1/8 each. 12/- dozen.

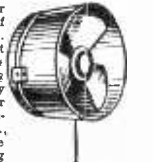


ROTISSEIRE MOTOR

Very powerful 7 r.p.m., operates from standard A.C. mains. 29/8, plus 3/6 P. & I.

EXTRACTOR FAN

Cleans the air at the rate of 10,000 cu.ft. per hour. At the pull of a cord it extracts grease, grime and cooking smells before they dirty decorations. Suitable for kitchens, bathrooms, factories, changing rooms, etc., it's so quiet it can hardly be heard. Compact, 6in. casing with 5 1/2 in. fan blades. Suitable wherever it is necessary to move air. Kit comprises motor, fan, fan fast, kit comprises motor, fan, blades, sheet steel casing, pull switch, mains connector and fixing brackets. 39/6 + 8/6 post and ins.



230 VOLT SOLENOID

1in. stroke. Size 2 1/2 in. x 2in. x 1 1/2 in. 14/6, postage 2/9.

FLUORESCENT CONTROL KITS

Each kit comprises seven items—Choke, 2 tube ends, starter, starter holder and 2 tube clips, with wiring instructions. Suitable for normal fluorescent tubes or the new "Grolux" tubes for fish tanks and indoor plants. Chokes are super-silent, mostly resin filled. Kit A—15-20 w. 19/8. Kit B—30-40 w. 19/8. Kit C—50 w. 19/8. Kit E—65 w. 19/8. Kit MF1 is for 6in., 9in. and 12in. miniature tubes, 19/8. Postage on Kits A and B 4/6 for one or two kits then 4/6 for each two kits ordered. Kit C & D 8/6 on first kit then 3/6 for each kit ordered. Kit MF1 3/6 on first kit then 3/6 on each two kits ordered.

DEAC RECHARGEABLE BATTERY

1-2V-2000 mA/hr. type (2000DK2). Size 2in. dia. x 1 1/2 in. thick approx. Tremendously powerful, will deliver 4 amp for 1 hour. Regular price over £2 each. Snip price 19/8 each. NEW AND UNUSED.

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. 500 mA at 8/6.



THERMOSTATS

Type "A" 15 amp. for controlling room heaters, greenhouses, airing cupboard. Has spindle for pointer knobs. Quickly adjustable from 30-80°F. 9/8 plus 1/- post. Suitable box for wall mounting. 5/-, P. & I. 1/-.
Type "B" 15 amp. This is a 17in. long rod type made by the famous Sunvic Co. Spindle adjusts this from 50-55°F. Internal screw alters the setting so this could be adjustable over 30° to 100°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. 3/8 amps. Has many uses one of which would be to keep the loft pipes from freezing, if a length of our blanket wire (16 yd 10/-) is wound round the pipes. 7/8, P. & I. 1/-.
Type "E" This is standard refrigerator thermostat. Spindle adjustments cover normal refrigerator temperature, 7/8, plus 1/- 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 60° to 150°F. Price 18/- plus 2/- post and insurance.

ELECTRONICS (CROYDON) LTD

Dept PW 266 London Road, Croydon CRO-2TH
Also 102/3 Tamworth Road, Croydon

There's Something for Everyone in the NEW HEATHKIT CATALOGUE!

GUITAR PRACTICE AMPLIFIER

Perfect for the youngster.

Kit K/JK-37 **£198 0**
Carr 8/-

ELECTRONIC METRONOME

For student or professional musician.

Kit TD-17 **£71 20**
Carr 3/-



'AMBASSADOR' SPEAKER

Luxury looks plus Hi-Fi sound.

Kit Ambassador **£291 60**
Carr 15/-

AUTO-TUNE-UP METER

Three instruments in one.

Kit K/ID-29 **£178 0**
Carr 5/-

AIRCRAFT MONITOR RECEIVER

Tunes 108-136 MHz.
Portable.

Kit K/GR98 **£271 20**
Carr 5/-

CAR RADIO

Luxury motoring entertainment.

Kit K/CR-1 **£121 20**
Spkr. extra £1 2 0
Carr 5/-

TECHNICIANS LOW COST 'VVM'.

7AC, 7DC, 7 ohms ranges

Kit K/IM-18U **£161 40**
Carr 5/-

PORTABLE VVM

For householders, hobbyists.

Kit K/IM-17 **£121 80**
Carr 6/-

SEVERN AM/FM RADIO

Features modular construction.

Kit K/Severn **£181 80**
Carr 5/-

STEREO HI-FI 'COMPACTS'

Record playing plus FM stereo.

Kit K/AD 27 **£82 00**

Stereo Record playing only
Kit K/AD 17 **£54 00**
Carr 13/- on each

STEREO RECORD PLAYER

Exciting sound/Budget price.

Kit K/SRP-1 **£27 60**
Carr 11/-

D.I.Y. SPEAKER SETS

for building into your own cabinets.

Kits from **£7 10 0** Carr 5/-
to **£13 10 0** Carr 9/-

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

This catalogue describes these and many more kits and ready-to-use models for stereo/Hi-Fi, Domestic Radio, Record Players, Amateur Radio, Short Wave etc.

Whatever your vocation motorist, hobbyist, Do-it-yourselfer, Engineer or Education here's a chance to make significant savings.



DAYSTROM LTD
GLOUCESTER
GL2-6EE

TO DAYSTROM LTD, GLOUCESTER GL2-6EE



Please rush me details of the Latest Heathkit models today!

NAME

ADDRESS

PW-11

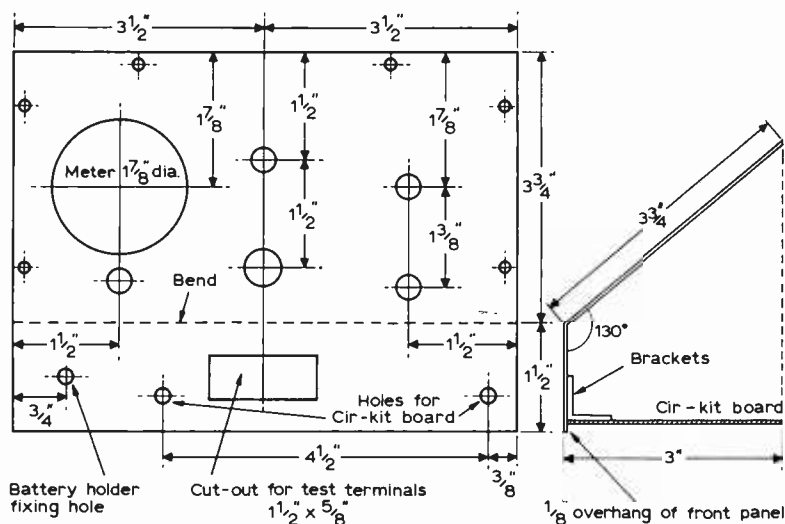


Fig. 8: (a) Cutting and drilling details for the capacitance bridge panel. Aluminium sheet of any gauge between 22 and 16 is quite satisfactory. (b) How to bend the panel to fit the case shown in Fig. 10.

bottom half; so that a ruler, placed at right angles against the back of the Cir-kit board (after bolting to the panel), would just touch the top edge of this angled portion. These details will be clear from Fig. 8b.

Before finally bolting the panel and printed circuit board together, mount the switches and other components in position on the panel and solder on the interconnecting wires, keeping leads conveniently short. Colour coding, especially of the capacitor bank leads will be found a considerable help at this stage.

Figure 9 gives details of the battery holder. This actually consists of a small aluminium box designed to hold two PP3 batteries fairly tightly in position, and is bolted to the front panel by means of a single fixing screw—indicated by “B” in Fig. 8a. With the intermittent use of this type of tester, replacing batteries will be an infrequent operation. Because of the different current requirements of oscillator and amplifier sections, interchanging PP3s after a period of use may, in fact, be all that is necessary to restore the bridge to a fully-operational state.

A suitable cabinet can be constructed from 1/2 in. plywood, cut and nailed together as shown in Fig. 10. Self-tapping screws, bolted to three metal brackets which are screwed to the inside of the cabinet, serve to hold the bridge securely in place. Before mounting the instrument in its cabinet, however, it will be advisable to complete (in pencil only, at this stage) the details on the range and other scales, since, as mentioned in the theoretical section, it may be necessary to alter some of the capacitors in order to obtain best agreement on all the ranges.

TESTING THE BRIDGE

When all the wiring and constructional work has been completed, and the oscillator and amplifier tested individually as already described, set R3 to zero resistance, VR1 to maximum, S2 to the $\times 1$ range, and switch S1 on. If desired, headphones can be connected across T3 primary in order to monitor the signal. (In the completed instrument, an ear-piece jack was connected across this point, and

mounted on the front panel (see photograph) for connecting a pair of high-impedance headphones. This was found useful, not only for monitoring purposes, but also for greater accuracy when testing very small capacitors on the $\times 1$ range, where the meter deflection can be very small.)

At this stage the meter reading should be zero. Touching the test points with one hand should now cause the meter to read, provided S3 is in the sensitive position. Now, switch to the $\times 10$ range, and a meter reading should be obtained without touching the terminals, together with a noticeable increase in headphone response. Operating S3 should decrease the reading without affecting the volume of note heard in the phones. Check also that a decrease in the value of VR1 resistance causes an increase in current on both of the

ranges mentioned. Now switch to the $\times 100$ range. The meter should go from the hard-over position (minimum value of VR1) to about mid-scale, on operating VR1. This is as far as one can go at this stage, since a maximum meter reading will almost certainly be obtained on all the higher ranges.

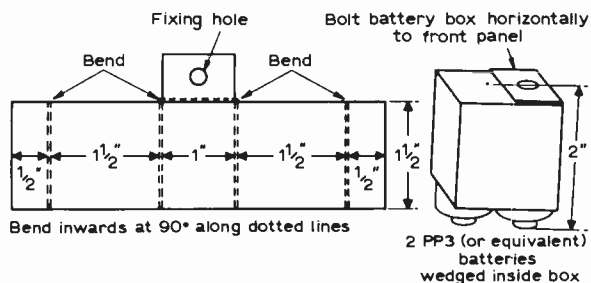


Fig. 9: The battery holder box, also cut out of thin aluminium sheet.

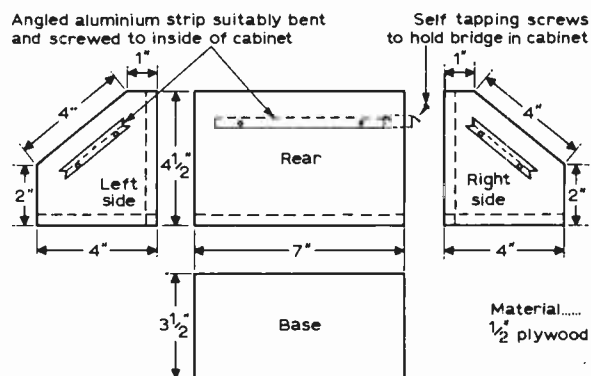


Fig. 10: An attractive style of cabinet, designed to be made from 1/2 in. plywood.

Assuming all the above tests are satisfactory, a test capacitor can now be connected across the test points; 300pF is a suitable value to start with. On range $\times 100$, a dip should be obtained about mid-scale, and a pencilled “3” scribed at this spot. Now check that a dip is obtained at roughly the same spot

with 3, 30, 3000pF etc., as discussed in the previous section, on operating the range switch. If necessary, alter the fixed capacitors, as recommended. If cramping of the scale is noticeable, increase resistance R3 slightly, until a suitable spread is obtained, finally locking this in position with a spot of wax or Duco cement.

APPLICATIONS

The most common application for a capacitance bridge is, of course, to determine whether a capacitor is showing its rated value, to evaluate the capacitance of an unknown component or one from which the marking has been obliterated. In addition, the present instrument is a very sensitive indicator of capacitor leakage, since a leaky component will give either a very shallow dip, or perhaps none at all, depending on the extent of the resistance which it exhibits. This effect is particularly noticeable with faulty electrolytics. In some commercial bridges, the extent of these "losses" can be precisely evaluated, by incorporating a variable resistance in parallel

with the range capacitor, thus effectively neutralising the "resistance" of the test capacitor, and enabling the full dip to be once more obtained. This refinement was not considered necessary in the present case.

An interesting application of the measurement of capacitance occurred recently, when the writer was asked to help with the final lining-up of a "Progressive Short-Wave Receiver", built according to this popular P.W. blueprint. In the text accompanying that article, instructions for bandspreading are given, which include the removal of vanes from a ganged capacitor, so as to give the requisite maximum capacitance on each section. Use is made of a mathematical formula, taking the initial capacitance of the capacitor as a guide. Instead of this procedure, it was decided to measure the maximum capacitance directly with the bridge, removing some vanes and adjusting the remainder at each stage until the correct capacitance for satisfactory bandspreading, coupled with perfect oscillator tracking, was obtained. ■

BASIC SEMICONDUCTOR TECHNOLOGY

—continued from page 517

carriers which are swept across the junction. Consequently the device is sensitive to the presence of light. The reader may by now have realised that the device is identical to the photodiode.

A much greater sensitivity however can be obtained by using a different device, the n-p-n phototransistor. This device makes use of a hook-collector, which is found in p-n-p devices.

The frequency response of phototransistors is limited by the time taken for the liberated carriers to diffuse to the collector junction. This depends on the distance away from the junction that the carriers are produced, with the consequence that phototransistors have to be physically small if they are to operate at high frequencies.

Operating limitations of transistors

Several factors have to be taken into account when a transistor is connected in circuit if it is not to be immediately destroyed after switching on.

Maximum power dissipation

The power which a transistor can dissipate is limited by its physical construction. The temperature at which the device can work is the limiting factor and it is necessary to remove the heat dissipated in the device so that this temperature is not exceeded. All three methods of heat transfer—radiation, conduction and convection—come into play in cooling a transistor. In order to avoid a large tem-

perature of operation power transistors are mounted on large heatsinks which provide a large area to dissipate the heat. When using them care should be taken that sufficient air can reach the sink in order to keep it cool. A matt black or anodised aluminium heatsink is better for radiating heat than a shiny aluminium one. The manufacturer of the transistor normally specifies the type of heatsink to use to get the maximum performance with a particular transistor.

Maximum voltage ratings

There is a maximum voltage to which the collector junction can be exposed. Two effects can give this limitation. First, avalanche multiplication of carriers can cause an excessive current to flow and cause breakdown of the junction. Secondly punch through can occur. This is due to the depletion layer in the base region extending to the emitter and causing an effective short-circuit of the transistor. The type of breakdown which occurs at the lowest voltage sets the limit of the maximum collector voltage, and this is determined by the construction of the particular device.

When a transistor is used as a switch very little power is dissipated in the device except during the actual switching operation, so care must be taken to avoid overloading it during this period.

Safety precautions

Whereas in valve circuits some measure of overloading can be tolerated with transistor circuits none of the maximum ratings given by the manufacturer should be exceeded. In the interests of economy it is wise for the amateur to derate these specifications by 25% and to incorporate protective devices such as resistors, fuses and current limiters wherever possible. A diode wired in series with the power supply lead as in Fig. 4 will avoid damage to the circuit if the power supply is inadvertently connected the wrong way.

Next month majority carrier devices such as the field effect transistor and MOST will be described.

TO BE CONTINUED

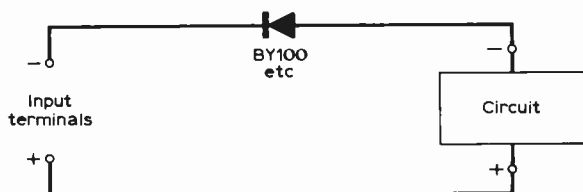


Fig. 4: Use of a rectifier diode to protect equipment against accidental reversal of the power supply connections.

DE LUXE PLAYERS

PORTABLE CABINET Asilum-
trated To fit standard
player or autochanger
RCS AMPLIFIER 3 WATT.

Ready made and tested
This is a 2-st. unit using a
triode pentode condenser
coupled valve, giving
3 watts output into a
3 ohm loudspeaker.
Tone and volume
controls mounted on
panel. Supplied with
knobs, loudspeaker
and valves UCL82,
UY85. Frequency response
50-12,000 cps. 59/6

SENSITIVITY 200mV.
SINGLE PLAYERS MONO
EMI Junior Mains 22.19.6
Garrard SP22 22.19.6
Garrard SP25 MKII 22.19.6
All fitted LP/78 stylus and pickup cartridge complete.
Stereo/mono pick-ups 20/- extra except 3000.

GARRARD TEAKWOOD BASE WB.1. Ready
cut out for mounting 1025, 3000, SP25, AT90, etc.
GARRARD PLASTIC COVER SP.1. for WB.1
BASE. Durable tinted attractive appearance. 65/-

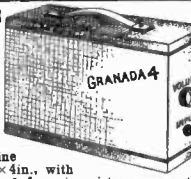
E.M.I. PICK-UP ARM. Complete with mono cartridge 22/8;
XTAL GRP7 17/8; Stereo Ceramic 35/-; ACOS LP only 10/6.

CRYSTAL MIKE INSERTS

1 1/2" dia. 6/8; ACOS 1 1/2" dia. 9/8. BM3. 1" dia. 9/8.
QUALITY RIBBON MIKE WITH GOOSENECK 21.11.10.

PORTABLE TRANSISTOR AMPLIFIER PLUS DYNAMIC MICROPHONE

A self-contained fully
portable mini p.a. system.
Many uses - ideal for
Parties, or as a Baby
Alarm, Intercom, Tele-
phone or Record Player
Amplifier, etc. Attractive re-
sined cabinet, size 12 x 9 x 4 in., with
powerful 7 x 4 in. speaker and four transistor one watt
power amplifier plus ultra sensitive microphone. Uses PP9
battery. Brand new in makers'
carton with full makers'
guarantee. World famous make. Only 90/- Post Free



WEYRAD P50-TRANSISTOR COILS

RAEW 9in. Ferrite Aerial
with car aerial coil 12/8
Osc. P50/1AC 5/6
I.F. P50/20C 40/4 kcs. 5/7
3rd I.F. P50/3CC 2/6
Telescopio Chrome Aerials 6in. extends to 23in. 5/-
Ferrite Rods Only 8 x 4in. 4/- 6 x 4in. 5/-

VOLUME CONTROLS 80 Ohm Coax 8D yd.

Long spindles. Midket Size
5 K. ohms to 2 Meg. LOG or
LIN. L/S 3/- D.P. 5/-
STEREO L/S 10/6. D.P. 14/8
Edco UK 3 P. Taper 5/-
WIRE WOUND 3-WATT POTS. WIRE WOUND 3-WATT
T.V. Type. Knurled Knob. STANDARD SIZE POTS.
Values 100 to 30 K. 4/6 LONG SPINDLE 7/6
Carbon 30 K to 2 meg. 10 OHMS to 100 K.

VEORBOARD 0-16 MATRIX

2 1/2 x 6in. 3/8. 2 1/2 x 3 1/2in. 3/2. 3 1/2 x 3 1/2in. 3/8. 3 1/2 x 5in. 5/2.
EDGE CONNECTORS 16 way 5/-, 24 way 7/8.
PINS 36 per packet 3/-, FACE CUTTERS 7/6.
S.R.B.P. Board 0-16 MATRIX 2 1/2in. wide 6d. per lin.,
3 1/2in. wide 9d. per lin.; 5in. wide 1/- per lin. (up to 17in.).
S.R.B.P. undrilled 1/4in Board 10 x 8in. 3/-.

BLANK ALUMINIUM CHASSIS 18 a.w.g. 2 1/2in. sides,
7 x 4in., 5/6; 9 x 7in., 6/8; 11 x 3in., 6/8; 11 x 7in., 7/6;
13 x 9in., 9/6; 14 x 11in., 12/8; 15 x 14in., 15/-
ALUMINIUM PANELS 18 a.w.g. 12 x 12in. 6/6; 14 x 9in.
5/6; 12 x 8in., 4/6; 10 x 7in. 3/8; 8 x 6in. 2/8; 6 x 4in. 1/6.

Q MAX CHASSIS CUTTER

Complete: a die, a punch, an Allen screw and key
1in. 16/- 1in. 17/8 1in. 19/6 1in. 24/- 2 1/2in. 44/3
1in. 16in. 1in. 19/6 1in. 20/6 1in. 29/- 2in. 57/3
1in. 16 1/2in. 1in. 19/6 1in. 21/6 2in. 39/- 1in. sq. 38/6

WAVE-CHANGE SWITCHES WITH LONG SPINDLES

2 p. 2-way, or 2 p. 6-way, or 3 p. 4-way 4/6 each.
1 p. 12-way, or 4 p. 2-way, or 4 p. 3-way, 4/6 each.
Wavechange "MAKITS" 1 p. 12-way, 2 p. 6-way, 3 p. 4-way,
4 p. 3-way, 5 p. 2-way, 1 water 12/-, 2 water 18/-, 3 water 24/-,
4 water 30/-, 5 water 38/-
TOGGLE SWITCHES, sp. 2/8; sp. dt. 3/8; dp. 3/8; dp. dt. 4/6

ALL PURPOSE HEADPHONES

H.R. HEADPHONES 2000 ohms Super Sensitive 35/-
LOW RESISTANCE HEADPHONES 3-5 ohms 39/8
DE LUXE PADDED STEREO PHONES 8 ohms 79/6

"THE INSTANT"

BULK TAPE

ERASER AND

RECORDING

HEAD

DEMAGNETISER

200/250 v. A.C. Leadet S.A.E.



Minimum Post and Packing 2/6.

RETURN OF POST DESPATCH.

HI-FI STOCKISTS

CUSTOMERS FREE CAR PARK

CALLERS WELCOME

RADIO COMPONENT SPECIALISTS 337 WHITEHORSE ROAD, WEST CROYDON

Full List 1/- Written guarantee with every purchase. (Export: Remit cash and extra postage.) Buses 133, 68 pass door. S.R. Stn. Selhurst. Tel. 01-684-1665

BARGAIN STEREO/MONO SYSTEM

Attractive Slim PLAYER CABINET with B.S.R. Stereo
Autochanger, 3 valve Stereo Amplifier, two 8 1/2 in. LOUD-
SPEAKERS. (Only 4 pairs of wires to join.) £19.19.6
Carr. 10/6. S.A.E. for details

NEW TUBULAR ELECTROLYTICS

2/350V ... 2/3 100/25V ... 2/- 8/600V ... 9/6
4/350V ... 2/3 250/25V ... 2/6 16/600V ... 12/6
8/450V ... 2/3 500/25V ... 4/- 16+16/500V ... 7/6
16/450V ... 3/- 8+8/450V ... 3/6 50+50/350V ... 7/6
32/450V ... 3/6 8+16/450V ... 3/6 80+100/350V ... 11/8
25/25V ... 1/6 16+16/450V ... 4/3 32+32+32/350V ... 8/-
50/50V ... 2/- 32+32/350V ... 4/6 100+50+50/350V ... 9/6
SUB-MIN. ELECTROLYTICS, 1, 2, 4, 5, 8, 16, 25, 30, 50, 100,
250mF 15V 2/-, 500, 1000mF 12V 3/8; 2000mF 25V 7/-
CERAMIC 500V 1pF to 0.01mF, 9d.
PAPER 350V-0.1 9d, 0.5 2/8; 1mF 3/-; 2mF 150V 3/-
500V-0.001 to 0.05 9d; 0.1 1/2; 0.25 1/6; 0.5 3/-
1.000V-0.001, 0.002, 0.004, 0.01, 0.02, 1/6; 0.04, 0.1, 2/6
SILVER MICA, Close tolerance 1%, 5-500pF 1/-; 500-2,200pF
3/-; 2,700-5,600pF 3/8; 6,800pF 0.01, mid 6/- each.
TWIN GANG, "10-0" 208pF 176pF, 10/8; 385pF, mini-
ature 10/8; 500pF standard with trimmers, 12/6; 500pF
midset less trimmers, 7/6; 500pF slow motion, standard 9/-;
small 3-gang 500pF 10/8. Single "0" 365pF 7/8. Twin 10/8.
SHORT WAVE, Single 10pF, 25pF, 50pF, 75pF, 100pF,
150pF, 200pF, 10/8 each.

TUNING. Solid dielectric 100pF, 300pF, 500pF, 7/- each.
TRIMMERS. Compression 30, 50, 70pF, 1/-; 100pF, 150pF,
1/8; 250pF, 1/8; 600pF, 750pF, 1/8; 1000pF, 2/8.
RECTIFIERS CONTACT COOLED 1/2 wave 60mA, 7/6;
85mA, 9/8. SILICON. BYZIS, 6/-; BY100, 10/-.

FUL wave Bridge 75A 10/-; 150mA 19/6; TV recta. 10/-
NEON PANEL INDICATORS 250V, AC/DC 3/8, Red, Green.
RESISTORS. Preferred values, 10 ohms to 10 meg.
1/4 W. 1 W. 20% 3d.; 1/2 W. 8d.; 3 W. 1/-; 1 W. 10% 6d.
HIGH STABILITY. 1 W. 10% 10 ohms to 10 meg., 2/-
Ditto 5%. Preferred values 10 ohms to 22 meg., 9d.

WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt,
10 ohms to 100K, 2/- each; 3 watt, 0.5 ohm to 8.2 ohms, 2/-
40 yd. 20/-; 80 yd. 30/-
Ideal 355 lines

OC71, OC72, OC81, OC74, OC45, AF17.
MAT100, 7/8; MAT101, 8/6; MAT120, 7/8; MAT121, 8/6.
REPAIRO TRANSISTOR TRANSFORMERS

TT45. Push Pull Drive, 9:1 CT, 6/-; TT46 Output, CT8:1 6/-
TT48. Interstage, 4:5:1, 6/-; TT52 Output 3 ohms, 20:1 6/-
TT23/4 PAIR 10 watt Amp. Transformers and circuit 36/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

TRANSISTOR MAINS POWER PACKS, FULL WAVE
9 volt 500mA. Size 4 1/2 x 2 1/2 x 2in. Metal case. 49/6
Crackle finish. Output terminals. On/off switch.
Half Wave 9 volt 500mA. Size 2 1/2 x 1 1/2 in. Snap terminals 32/6
9 volt 500mA. TRANSFORMER ONLY. 2 1/2 x 1 1/2 in. 10/8
BENCH POWER PACK 250-250V, A.C. Mains
with Meter. Supplies 6-9-12v 1 amp D.C. £7/-

BAKER 12in. "SUPERB" LOUDSPEAKER

Suitable for all Hi-Fi Systems.
Provides rich clear reproduction
of the deepest bass and remark-
able efficiency in the upper
register. Response 20-10,000
cps. "Baker" double cone
with special "Ferroba" ceramic
magnet. Flux density 18,500
gauss. Bass resonance 22-28
cps. 20 watt rating. Voice coil
8 ohms or 15 ohms.

£15 Post Free
48-page Enclosure Manual
6/9 post paid
LOUDSPEAKER CABINET
WADDING 18in. wide 2/6 t.

BAKER "GROUP SOUND" SPEAKERS-POST FREE
"Group 25" "Group 35" "Group 50"
12in. 6 gns. 12in. 8 1/2 gns. 15in. 18 gns.
25 watt 35 watt 50 watt

ALL MODELS "BAKER SPEAKERS" IN STOCK

Goodmans Tweeter 3 1/2in 3 ohm 35/-, EMI 2 1/2in 8 ohm 17/6,
Horn Tweeters 2-18kcs, 10W 15 ohm 29/8, Crossover 16/6.
LOUDSPEAKERS P.M. 3 OMS. 2 1/2in 3in, 4in, 5in, 7 x 4in.
17/6 each; 6in 22/8; 8 1/2in, 21/-; 8 x 2 1/2in

LOW PRICE, HIGH QUALITY SPEAKER SYSTEMS

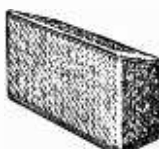
All cabinets are new and carefully designed acoustically with speakers mounted on 1/2 in. chipboard baffles. All speakers are ex-TV high quality with hi-flux magnets carefully matched and tested.



COWDREY FIVE. Specially designed Corner Cabinet; Fitted rubber feet. 20 1/2 x 13 x 7 1/2 in. deep. Finished in natural teak veneers with Vynair front. Fitted 8 x 3 in., 7 x 4 in. and three 5 in. round speakers wired in series to match. 15 ohm impedance (handles 15 watts). **£6.6.0.** P. & P. 8/6 each.

ADAstra DOUBLE 5 stereo solid state amplifier housed in handsome cabinet veneered in natural teak. Size 11 1/2 x 6 x 5 1/2 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. The elegant tapered cabinet, for table or wall mounting measuring 10 1/2 x 16 x 5 1/2 in. deep. Is attractively finished in black cloth with a striped grey Vynair front fitted with 13 1/2 x 8 in. speaker with volume control. Please state impedance required—3 or 15 ohm. **£4.5.0.** P. & P. 7/6 each. Fitted with E.M.I. 13 x 8 in. speaker and twin tweeters. 15 ohm impedance capacity 10 watts 30/- extra.



SPEAKERS: Elac Heavy duty Ceramic Magnets 11,000 line, 10 in. round, 10 x 6 in. 3 ohm or 15 ohm. **48/6.** P. & P. 3/6. 8 in. round 15 or 3 ohm. **42/6.** P. & P. 3/6. E.M.I. 13 1/2 x 8 in. 3 ohm. **45/-.** 15 ohm **48/6.** P. & P. 1/6. E.M.I. 3 in. tweeter **17/6.** P. & P. 1/6. E.M.I. 13 1/2 x 8 in. fitted two 2 1/2 in. tweeters. 15 ohm **77/6.** P. & P. 4/6. E.M.I. 13 1/2 x 8 in.



CAXTON COLUMN. This is a column cabinet 23 1/2 x 5 1/2 x 5 1/2 in. deep fitted with three speakers. Handles 8 watts and will improve the quality of any tape recorder or record player. Finished in wood grain cloth with sandstone Vynair front it is a real bargain at **59/6.** P. & P. 10/6 each

ELF. An extension speaker of quality. 9 x 5 1/2 x 3 1/2 in. veneered in natural teak, with smart gold and brown Vynair front trimmed with white. Fitted re-coned 5 in. 3 ohm speaker. The baffle is half inch thick. A real bargain at **37/6.** P. & P. 3/6.



IMP. Wedge shaped extension speaker cabinet is fitted with 7 x 4 in. speaker. Covered in walnut wood grain cloth with fawn Vynair front, keyhole slot in back. 7 1/2 x 6 1/2 in. Only **25/6.** P. & P. 4/6 each.

(15 ohm) Hi-Fi quality **£5.19.6.** P. & P. 4/6. E.M.I. Woofers, 6 1/2 x 6 1/2 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 12 in., 25 watt 15 ohm **£6.6.0.** P. & P. 3/6.

BROADWAY Electronics (Few minutes from Tooting Broadway Underground Station)
92 MITCHAM ROAD, TOOTING BROADWAY, LONDON, S.W.17 01-672 3984 (Closed all day Wednesday)

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

1969 List 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 (November PW)

Est. 1943 **JOHNSONS** Tel: 24864

VHF and Short-Wave kits for the Amateur enthusiast and constructor. For 2 and 4 metres, the unique two transistor model SR2/P, 70-150Mc/s, 75/-, p.p. 4s. New! multi-range Pre-Amp all bands from SW to UHF (colour T.V.I) No mods, fitted instantly aerial input. Write today, enclosing a stamped addressed envelope for interesting free literature, and details, direct to

JOHNSON'S (RADIO)
St. Martin's Gate, Worcester



ELECTRAMA

FANTASTIC SPEAKER BARGAIN
Famous English, 12" high flux, heavy cone, 10 watts speaker with built-in tweeter. 3 or 15 ohms. **39/6** (P. & I. 4/9)

2 for 70/- (P. & I. 6/9)
NEW RELEASE

HI-FI COLUMN SPEAKER CABINET

Beautifully made. Suitable for 7-12" speakers. Rose wood finish. Screwed and glued. Attractive grey cloth front measures 24" x 13" x 10" with tweeter hole above.

95/- (Carr. 10/-)

With 12" speaker as advertised above **£6.5.0.** (carr. 10/-)

1 George St., Hailsham, Sussex

NEW RANGE BBC 2 AERIALS

All U.H.F. aerials now fitted with tilting bracket and 4 element grid reflectors.
Loft Mounting Arrays, 7 element, 37/6.
11 element, 45/-, 14 element, 52/6. 18 element, 60/-.
Wall Mounting with Cranked Arm, 7 element, 60/-. 11 element, 67/-, 14 element, 75/-, 18 element, 82/6.
Roof Mounting with 2 in. 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). Telescopic loft, 25/-, External S/D, 30/-, "H" 22-15.0.
ITV (Band 2). 3 element loft array, 30/-, 5 element, 40/-, 7 element, 50/-.
Wall mounting, 3 element, 47/6. 5 element, 52/6.
Combined BBC/ITV, Loft 1+3, 40/-; 1+5, 50/-; 1+7, 60/-; Wall mounting 1+3, 57/6; 1+5, 67/6; Chimney 1+3, 67/6; 1+5, 75/-.
VHF transistor preamps, 75/-.

COMBINED BBC/ITV — BBC2 AERIALS: 1+3+9, 70/-; 1+5+9, 80/-; 1+5+14, 90/-; 1+7+14, 100/-.
Loft mounting only. Special leaflet available.
F.M. (Band 2). Loft S/D, 15/-, "H", 32/6. 3 element, 55/-, External units available. Co-ax. cable 8d. yd. Co-ax. plugs, 1/4. Outlet boxes, 5/-, Diplexer Crossover Boxes, 13/6. C.W.O. or C.O.D. P. & P. 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

TAKE 20

JULIAN ANDERSON

A series of simple transistor projects, each using less than twenty components and costing less than twenty shillings to build

ONE of the main aims of the *Take 20* series is to introduce readers to a wide variety of simple circuits. With some exceptions, a few components can be made to do the job of a large number of components though less efficiently; however efficiency and accuracy are not always of prime importance. By designing and writing articles on very simple projects I am not pretending that highly complicated circuits are a waste of time. This shows up the *Take 20* philosophy; some designers—most of them in fact—try very hard to make their equipment as perfectly as possible, the *Take 20* attitude is to use the absolute minimum of components that will do the job. Of course the fewer components used, the easier the project is to build and the less the likelihood of mistakes. I mention this because our project this month is an r.f. signal generator, which while very simple, will prove very useful when building other equipment and lining up superhet receivers, as well as acting as a Beat Frequency Oscillator (B.F.O.) for radios using either a 465kHz or 1.6MHz i.f., it cannot however be compared to other designs for signal generators or commercial equipment of this type.

The Circuit

Figure 1 shows the circuit. It consists of a straight-forward Hartley Oscillator using a high gain n-p-n transistor. There is however no need to use the BC169B, almost any r.f. transistor could be used—such as the old faithful OC44—except of course when p-n-p transistors are used the battery polarity must be reversed.

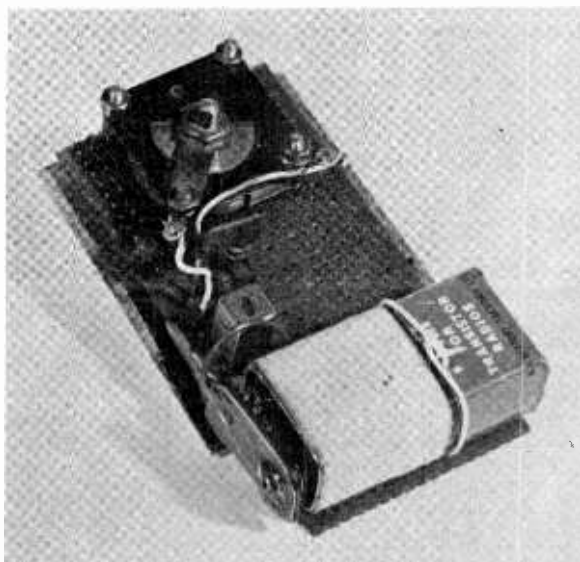
Coils are not the easiest things to construct and where possible I try to use readymade ones, in this case an i.f. transformer of 465kHz. Most of these are fitted with a capacitor of 250pF or below and by removing this and replacing it with a variable capacitor we will not only be able to tune to the i.f. but also cover the complete range of the medium wave broadcast band, if not on fundamentals than on harmonics. The tuned circuit comprising the i.f. coil and VC1 is in the collector circuit and feedback is by means of C1 which couples back part of the signal to maintain oscillation. The value of C1 can be almost anything between 10pF and 1,000pF, its actual value being unimportant. R1 provides the base bias.

Construction and Uses

Building the signal generator is a simple matter and should present no problems; the layout of the components is shown in Fig. 2. The prototype was built on a

No. 7

M.W. SIGNAL GENERATOR/B.F.O.



The m.w. signal generator and B.F.O.

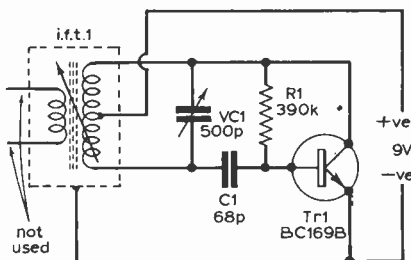


Fig. 1. The circuit of the signal generator.

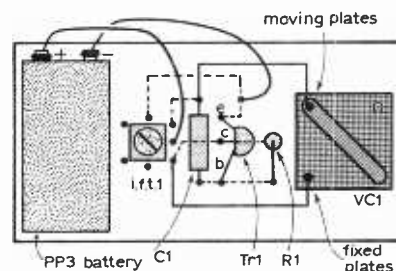


Fig. 2. Suggested component layout.

pin-board but Veroboard or Paxolin could easily be used. For equipment of this type an on/off switch is hardly necessary and removing the battery terminals will serve this function.

After switching on place the unit near a superhet radio tuned to a station and adjust VC1 until a whistle is heard. Unscrew the i.f. adjusting core and retune until VC1 is nearly in the fully-meshed position (maximum

Next month's *Take 20* describes an intercom unit which doubles as a baby alarm. It makes use of two balanced armature earpieces or 80Ω loudspeakers and a simple amplifier.

★ components list

R1	390kΩ ¼ watt miniature 10%	3d.
C1	68pF—see text	9d.
VC1	500pF variable	5s. 0d.†
Tr1	BC169B—see text	2s. 3d.
I.F. Transformer,	465kHz.	1s. 6d.†

Miscellaneous

Paxolin board, 9V battery, battery clips, knob etc. 5s. 0d.

14s. 9d.

†A.J.H. Electronics, 59 Waverley Road, The Kent, Rugby, Warwickshire. Both items for 8s. inc. postage.

capacitance) when the whistle is heard. Some i.f. transformers will not be suitable for tuning this low but the actual position is unimportant. Set your radio to 530kHz (567 metres) and mark the position of the setting of VC1 when the signal generator is on that frequency, similarly tune to 1,602kHz (187 metres) and mark the position. These two points, together with a mark where a whistle is heard on *all* stations, will be all that is necessary for lining up a superhet on the medium wave band. If the unit is tuned to the i.f. frequency of a receiver and placed near it a beat note will be heard enabling c.w. and s.s.b. transmissions to be heard; all in all your signal generator should prove to be a very useful piece of equipment. ■

MEDIUM WAVE DX RECEIVER

—continued from page 495

A number of queries have arisen with regard to the first part of this article that appeared last month. IFT1 is made by Electroniques and not Denco. Capacitors C7, 9, 10, 11 should be silver mica and VR1, 2, 4, 5 are linear. VR3 is log.

Fig. 1.—The junction of C9, C10, VC3, TC3 should be shown going to earth and not the negative line via R11.

Fig. 2.—IFT1 lead marked "from Tr2 collector" should go to tapping point and not to top of winding as shown.

Fig. 3.—Gain of this circuit may be improved by decoupling the 5.6kΩ resistor in the source lead of Tr1, with a 0.1μF capacitor.

Fig. 3/Fig. 4.—The 30pF capacitor shown at the right hand lower side in both diagrams is in fact C7 in Figure 1 and should not be duplicated.

Fig. 3.—Add to caption . . . "IFT1 modified as Fig. 6".

Fig. 6.—Add to caption . . . for f.e.t. front end (IFT1 modification is only required for f.e.t. front end). ■

QUERY COUPON

This coupon is available until 7th November, 1969 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, OCTOBER 1969

GUIDE TO COMPONENTS

—continued from page 498

Junction diodes have a greater current capability than point contact devices and are used as power rectifiers as well as general purpose signal diodes. Both silicon and germanium are used but silicon diodes predominate for rectification as they are capable of operating at high temperatures (+175°C). The junction capacitance and charge storage is high in junction diodes and they are therefore of limited value at high frequencies.

Diffused Diodes

The great majority of rectifiers and general purpose low-frequency diodes are manufactured by gaseous diffusion techniques. They are manufactured by passing a stream of gases containing impurity

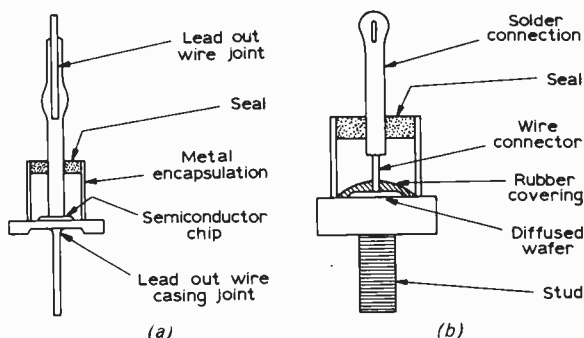


Fig. 9: Sections through diffused power rectifiers. (a) Medium power diffused rectifier. (b) Power rectifier—stud mounting.

elements over the doped p- or n-type slice to give a p-n junction. The slices are mounted on metal headers for power rectifiers as shown in Fig. 9, or in glass encapsulations as shown in Fig. 8.

The power rectifiers shown in Fig. 9 are designed to give increased thermal dissipation from the junction and hence increased power dissipation. This is achieved by attaching the header to the metal casing. Figure 9(a) illustrates a medium power rectifier of 1-2A rating and is of a wire ended configuration which can be used directly in printed circuits. Figure 9(b) is a stud mounting encapsulation and is used for rectifiers in the range 2-15A. In both cases the slice is bonded to the casing and the lead-out terminal is brought out through a resin or glass seal. The casing is therefore electrically connected to one side of the junction but usually diodes are available with either anode or cathode connected to the casing.

TO BE CONTINUED

CQ2 VHF RECEIVER

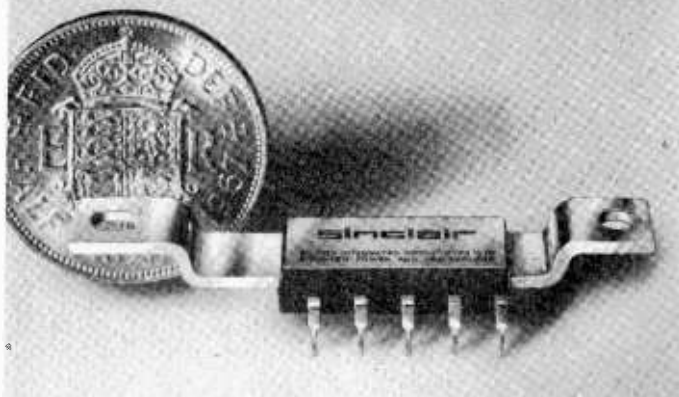
(September 1969 issue)

The value of R6 is correctly shown in the circuit diagram as 22kΩ and not 220kΩ as given in the components list.

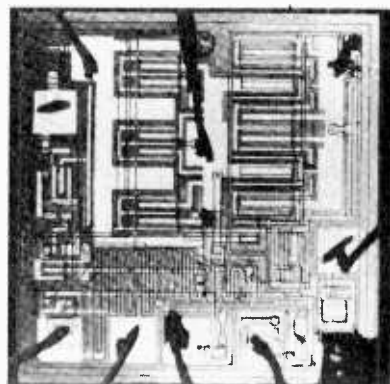
Published approximately on the 7th of each month by IPC Magazines Limited, Tower House, Southampton Street, London, W.C.2. Printed in England by Index Printers, Dunstable, Beds. Sole Agents for Australia and New Zealand—Gordon and Gotch (A/asia) Ltd.; South Africa—Central News Agency Ltd.; Rhodesia, Malawi and Zambia—Kingston Ltd.; East Africa—Stationery and Office Supplies Ltd. Subscription rate (including postage): For one year to any part of the world £22s 0d.

PRACTICAL WIRELESS is sold subject to the following conditions, namely, that it shall not, without the written consent of the Publishers first given be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold or hired out or otherwise disposed of in a mutilated condition or any unauthorised cover by way of Trade, or affixed to as part of any publication or advertising, literary or pictorial matter whatsoever.

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 power of 10 watts. It contains 13 transistors (including two power types), 2 diodes, 1 zenor 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 the usual 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 for producing monolithic I.C.s are expensive but once made, the circuits can be produced with complete uniformity and at very low cost. It also enables us to give a 5 year guarantee on each IC-10 knowing that every unit will work as perfectly as the original and do so for a lifetime.

■ SPECIFICATIONS

Output	10 Watts peak, 5 Watts R.M.S. continuous.
Frequency response	5 Hz to 100 KHz ± 1 dB.
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 x 0.4 x 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 and 5 year guarantee **59/6**

POST FREE

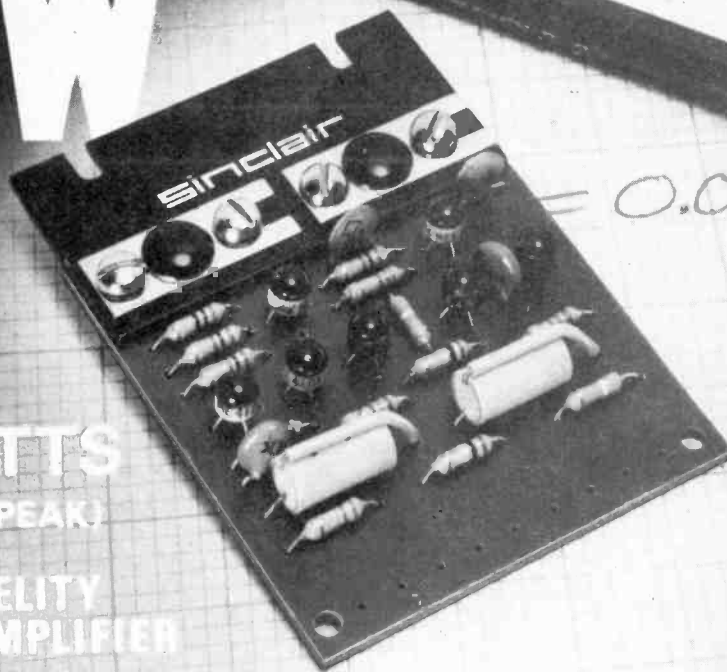
sinclair

SINCLAIR RADIONICS LIMITED
22 NEWMARKET ROAD · CAMBRIDGE
Tel. 0233-52731

NEW

25 WATTS
(50 WATTS PEAK)

**HIGH-FIDELITY
POWER AMPLIFIER**



Z.30

**0.02% DISTORTION
AT FULL POWER**

**OPERATES IDEALLY
FROM 8 TO 35 VOLTS**

SIZE $3\frac{1}{2} \times 2\frac{1}{4} \times \frac{1}{2}$ ins.

**FREQUENCY RESPONSE
FROM 20 Hz TO 30 kHz**

**USE IT FOR HIGH FIDELITY
MUSIC INSTRUMENTS,
ECONOMY RECORD PLAYER,
P.A., INTERCOM, ETC.**

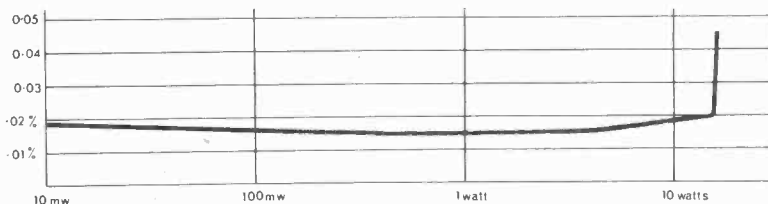
89/6

SINCLAIR RADIONICS LIMITED
22 NEWMARKET RD., CAMBRIDGE Tel: 0223 52731

THE WORLD'S LOWEST DISTORTION HIGH FIDELITY AMPLIFIER.

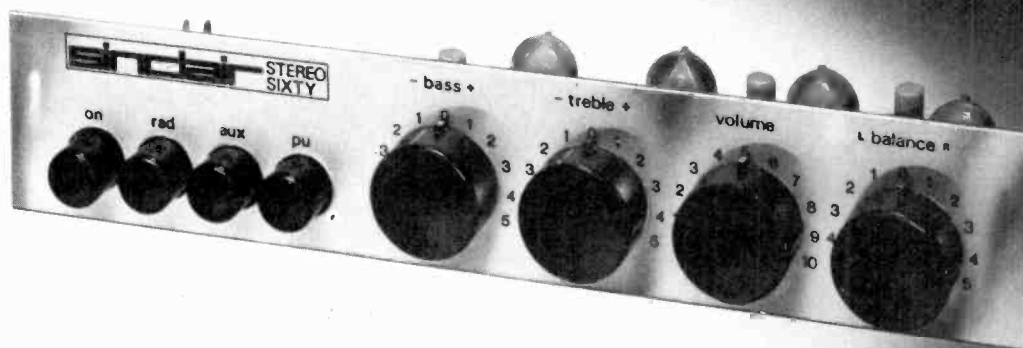
For four years, the Sinclair Z.12 dominated the constructor world, being the best selling unit of its kind this side of the Atlantic. Excellent as it was, the new Sinclair Z.30 is still better. Half the size of the Z.12, it has more than twice the power, very much greater gain and a level of distortion 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 bootstrapping. 9 silicon epitaxial planar transistors are used to provide enormous power (up to 25 watts RMS continuous sine wave (50 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.

- Input Sensitivity—250 mV into 100 Kohms
- Signal to noise ratio—better than 70dB unweighted
- Class AB output
- Power requirements 8-35 volts from batteries or PZ.5

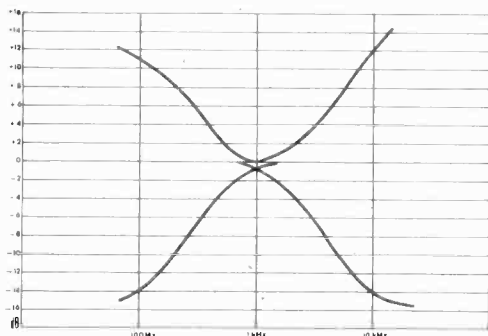


sinclair

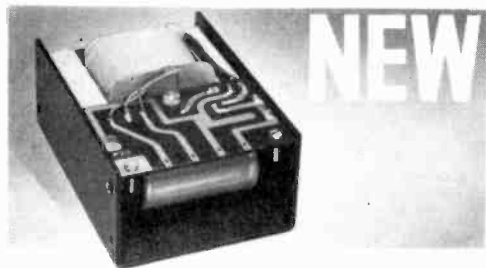
NEW



STEREO SIXTY PRE-AMP & TONE CONTROL UNIT



£9.19.6



NEW

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.

Frequency range : Radio & Aux. 20-25,000 Hz L1dB Pick-up corrected to within ± 1 dB for R.I.A.A. equalisation.

Inputs : Radio, pick-up (magnetic, ceramic or crystal), Auxiliary.

Overload factor : > 20 dB per channel on all inputs

Distortion : 0.03%

Signal to noise ratio : Better than 70dB unweighted

Controls : press buttons for on-off, P.U, radio and aux. Treble ± 15 dB to -15 dB at 10kHz. Bass ± 15 dB to -15 dB at 100Hz. Volume. Stereo Balance.

Size : $8\frac{1}{4}'' \times 1\frac{1}{2}'' \times 4''$ from front to back, plus knobs.

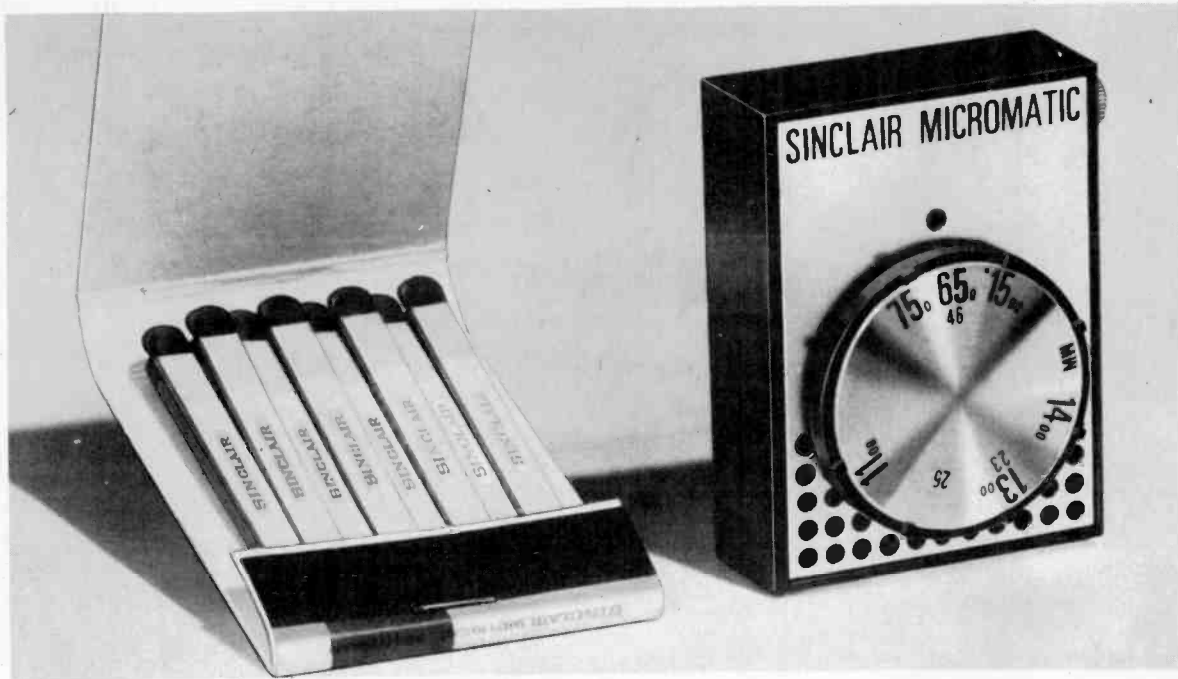
Finish : Brushed aluminium with black titling, knobs and press buttons.

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. For AC Mains, 200-240V/50Hz. £4.19.6

USE THIS COUPON FOR Z.30, STEREO 60 AND P.Z.5

To: SINCLAIR RADIONICS LTD., 22 NEWMARKET RD., CAMBRIDGE	
Please send	
NAME	ADDRESS
For which I enclose cash/cheque money order	



SINCLAIR MICROMATIC

the world's most successful miniature radio

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; bandsread 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 wristwatch, and dependable under the severest listening conditions.

Specifications

Size:

1 1/8" x 1 1/8" x 1/2" (46 x 33 x 13mm).

Weight incl. batteries:

1 oz. (28.35gm) approx.

Tuning:

Medium wave band with bandsread 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.

49/6

Plus 11d. P.T. surcharge

Ready built, tested and guaranteed, with earpiece.

59/6

Plus 1/1d. P.T. surcharge

Mallory Mercury Cell RM675 (2 required) each 2/9d.

USE THIS COUPON FOR MICROMATIC AND Q.16 ORDERS

TO: SINCLAIR RADIONICS LIMITED, 22 NEWMARKET ROAD, CAMBRIDGE

Please send

NAME

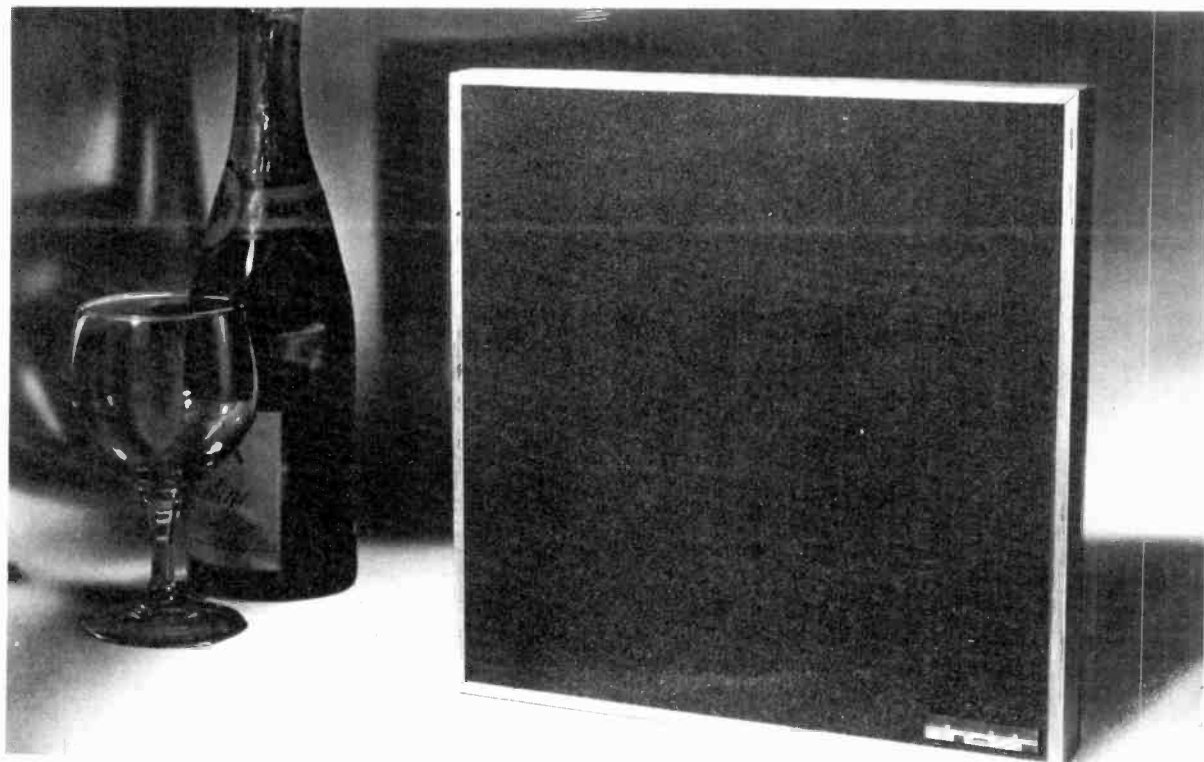
ADDRESS

For which I enclose cash/cheque/money order.

PE1069

sinclair

SINCLAIR RADIONICS LTD.
22 NEWMARKET ROAD
CAMBRIDGE
Tel: 0223 52731



SINCLAIR Q.16 new elegance in a loudspeaker of outstandingly fine performance

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.

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.

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 16,000 Hz. 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 $\times$ $4\frac{1}{2}$ " deep from front to back.

£8.19.6

SINCLAIR RADIONICS LIMITED
22 NEWMARKET RD., CAMBRIDGE Tel: 0223 52731

sinclair

ELECTROVALUE

**RAPID
MAIL ORDER
SERVICE**

**EVERYTHING BRAND NEW AND TO EXACT
SPECIFICATION • NO SURPLUS GOODS**

AMPLIFIER KITS

PEAK SOUND P.W. DOUBLE 12

Complete stereo kit including cabinet, but less panel and other metalwork. £23 net. Available in separate packages as follows: Main amplifier kit £319.6 per channel, net. Accessories 19/- mono, 36/- stereo.

Pre-amplifier kit £17.0 per channel, net. Accessories 13/6 mono, 27/3 stereo.

Tone control kit 19/- per channel, net. Accessories 8/9 mono, 22/6 stereo.

Power supply kit £410.0 mono or stereo, net.

Cabinet kit £212.6 net. Metalwork available separately from other sources, details on request.

30 WATT (designed by Dr. A. R. Bailey). Published May 1968 W.W., modified November 1968 W.W.

Full kit for main amplifier £9.9.6 (less power supply). Transistors only for main amplifier £7.9.6. PC board supplied free with above kit. Heat sinks for output transistors 8/6 extra.

Power supply kit, unregulated, November 1969 circuit £414.0. Regulated version, 60V 1.6A or 0.8A, current limiting, re-entrant characteristic: does not need re-set button £810.0. Transformer only: 0-25-45-50V 2A 58/-.

8 x 8 watt Stereo only. Peak Sound SA 8 x 8 kit. Sensitivity 50mV into 1M Ω , output into 5 Ω . Complete with cabinet and power supply. Kit complete £1610.0 net. Built and tested £21 net.

BARGAINS IN BRAND NEW ELECTRONIC COMPONENTS

Ultra low-noise resistors (under 0.1 μ V/V) Elosil TR5: Metal oxide, 2% tolerance, range 10 Ω to 1M Ω . All values in E24 series available. $\frac{1}{2}$ W rating. 1-24 10d. each; 25-99 9d. each; 100 up 8d. each. (Ohmic values may be mixed to obtain quantity price.)

Potentiometers, carbon track, long plastic spindles: Single gang linear 220 Ω to 2.2M Ω 2/6 each; log 4.7K Ω to 2.2M Ω 2/6 each. Dual gang stereo-matched lin or log 10K to 1M Ω 8/6 each. Stereo balance log/anti-log 10K, 47K, 1M Ω only, 8/6 each. All types available with $\frac{1}{2}$ A D.P. switch 2/3 extra.

TRANSISTORS, etc.

2N696	5/6	2N3704	3/9	BC107	3/6	BFY51	4/3
2N697	6/-	2N3705	3/5	BC108	3/-	MC140	6/3
2N706	3/5	2N3707	4/-	BC109	3/6	MJ480	21/-
2N1302	4/-	2N3794	2/11	BC125	12/-	MJ481	27/-
2N1303	4/-	2N4286	2/11	BC126	12/-	MJ491	31/-
2N1304	4/-	2N4289	2/11	BC148	3/3	MPF103	11/6
2N1305	4/-	2N4291	2/11	BC149	4/3	MPF105	7/6
2N2147	18/9	cheapest FET:		BC169	2/3	OA47	1/9
2N2926yellow 1/9		2N5163	5/-	BC183L	2/-	OA90	1/3
2N2926green 2/3		40361	12/6	BC184L	2/3	OA91	1/3
2N3053	5/3	40362	16/9	BD124	16/-	OA202	2/-
2N3054	15/6	AD149	17/6	BFX85	8/3	P346A	5/9
2N3055	16/6	AD161	14/-	BFX88	7/9	TPMD	
2N3702	3/6	AD162	pr.	BFY50	4/9	(=ORP12)	6/-
2N3703	3/3						

Large capacitors, high ripple current types. 2000 μ F 25V 7/-; 2000 μ F 50V 9/3; 5000 μ F 25V 10/3; 5000 μ F 50V 17/6. S-DeC 30/6; 2-DeC DeCstore 69/6; 4-DeC 119/6.

● **DISCOUNTS** (on all but net items): 10% for total order value of £3 or over. 15% for total order value of £10 or over.

● **POSTAGE** and packing: on orders up to £1 add 1/- . Over £1 post free in U.K. Overseas orders welcomed: carriage charged at cost.

● **CATALOGUE** gives further details of above products and much information on semiconductor characteristics etc. 1/6 post free.

ELECTROVALUE

(Dept. P.W.11)

28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY.

Tel: Egham 5533

17in.—£11.10.0
19in. SLIMLINE
SOBELL—24 Gns.

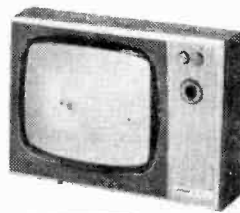
**TWO-YEAR GUARANTEE
EX-RENTAL TELEVISIONS**

**FREE ILLUSTRATED
LIST OF TELEVISIONS**

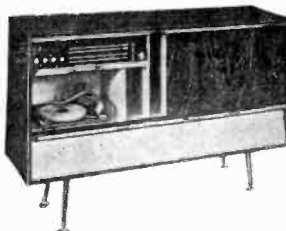
17"-19"-21"-23"
WIDE RANGE OF MODELS
SIZES AND PRICES
DEMONSTRATIONS DAILY

**TWO-YEAR GUARANTEED
REGUNNED TUBES**

70° and 90° 14in.—69/6, 17in.—89/6, 21in.—99/6, 110° 17in., 19in. and 21in.—99/6.
23" (not bonded)—119/6. Exchanged bowls.
Carr. 10/6.



COCKTAIL/STEREOGRAM CABINET 19 gns.



Polished walnut veneer with elegant glass fronted cocktail compartment, padded. Position for two 10in. elliptical speakers. Record storage space. Height 35 $\frac{1}{2}$ in., width 52 $\frac{1}{2}$ in., depth 14 $\frac{1}{2}$ in. Legs 1 gn. extra.

Speakers 6/6: 2"-75 Ω . 2 $\frac{1}{2}$ "-35 Ω . P. & P. 2/6. **Acos Mics.** 35/- Standard: Stick Mic. 2 gns. P. & P. 3/6. **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 3/6: 6", 8" x $\frac{3}{8}$ " complete with LW/MW Coils. P. & P. FREE.

TRANSISTOR CASES 19/6. Cloth covered, many colours. Size 9 $\frac{1}{2}$ " x 6 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ " P. & P. 4/6. Similar cases in plastic 7/6.

RECORD PLAYER CABINETS 49/6. Cloth covered, size 16 $\frac{1}{2}$ " x 14 $\frac{1}{2}$ " 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

W.E.C. LTD.

HARDWARE and SUNDRIES

SCREWED ROD BRASS 6 BA 1/6d, 4 BA 2/-, 2 BA 2/6d

VEROBOARD 15 Matrix 2 $\frac{1}{2}$ " x 3 $\frac{1}{2}$ " 3/3d ea. 3 $\frac{1}{2}$ " x 6" 5/6d. ea.

STEEL SHEET (See catalogue) 12" x 12" x 22 SWG 2/6d ea. 12" x 6" x 20 SWG 1/6 ea.

ALUMINIUM ALLOY (See catalogue) 12" x 12" x 22 SWG 6/- ea.

12" x 6" x 20 SWG 4/- ea.

BAKELITE SHEET 12" x 8" x $\frac{1}{4}$ " 3/9d ea.

S.R.B.P. SHEET 12" x 8" x $\frac{1}{4}$ " 9/9d ea.

S.R.B.P. TUBING 12" lengths $\frac{1}{4}$ " dia. 1/9 ea. $\frac{3}{8}$ " dia. 2/- ea. $\frac{1}{2}$ " dia. 2/3d ea. $\frac{3}{4}$ " dia. 2/6d ea.

GROMMETS Ass. 10 for 1/6d

SOLDER 22 SWG 3/-

SINGLE STRANDED P.V.C. 14/.0076" 4d per yd.

50 Ass. Screws 6 BA C.H. $\frac{1}{4}$ " x $\frac{1}{4}$ " 4/9d

With nuts and washers

50 Ass. Screws 4 BA C.H. $\frac{1}{4}$ " x $\frac{1}{4}$ " 5/9d

With nuts and washers

50 Ass. Screws 2 BA C.H. $\frac{1}{4}$ " x $\frac{1}{4}$ " 7/3d

With nuts and washers

FREE Plastic Storage box with each 50 screws.

ALSO IN STOCK

Relays, Capacitors, Knobs, Switches, Terminals, Semiconductors, etc.

Terms C.W.O. plus 3/- p. & p.

SEND FOR FREE CATALOGUE

W.E.C. LTD.

74 THE STREET, ASHTEAD, SURREY.

THE BEST STORIES BY THE BEST WRITERS

ARGOSY is the most lively and stimulating fiction magazine of today. It publishes new short stories from all over the world. Only the best writers contribute to its pages; in fact, there is only one test for an ARGOSY story—it must be good. Buy it every month.

argosy

Obtainable from all Newsagents and Bookstalls—
Monthly 3/6

NEW! HSL.700 MONO TRANSISTOR AMPLIFIER

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 4 1/2 in. Performance figures:

Sensitivity: PU1-50mV, 1 meg 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 ohms. Overall frequency response 30 Hz-18 Kc/s. Continuously variable tone controls; Bass, +8 db to -12 db at 100 c/s. Treble, +8 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, attractive 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 15W. P. & P. 3/1. 7 x 4in. 3 ohm 21W. P. & P. 4/1. 10 x 6in. 3 ohm 27W. P. & P. 6/1. E.M.I. 8 x 5 in. 3 ohm with high flux ceramic magnet 21W. P. & P. 4/1. E.M.I. 13 1/2 x 8in. 3 ohm with high flux ceramic magnet 48W. (15 ohm 45W.). P. & P. 6/1. E.M.I. 13 x 8in. 3 or 15 ohm with two built in tweeters and crossover network 4 gns. P. & P. 6/1.

BRAND NEW. 12in. 15w. H/L Speakers, 3 or 15 ohms. Current production by well-known British maker. Now with Hiflux ceramic ferrobair magnet assembly 85.10.0. P. & P. 7/6. Guitar models: 25w. 85.0.0. 35w. 85.0.0. E.M.I. 3 1/2in. **HEAVY DUTY TWEETERS.** Powerful ceramic magnet. Available in 3 or 8 ohms 15W. each; 15 ohms 18W. each. P. & P. 2/6.

12in. **"BA" TWIN CONE LOUDSPEAKER.** 10 watts peak handling. 3 or 15 ohm 37/6. P. & P. 6/1.

35 OHM SPEAKERS

3 1/2in. 14W. P. & P. 2/6. 7 x 4in. 21W. P. & P. 4/1.

80 OHM MOVING COIL SPEAKERS

High Flux Magnet 9in. dia. 10W. each. P. & P. 1/6. **PYE MICROTWEETERS 8/2. G/O.** Lever roller action. Rating 250v. AC at 5 amps. Size approx. 1 1/2 x 1/2 in. 4/1. each. P. & P. 1/1. (6 or more post free).

HONEYWELL MICROTWEETERS 8/2. G/O. Push button action. Rating 250v. AC at 15 amps. Size approx. 1 1/2 x 1/2 in. 4/1. each. P. & P. 1/1. (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. 56in. Maximum diameter 1 1/2 in. 10W. each. P. & P. 1/6. 6 section Lacquered Brass. Extends from 6in. to 22 1/2 in. approx. Maximum diameter 1 in. 5W. each. P. & P. 1/1.

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-210-240v. Secondary combinations: 0-5-10-15-20-25-30-35-40-60v. half wave at 1 amp. or 10-0-10, 20-0-20, 30-0-30v. at 2 amps full wave. Size 3in. long x 3 1/2 in. wide x 3in. deep. Price 32/6. P. & P. 6/1.

MAINS TRANSFORMER. For transistor power supplies. Pri. 200/240v. Sec. 9-0-9 at 500 mA. 11/1. 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. **BRAND NEW MAINS TRANSFORMERS for Bridge Rectifier.** Pri. 240v. AC Sec. 240v. at 50mA and 6.3v. at 1-5 amp. Stock size 2 1/2 x 3 1/2 in. 10/6. P. & P. 3/6. (Special quotations for quantities.)

HARVERSON'S SUPER MONO AMPLIFIER

A super quality gram amplifier using a double wound mains transformer, E280 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 7 1/2 in. wide x 3 1/2 in. deep x 6 1/2 in. high overall. AC 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 **49/6** P. & P. 6/1.

BRAND NEW! PARMECO MAINS TRANSFORMERS Primary 110v-250v. Secondary 330-0-330v. 100 mA and 6.3v. at 2 amps, 6.3v. at 2 amps and 6.3 v. 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 in. Weight 8 lb. Limited number only at 87/6. P. & P. 8/1.

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. to +12dB. Treble cut approx. to -18dB. Negative feedback 18dB over main amp. Power requirements 25V at 8 amp.

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. 11/1. (Excluding metalwork, knobs, plugs and sockets and fuses.)



SPECIAL PURCHASE!
E.M.I. 4-SPEED PLAYER.
Heavy 8 1/2 in. metal turntable. Low flutter performance 200/250 v. shaded motor (90 v. tap). Complete with latest type lightweight pick-up arm and mono cartridge with t/o stylus for LP/78. ONLY 63/1. P. & P. 6/6.

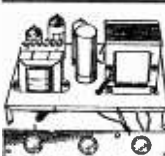
QUALITY RECORD PLAYER AMPLIFIER MKII

A top quality record player amplifier employing heavy duty double wound mains transformer, EOC83, EL84, E280 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 75/1. P. & P. 6/1.

ALSO AVAILABLE mounted on board with output transformer and speaker ready to fit into cabinet below. PRICE 75/6. P. & P. 7/6.

DELUXE QUALITY PORTABLE R/P CABINET MKII

Unit motor board size 14 1/2 x 12 1/2 in. clearance 2 1/2 in. below. 5 1/2 in. above. Will take above amplifier and any B.S.R. or GARRARD autchanger or Single Player Unit (except AT60 and SP25). Size 18 x 15 x 8 in. 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 x 4 1/2 x 4 1/2 in. Incorporates EOC83, EL84, E280 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 4 1/2 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only 84.15.0. P. & P. 6/1.

speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 4 1/2 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only 84.15.0. P. & P. 6/1.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc. 79/8. P. & P. 6/1.

BRAND NEW TRANSISTOR BARGAINS. GET 16 (Matched Pair) 157-1 V1510p 10/-; OC71 5/-; OC76 6/-; AF117 3/6; 2G339 (NPN) 3/-; Set of Mullard 6 transistors OC44, 2-OC45, AC128D matched pair AC128 25/-; ORP12 Cadmium Sulphide Cells 10/6. All post free.

VYNAR and REXINE SPEAKER AND CABINET FABRICS. Approx. 54in. wide. Usually 35/- yard. Our PRICE 18/6 per yard length. P. & P. 2/6 (min. one yd.). S.A.E. for samples.

SPECIAL OFFER! PLESSEY TYPE 89 TWIN TUNING GANG. 400pF. 145pF. Fitted with trimmers and 5:1 integral auto motion. Suitable for nominal 470 kc/s I.F. Size approx. 2 x 1 x 1 1/2 in. Only 8/6. P. & P. 2/6.

HIGH GRADE COPPER LAMINATE BOARDS 8 x 6 x 1/16 in. FIVE for 10/-, P. & P. 2/1.

DE LUXE STEREO AMPLIFIER



A.C. mains 200-240 volts. Using heavy duty fully isolated mains transformer with full wave rectification giving adequate

hum. Valve line up: —2 x ECL86 Triode Pentodes. 1 x E280 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 level to be used with negligible distortion. Supplied complete with knobs. Chassis size 11" x 4" x 4". Overall height including valves 5". Ready built and tested to a high standard. PRICE 85 s. P. & P. 8/1.

4-SPEED RECORD PLAYER BARGAINS

Mains models. All brand new in maker's packing. B.S.R. UA25 with latest mono compatible cart. 86.19.6 All plus Carriage and Packing 6/6

LATEST GARRARD MODELS. All types available 1025, 2025, SP25, 3000, AT90 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. O.U.R. PRICE 5 gns. complete. P. & P. 8/6.

LATEST RONETTE T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78. Only 32/6. P. & P. 2/1.

LATEST RONETTE T/O MONO COMPATIBLE CARTRIDGE for playing EP/LP/78 mono or stereo records on mono equipment. Only 30/1. P. & P. 2/1.

SONOTONE STAHG compatible Stereo Cartridge with diamond stylus 50/1. P. & P. 2/1.

FEW ONLY! ACOS High-G for EP and LP. Only 10/1. P. & P. 2/1.

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 ST Mullard AC128D) and matched pair of AC128 o/p.
● 9 volt operation.
● Everything supplied, wire, battery clips, solder, etc.
● Comprehensive advice to follow instructions and circuit diagram 2/6 (Free with Kit). All parts sold separately.
SPECIAL PRICE 45/1. P. & P. 3/1.
Also ready built and tested, 52/6. P. & P. 3/1.

10/14 WATT HI-FI

AMPLIFIER KIT
A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Simple 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 2EL84s, EOC83, EP86 and E280 rectifier. Simple instruction booklet 2/6 (Free with parts). All parts sold separately. ONLY 87.9.6. P. & P. 8/6. Also available ready built and tested complete with std. input sockets, 89.5.0. P. & P. 8/6.

SPECIAL OFFER

Hi-Fi Celestion Speaker Unit. Size 6 x 4in. Powerful 11,000 line magnet with specially tested cone surround, 10-18 ohm impedance. Few only at 20/1. P. & P. 3/6.

DUAL PURPOSE BULK TAPE ERASER AND TAPE HEAD DEMAGNETISER 35/-. P. & P. 3/1.
CRYSTAL MIKES. High Imp. for desk or hand use. High sensitivity. 15/6. P. & P. 1/6.

HIGH IMPEDANCE CRYSTAL STICK MIKES. OUR PRICE 21/1. P. & P. 1/6.

Open all day Saturday
Early closing Wed. 1 p.m.
A few minutes from South Wimbledon
Tube Station

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, LONDON S.W.19 Tel.: 01-540 3985

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

Please write clearly
PLEASE NOTE: P. & P. CHARGES
QUOTED APPLY TO U.K. ONLY.
P. & P. ON OVERSEAS ORDERS
CHARGED EXTRA.

M. & B. RADIO

15a HUNSLET ROAD, LEEDS LS10 1JQ

Telephone: 0532-35649

R210 RECEIVER. Modern 14 miniature valve receiver. 2-16Mc/s in 7 bands each 50in. film strip scale. 10/100Kc/s xtal calibrator. BFO. CW filter. Internal 24V psu. Supplied c/w handbook and home-made mains psu. £30, carr. 25/-.

VHF MOBILE TX/RX. Miniature valve trans-receiver with 12V transistor power unit. Double conversion receiver. Xtal controlled but easily converted to tuneable. High or low band models (2 or 4 metres). Please state which when ordering. Positive or negative earth. Supplied c/w circuit and notes. TESTED £9.10.0, carr. 27/6.

TRANSISTORISED 2-METRE CONVERTERS. 2 RF stages. Various IF frequencies. Please state preference when ordering. £7.15.9, plus 5/- pp.

12 VOLT TRANSISTOR INVERTERS. Gives 240V DC at 40 watts. Ideal for caravan fluorescent lighting. £6, plus 7/6 pp. Various other transistor inverters. Please send SAE for details.

RADIOTELEPHONE press to talk microphones. Used. 5/-, plus 2/- pp.

SPRING LOADED mobile whip base sections. Chrome finish. Brand new. 6/6, plus 1/6 pp.

GRANADA 4. Transistor amps in cabinet with speaker. Tested. 62/6, plus 7/6 pp.

GPO Telephones with dial, 17/6, plus 6/- pp. Modern style telephone 42/6, plus 6/- pp.

QQV03/10 6/- tested. **QQV06/40A** 37/6 tested. 800piv 16 amps silicon diodes on heat sink, 6/- BY128 2/6. 2 x OC35s on heat sink, 10/- OC35 on small heat sink 5/-, 1/- pp.

STETHOSCOPE HEADSETS. Brand new. Ideal for stereo or mono. Low imp. 27/6, plus 3/6 pp.

2-METRE TRANSISTOR P.A. £7.10.0. Transistor amplifiers, modulators, mic pre-amps. VHF transmitters. Scopes. Aerials. Valves. Etc.

TELEMETER. A well finished cabinet containing lots of useful items for the constructor. Tape unit and head, 2 motors, speaker, auto and mains transformers, miniature valve I.F. unit etc. Ideal for stripping or modifying. 77/6 plus 7/6 carriage.

STEREO CABINETS. A beautifully finished polished wood cabinet supplied in original carton. NEW. 47/6 plus 6/6 carr.

LISTS 6d., plus SAE.

BI-PRE-PAK LTD

222-224 WEST ROAD, WESTLIFT-ON-SEA, ESSEX
PHONE: SOUTHEAST (0702) 46344

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.

P.1 PLEASE ASK FOR PAK P.1. ONLY 10/-
2/- P & P on this Pak.

NEW, UNMARKED, UNTESTED PAKS

B78 12 Integrated circuits, Mixed types, data supplied with orders. 10/-

B83 200 Trans. manufacturer's rejects all types NPN, PNP, Sil. and Germ. 10/-

B84 100 Silicon diodes DO-7 Case, OA200 -OA202 Polarity marked. 10/-

H5 16 1 amp. Plastic diodes 50-10 volts. 10/-

H6 40 250mW Zeners DO-7 glass type. 10/-

NEW, TESTED AND MARKED PAKS

B81 10 Reed Switches, mixed types large and small 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/-

Transistors Price

AC126	2/6
AC127	2/6
AC176	2/6
AD149	5/-
BC107-8-9	10/-
BC171	2/6
BC172	3/-
BC173	3/-
OC22	6/-
OC23	6/-
OC25	7/6
OC28	5/-
OC28	10/-
OC35	5/-
OC44	2/6
OC45	2/6
OC71	2/6
OC83	4/-
OC139	2/6
OC140	3/6
OC201	8/-
OCF71	10/-
SC108	3/6
SC109	3/6
2N4284	3/6
2N4285	3/6
2N4286	3/6
2N4287	3/6
2N4288	3/6
2N4289	3/6
2N4290	3/6
2N4292	3/6
2N3055	15/-
2N3034	10/-
2N3819 FET	9/-

★ ALL OUR TESTED SEMICONDUCTORS HAVE A WRITTEN GUARANTEE ★

Send for our FREE list and catalogue of all our products. Check your own equivalent with our free substitution chart.

Matched Set. NPN/ PNP AD161-AD162 Comp. pair Pak **10/- PR.** Complementary Set. NPN/PNP Germ. trans., Pak F.3 **2/6 PR.** B.77.

NO CONNECTION WITH ANY OTHER FIRM MINIMUM ORDER 10/-.
CASH WITH ORDER PLEASE, add 1/- post and packing.
OVERSEAS ADD EXTRA FOR AIRMAIL

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

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.

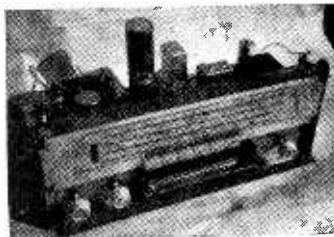
name.....

address.....

age.....

POST THIS COUPON NOW!

NEW 6 PUSH-BUTTON STEREOGRAM CHASSIS



M.W.; 8.W.1; 8.W.2; V.H.F.; Gram; Stereo Gram. Two separate channels for Stereogram with balance control. Also operates with two speakers on Radio. Chassis size: 15 x 7 x 6 1/2 in. high. Dial cream and red. 15 x 3 in. 100-550M; 18-51M; 60-187M; VHF 36-100 Mc/s. Valves: ECH85, ECH81, EF89, 2 x ECL86, EM54 and Rect. Price £19.19.0, carr. paid or £7.0.0 deposit and 6 monthly payments of 47/6. Total H.P. price £215.0.

STEREO AMPLIFIER type HV—2 x 3 Watts

Fully built. On off, sep. vol. and tone each channel 12 x 4 1/2 x 6 in. high. EZ80, 2 x ECL86; for 3 ohm speakers, double wound main trans; fixing flanges and base plate; suitable for crystal cart., tuner etc. £8.10.0 (8/- p. & p.). Available as kit with full instructions at £5.5.0 (8/- p. & 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 3 1/2 x 4 in. high double wound mains trans. with supporting brackets. For 3-ohm speaker. £8 (8/- p. & p.).



MONO GRAM CHASSIS

3 Wave band long-med-short, Gram, 200-250V AC Ferrite aerial. Chassis 13 x 7 x 5 in. Dial 13 x 4 in. Double wound mains transformer 5 valves ECH81 EF89, EBC81, EL84, EZ80. Price £10.12.6. (7/6 p. & p.).

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.

VALVES SAME DAY SERVICE NEW! TESTED! GUARANTEED!

SETS

1R5, 1R5, 1T4, 3B4, 3V4, DAF91, DF91, DK91, DL92, DL94.
Set of 4 for 18/6. DAF96, DF96, DK96, DL96, 4 for £6/6.

OZ4	4/6	12AX7	4/6	DK32	7/6	EF184	5/6	PCL83	9/-	1JBF80	5/6
1A7GT	7/6	12K8GT	7/-	DK91	5/6	EH90	5/6	PCL84	7/6	UBF89	6/6
1H8GT	7/3	12N7GT	6/6	DK96	7/-	EL33	8/6	PCL85	9/-	UC92	5/-
1N5GT	7/9	19BC6G17/6		DK96	7/-	EL34	9/6	PCL86	8/3	UC84	7/6
1R5	5/9	20F2	13/6	DL35	5/-	EL41	10/6	PEN44	12/6	UC85	8/6
1R5	4/3	20P3	11/6	DL92	5/6	EL84	4/6	PFL200	12/6	UCF80	8/6
1T4	2/9	20P4	18/6	DL94	6/-	EL90	4/6	PFL200	12/6	UCF80	8/6
3B4	5/9	25L6GT	5/-	EL96	7/-	EL90	4/6	PL36	9/6	UCH81	6/3
3V4	6/-	25U4GT	11/6	DY86	5/9	EM80	7/6	PL82	6/6	UCH82	7/-
5U4G	4/6	30C1	6/6	DY87	5/9	EM81	7/6	PL83	6/6	UCH83	11/6
6Y3GT	5/9	30C15	13/-	EABC80	6/6	EM84	6/6	PL84	6/6	UF41	10/6
5Z4G	7/6	30C17	16/-	EAF42	8/6	EM87	7/6	PL500	13/-	UF80	7/-
6J30L2	12/-	30C18	11/6	EB91	2/3	EY61	7/6	PL504	13/6	UF85	6/6
6AL5	2/3	30F5	16/-	EBC33	8/-	EY66	6/6	PL508	23/6	UF89	6/6
6AM6	2/9	30FL1	13/6	EBC41	9/6	EZ40	7/6	PL802	14/6	UL41	10/6
6AQ5	4/6	30FL12	14/6	EBF80	6/6	EZ80	4/6	PM84	7/6	UL44	20/6
6AT8	4/-	30FL14	12/-	EBF89	6/3	EZ81	4/6	PX25	10/6	UL84	7/-
6AU6	4/6	30L1	6/6	ECC81	3/6	GZ32	8/6	PY32	10/-	UM84	7/-
6BA6	4/6	30L15	14/-	ECC82	4/6	GZ34	9/6	PY33	10/-	UY41	8/3
6BE6	4/6	30L17	15/6	ECC83	7/6	KT61	5/9	PY81	5/3	UY85	5/6
6BJ6	8/6	30P4	12/-	ECC85	5/9	KT66	16/-	PY82	5/3	VP43	10/6
6BW6	13/-	30P12	13/6	ECC91	3/-	ME140015/-		PY83	5/9	W119	7/-
6F13	3/6	30P19	12/-	ECC804	12/-	N78	17/6	PY88	6/6	Z77	2/9
6F14	9/-	30PL13	13/6	ECF80	6/6	PACB80	7/6	PY800	7/6	Transistors	
6F23	14/3	30PL13	15/6	ECF82	5/6	PC86	10/3	PY801	6/6	AC107	3/6
6F25	13/-	30PL14	15/6	ECH35	6/-	PC88	10/3	R19	6/6	AC127	2/6
6J6	3/-	35L6GT	8/6	ECH42	10/6	PC97	8/6	R20	12/6	AD140	7/6
6K7G	2/6	35W4	4/6	ECH81	5/3	PC97	8/6	U25	13/-	AP115	3/6
6K8G	2/6	35Z4GT	5/-	ECH84	7/6	PC900	8/-	U26	12/-	AP116	3/6
6L18	6/-	6063	12/6	ECL80	6/6	PC984	6/6	U47	13/6	AP117	3/6
6V6G	3/3	AC/VP210/-		ECL82	6/6	PC985	6/-	U49	13/6	AP125	3/6
6V6GT	6/6	AZ31	9/6	ECL83	8/6	PC988	9/6	U52	4/6	AC127	3/6
6X4	4/3	B729	12/6	ECL86	8/-	PC989	10/6	U78	4/3	OC26	5/6
6X5GT	5/9	OCF35	10/-	EF374	6/6	PCF80	6/6	U91	12/6	OC44	2/3
7B7	7/-	CL33	18/6	EF39	4/6	PCF80	6/6	U93	8/6	OC45	2/3
7C6	6/6	CY31	6/6	EF41	10/9	PCF82	6/6	U95	14/6	OC71	2/6
10P1	14/-	DAC32	7/3	EF40	4/6	PCF200	13/6	U96	12/6	OC72	2/6
10P18	7/-	DAF91	4/3	EF85	5/3	PCF800	13/6	U329	14/6	OC75	2/6
10P13	15/6	DAF96	6/6	EF86	6/6	PCF801	6/6	U801	19/6	OC81	2/3
12AH8	33/-	DF33	7/9	EF89	5/3	PCF802	9/6	UABC80	6/6	OC81D	2/3
12AT7	3/9	DF91	2/9	EF91	2/9	PCF805	11/6	UAF42	9/6	OC82	2/3
12AU6	4/6	DF96	6/6	EF94	4/6	PCF808	12/-	UB41	6/6	OC82D	2/3
12AU7	4/9	DH77	4/-	EF183	6/-	PCL82	7/-	UBC41	8/6	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.

SUPER-BARGAIN STOCKTAKING SALE!

Use the form below for your order. CONDENSERS MUST BE ORDERED BY STOCK NUMBER ONLY. If any sale item is 'sold-out' when order received we shall substitute items of equal value.

ELECTROLYTIC CAPACITORS

Stock No.	Capacity	Voltage	Price	No. Req'd	£ s. d.	Stock No.	Capacity	Voltage	Price	No. Req'd	£ s. d.
1	1uf	6	4d.			39	100uf	275	2/6		
2	4uf	25	4d.			40	30uf	10	3d.		
3	4uf	4	4d.			41	2,000/2,000	25	7/6		
4	8uf	6	4d.			42	18uf	50 REV	2/-		
5	3uf	25	4d.			43	16/16	275	2/-		
6	64uf	9	4d.			44	18	275	1/-		
7	20uf	6	4d.			45	350	12	9d.		
8	20uf	50	6d.			46	20/4	275	1/-		
9	30uf	15	6d.			47	250	50	2/-		
10	8uf	12	4d.			48	500	25	1/6		
11	8uf	6	4d.			49	400	15	1/-		
12	1uf	350	6d.			50	400	2.5	3d.		
13	8/8/8	350	1/-			51	64	275	1/9		
14	50uf	6	4d.			52	32/32	350	2/6		
15	100/200	275	4d.			53	8/8/8	675	1/9		
16	32	150	9d.			54	500	6	6d.		
17	64	2.5	3d.			55	64	275	1/3		
18	100/200/200/50	275	7/6			56	25	6	3d.		
19	50/80	300	3/-			57	100	9	6d.		
20	150/200	275	6/-			58	400	50	2/-		
21	24	275	1/-			59	400	30	1/6		
22	10	25	3d.			60	500	4	3d.		
23	125	2.5	3d.			61	150	30	1/6		
24	2	150	3d.			62	64/32/8	275	2/6		
25	16/32	350	2/6			63	200	275	2/6		
26	32	275	1/6			64	40	6.4	3d.		
27	350	12	6d.			65	50	25	6d.		
28	75/75/75/75	150	2/6			66	250	50	1/9		
29	1	20	3d.			67	30	6	3d.		
30	12.5	40	9d.			68	100/100/50	275	5/-		
31	640	2.5	3d.			69	50/50/50	350	4/-		
32	3,000	35	7/6			70	40/40/20	275	2/-		
33	3,000	15	3/-			71	400	6.4	3d.		
34	3,000	30	7/-			72	320	10	3d.		
35	250	70	2/-			73	32/32	275			
36	2,500	9	2/-				+ 25	+ 25	2/6		
37	32	50	9d.								
38	750	12	1/9								
						TOTAL					

RESISTORS. 5% EXCELLENT QUALITY. 7/6 per 100 or 2/- per dozen

Tick the values required.

13 ohms	1 k ohm	5.6 k ohm	30 k ohm	130 k ohm	1.8 meg ohm
22 ohms	1.5 k ohm	6.8 k ohm	36 k ohm	360 k ohm	3.6 meg ohm
36 ohms	1.8 k ohm	7.5 k ohm	43 k ohm	430 k ohm	5.1 meg ohm
47 ohms	2.2 k ohm	10 k ohm	47 k ohm	470 k ohm	6.2 meg ohm
91 ohms	2.4 k ohm	16 k ohm	51 k ohm	560 k ohm	7.5 meg ohm
220 ohms	3.3 k ohm	18 k ohm	62 k ohm	620 k ohm	8.2 meg ohm
470 ohms	3.6 k ohm	22 k ohm	75 k ohm	820 k ohm	1.2 meg ohm
560 ohms	4.3 k ohm	24 k ohm	82 k ohm	9.1 meg ohm	1.5 meg ohm
750 ohms	4.7 k ohm	27 k ohm	91 k ohm	10 meg ohm	
or our selection (mixed) 6/6 per 100.					

TOTAL

SILVER MICA/CERAMIC/POLYSTYRENE CONDENSERS

10/- per 100. 3/- per dozen.

Available in following values. Tick those required.

2 pf	12 pf	50 pf	135 pf	250 pf	1,000 pf
3.9 pf	15 pf	58 pf	140 pf	330 pf	1,100 pf
4 pf	18 pf	62 pf	158 pf	420 pf	1,500 pf
4.7 pf	22 pf	72 pf	170 pf	600 pf	2,200 pf
5 pf	25 pf	80 pf	180 pf	680 pf	2,500 pf
6 pf	27 pf	82 pf	190 pf	800 pf	2,700 pf
8 pf	30 pf	100 pf	200 pf	820 pf	3,000 pf
10 pf	39 pf	125 pf	240 pf	900 pf	6,200 pf

TOTAL

COMPARE THESE PRICES!!!

MULLARD POLYESTER CONDENSERS

No.	Price
1,000 pf 3d. each 400V	
1,500 pf 3d. "	
1,800 pf 3d. "	
2,200 pf 3d. "	
15 uf 6d. "	160V
22 uf 6d. "	160V
27 uf 6d. "	160V
1 uf 1/- "	125V

Total

25% discount lots of 100 per type.
50% discount lots of 1,000 per type.

GANGED STEREO POTS.

250K. 2/6 each.

SKELTON PRESETS.

Mixed. 8/- dozen.

VOLUME CONTROLS. 1meg. 1meg.

with D.P. switch. 2/- each.

TELEVISION REMOTE

CONTROLS. Philips. contain 11' 7-way cable, 1 double pot., 5 resistors, 2 condensers, 10/- each. (Cost £3.3.0.)

THIN CONNECTING WIRE.

10yds 1/-, 100yds 7/6, 1,000yds 50/-.

CO-AXIAL CABLE.

Black. 6d. yd. £1 50 yds.

CRYSTAL MIKES. 10/- each.

TRANSISTOR BARGAIN! THEY CAN'T GET ANY CHEAPER!!!!

P.N.P. Audio. Untested, unmarked. Mainly O.K.. 10/- per 100.

N.P.N. Silicon. R.F. types. unmarked. All Useable. 10/- per 50.

Power Output (similar O.C35). All Tested, 4/- each. £2.0.0. dozen.

SILICON PLANAR TRANSISTORS. All Tested. No Leaks or Shorts. Gain of 20/50. 6d. each; 50/100, 9d. each; 100/200, 1/- each. Transistors similar to OCP71 (light sensitive). 2/- each.

THYRISTORS. 400 volt BTY 79. 7/6 each; SCR 51 (10 amp.), £1 each.

RECTIFIERS. Latest type. All marked. 300 volt peak, 1 amp. mean current type 1N4006 2/6 each. 24/- dozen. £7.10.0 100. S.T.C. 3/4 (400 volt) 2/6 each. 24/- dozen. £7.10.0 100. BYZ 13 or 19 (6 amp.) 2/6 each. 24/- dozen. £7.10.0 100.

MAINS DROPPER TYPE RESISTORS. Hundreds of types from 7 ohm upwards. 1 watt to 50 watts. A large percentage of these are Multi-tapped droppers for radio/television. Owing to the huge variety these can only be offered 'assorted', 10/- per dozen.

RECORDING TAPE GIVE-AWAY!!!!

ALL BRITISH MADE, BEST QUALITY. 5" 600', 7/3; 5 1/2" 900', 9/-; 7" 1,200'. 12/-; 3" 'odd-ends'—may be standard, long or double play—but minimum 150', 2/3.

GIANT SELENIUM SOLAR CELLS. Last few to clear at half price!

Circular, 67 m.m. diameter, 5/- each. 50mm x 37mm, 3 for 10/-.

RECORD PLAYER CARTRIDGES

ACOS GP87/2, 15 (Mono); GP91/3, 20/- (Compatible); GP93/1, 25/- (Stereo); GP94/1, 30/- (Stereo, ceramic); GP93/1 with diamond needle, 32/6; GP94/1 with diamond needle, 37/6.

TRANSISTORISED FLUORESCENT LIGHTS. 12 VOLT.

8 watt 12" tube, Reflector type, 59/6. 15 watt 18" tube, Batten type, 79/6. Complete with tube. Postage 3/-.

TRANSISTORISED SIGNAL INJECTOR KIT. 10/-

TRANSISTORISED SIGNAL TRACER KIT. 10/-

TRANSISTORISED REV. COUNTER (CAR). 10/-

VERO-BOARD

2 1/2" x 1" x 15	1/3	5" x 3 1/2" x 15	5/6	3 1/2" x 3 1/2" x 1	4/9
3 1/2" x 2 1/2" x 15	3/3	17" x 2 1/2" x 15	11/-	5" x 2 1/2" x 1	4/7
3 1/2" x 3 1/2" x 15	3/11	17" x 3 1/2" x 15	14/8	5" x 3 1/2" x 1	5/6
5" x 2 1/2" x 15	3/11	3 1/2" x 2 1/2" x 1	4/2		

Spot Face Cutter. 7/6. Pin Insert Tool. 9/6. Terminal Pins. 3/6 for 36.

Spot Face Cutter and five 2 1/2" x 1" boards. 9/9.

These prices cannot be repeated. Order now. Don't forget to add your name and address! Please include suitable amount to cover post and packing Minimum 2/-.

G. F. MILWARD, DRAYTON BASSETT, NEAR TAMWORTH, STAFFS. 'Phone Tamworth 2321

BI-PAK SEMICONDUCTORS

500 CHESHAM HOUSE,
150 REGENT ST., LONDON, W.1.

KING OF THE PAKS SUPER PAKS

Unequalled Value & Quality BI-PAK NEW—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	60 Sil. Planar Diodes 250mA OA/200/202	10/-
U9	20 Mixed Volts 1 watt Zener Diodes	10/-
U11	30 PNP Silicon Planar Transistors TO-5 sim. 2N1132	10/-
U12	12 Silicon Rectifiers EPOXY BY126/127	10/-
U13	30 PNP-NPN Sil. Transistors OC200 & 2N104	10/-
U14	150 Mixed Silicon and Germanium Diodes	10/-
U15	30 NPN Silicon Planar Transistors TO-5 sim. 2N697	10/-
U16	10 3-Amp Silicon Rectifiers Stud Type up to 1,000 PIV	10/-
U17	30 Germanium PNP AF Transistors TO-5 like ACY 17-22	10/-
U18	8 6-Amp Silicon Rectifiers BV213 Type up to 600 PIV	10/-
U19	30 Silicon NPN Transistors like BC108	10/-
U20	12 1.5-amp Silicon Rectifiers Top-Hat up to 1,000 PIV	10/-
U21	30 AF Germanium alloy Transistors 2G300 Series & OC71	10/-
U22	10 1-amp Glass Min. Silicon Rectifiers High Volts	10/-
U23	30 Madt's like MAT Series PNP Transistors	10/-
U24	20 Germanium 1-amp Rectifiers (GJM) up to 300 PIV	10/-
U25	25 300 Mc/s NPN Silicon Transistors 2N708, BSY27	10/-
U26	30 Fast Switching Silicon Diodes like 1N914 Micro-min.	10/-
U28	Experimenters' Assortment of Integrated Circuits, untested, Gates, Flip-Flops, Registers, etc., 8 Assorted Pieces	20/-
U29	10 1-amp SCR's TO-5 can up to 600PIV CR81/25-600	20/-
U30	15 Plastic Silicon Planar trans. NPN 2N2924-2N2926	10/-
U31	20 Sil. Planar NPN trans. low noise Amp 2N3707	10/-
U32	25 Zener Diodes 400mW D07 case mixed Volts, 3-18	10/-
U33	15 Plastic case 1-amp Silicon Rectifiers 1N-4000 series	10/-
U34	30 Sil. PNP alloy trans. TO-5 BCY26, 2N302/4	10/-
U35	25 Sil. Planar trans. PNP TO-18 2N2906	10/-
U36	25 Sil. Planar NPN trans. TO-5 BFY50/51/52	10/-
U37	30 Sil. alloy trans. 80-2 PNP, OC200 2N322	10/-
U38	20 Fast Switching Sil. trans. NPN 400Mc/s 2N3011	10/-
U39	30 RF Germ. PNP trans. 2N1303/5 TO-5	10/-
U40	10 Dual trans. 6 lead TO-5 2N2060	10/-
U41	30 RF Germ. trans. TO-1 OC45 NKT72	10/-
U42	10 VHF Germ. PNP trans. TO-1 NKT667 AP117	10/-

Code Nos. mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked

FULLY TESTED

AC107	3/6
AC128-7-8	2/6
AF116-117	3/6
AF139	10/-
AL102	15/-
BC107-8-9	5/-
BFY60-51-52	7/6
BSY26-7	3/6
BSY28-9	4/6
BSY95-95A	4/6
OC22-25	5/-
OC26-35	5/-
OC28-29	7/6
OC44-45	1/6
OC71-81	1/6
OC72-75	2/6
OC81D-82D	2/3
OC82	2/6
OC140	2/6
OC170	2/6
OC171	3/6
OC201	7/6
ORP12-60	8/6
OCPT1	8/6
OA6-10	2/6
OA47	1/3
OA70	1/3
OA79	1/3
OA81-85	1/6
OA91	1/3
OA95	1/3
CA200	3/6
CA202	3/6
2N696-7	5/-
2N706	3/6
2N708	5/-
2N2180	15/-
2N2646	5/-
2N2712	5/6
2N2926	2/6
MAT100-101	3/6
MAT120-121	3/6
ST140	3/6
ST141	4/-
2N3819	10/-
2N3820	25/-

TESTED SCR'S

PIV 1 AMP	7A	16A	30A
25	5/-	7/6	30/-
50	7/6	8/6	10/6
100	8/6	10/-	15/-
200	12/6	15/-	20/-
300	15/-	20/-	25/-
400	17/6	25/-	30/-
500	30/-	40/-	45/-
600	—	40/-	60/-

SIL. RECTS. TESTED

PIV 750mA	3A	10A	30A
60	1/-	2/6	4/3
100	1/3	3/6	4/6
200	1/9	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	6/6	9/-
800	3/6	7/6	11/-
1000	5/-	9/3	12/6
1200	6/6	11/6	15/-

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-organised and streamlined our Despatch Order Department and we now request you to send all your orders together with your remittance, direct to our Warehouse and Despatch Department, postal address: **BI-PAK SEMI-CONDUCTORS**, Despatch Dept., P.O. BOX 6, WARE, HERTS. Postage and packing still 1/- per order. Minimum order 10/-.

BRAND NEW TEXAS GERM. TRANSISTORS

Pak No.	EQVT.
T1	2G3710 OC71 10/-
T2	2G3734 OC75 10/-
T3	2G3744A OC81D 10/-
T4	2G381A OC81 10/-
T5	2G383T OC82 10/-
T6	2G344A OC44 10/-
T7	2G345A OC45 10/-
T8	2G378 OC78 10/-
T9	2G399A 2N1302/10/-
T10	2G417 AP117 10/-

FULL RANGE OF ZENER DIODES

VOLTAGE RANGE	2-16V.
400mW	2/6 each
50W	3/6 each
10W	5/- each
All fully tested. State voltage required.	

120 VCB NIXIE DRIVER TRANSISTOR. Sim. B8X21 & C407. 2N1893 FULLY TESTED AND CODED

ND120 1-24 3/6 each.

TO-5 NPN 25 up to 3/- each.

UNIJUNCTION

UT46 Eqv. 2N246, 7/6
Eqvt. T1545 BEN3000
25-95/-, 100 up 4/- each

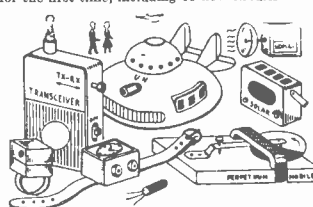
PRINTED CIRCUITS

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.

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 SW/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 2/-
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-FLEXION" Triple Reflex with self-adjusting regeneration (Patent Pending). (9) Solar Battery Loudspeaker Radio. The smallest 3 designs yet offered to the Home Constructor anywhere in the World. 8 Subminiature Radio Receivers based on the "Triflexion" 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 .55". (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 52 Radio, Electronic and Photoelectric Projects Assembled.

YOUR CAREER in RADIO & ELECTRONICS?

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

To: British National Radio School, Reading, Berks.

Please send FREE BROCHURE to

NAME Block

ADDRESS Caps.

..... Please

11/69

BRITISH NATIONAL RADIO SCHOOL

DUXFORD ELECTRONICS

ELECTROLYTIC CAPACITORS (Mullard).—10% to + 50%.

Working Voltage (V)—Capacitance (μF)		Price each		10 off		Pack Prices		100 off	
4V	6-4V	10V	16V	25V	40V	64V			
8	6-4	4	2-5	1-6	1	0-64	1/4	12/4	25 off
32	25	16	10	6-4	4	2-5	1/2	10/6	26/6
64	50	32	20	12-5	8	5	1/2	10/4	23/-
125	100	64	40	25	16	10	1-1/2	8/9	18/9
250	200	125	80	50	32	20	1/1	9/6	20/9
400	320	200	125	80	50	32	1/2	10/4	22/6
800	640	400	250	160	100	64	1/6	13/4	29/6
1250	1000	640	400	250	160	100	2/-	18/10	37/9
2000	1600	1000	640	400	250	160	2/6	22/3	44/3
3200	2500	1600	1000	640	400	250	3/-	26/9	59/-
				800	500	320	5/3	46/6	101/-
				1250	800	500	6/6	57/6	125/4
				2000	1250	800	8/-	71/4	157/-
				4000	2500	1600	12/6	91/6	194/9
				6400	4000	2500	15/-	133/4	291/8
									1000/-

POLYESTER CAPACITORS (Mullard)

Tuular, 10%, 160V.

Prices per Capacitance value (μF)	each	10 off	25 off	100 off
0-01, 0-015, 0-022	7d.	5/1	10/11	36/5
0-033, 0-047	7d.	5/8	11/10	37/6
0-068	8d.	6/6	13/6	43/9
0-1	9d.	6/8	14/3	47/7
0-15	11d.	7/6	16/6	57/3
0-22	1/-	8/2	17/9	61/5
0-33	1/3	10/11	23/3	77/1
0-47	1/6	13/2	28/1	93/9
0-68	2/3	19/7	42/3	140/7
1-0	2/8	23/4	48/9	165/7

Tubular, 10%, 400V.

Prices per Capacitance value (μF)	each	10 off	25 off	100 off
0-001, 0-0015, 0-0022	6d.	4/5	9/9	33/4
0-0033, 0-0047	6d.	4/6	9/10	33/6
0-0068, 0-01	7d.	5/1	10/11	36/5
0-015	7d.	5/2	11/10	37/6
0-022	7d.	5/3	12/-	37/9
0-033	8d.	5/8	12/7	42/7
0-047	9d.	6/7	14/5	49/-
0-068	11d.	7/8	16/7	51/-
0-1	11d.	8/-	17/2	57/4
0-15	1/2	10/3	22/-	74/-
0-22	1/6	14/3	28/5	95/10
0-33	2/3	19/7	42/3	140/7
0-47	2/8	23/4	48/9	165/7

Modular, metallised, P.C. mounting, 250V.

Prices per Capacitance value (μF)	each	10 off	25 off	100 off
0-01, 0-015	7d.	5/2	11/3	38/7
0-022	7d.	5/4	11/9	41/8
0-033, 0-047	8d.	5/11	12/10	43/9
0-068	9d.	6/7	14/1	47/1
0-1	9d.	6/9	14/9	51/-
0-15	11d.	8/2	18/-	62/6
0-22	1/-	8/9	18/11	63/6
0-33	1/5	12/6	27/-	91/8
0-47	1/8	14/8	31/9	107/10
0-68	2/3	19/10	43/2	146/9
1-0	2/9	23/8	49/8	160/4

CAPACITORS

Subminiature Polyester film, Modular for P.C. mounting. Hard epoxy resin encapsulation. Radial leads.

±10% tolerance. 100 Volt Working.

Prices—per Capacitance value (μF)	each	10 off	25 off	100 off
0-001, 0-002, 0-005	6d.	4/3	8/4	30/-
0-01, 0-02	6d.	4/3	8/4	30/-
0-05	8d.	6/-	12/6	41/8
0-1	10d.	7/1	15/6	51/-
0-2	1/2	10/-	20/10	68/6

Polystyrene film, Tubular, Axial leads. Unencapsulated. ±5% or ±1μF tolerance. 160 Volt Working.

Prices—per Capacitance value (μF)	each	10 off	25 off	100 off
10, 12, 15, 18, 22, 27, 33	each	10 off	25 off	100 off
39, 47, 56, 68, 82, 100, 120	5d.	3/7	7/9	24/-
180, 220, 270, 330, 390	5d.	3/7	7/9	24/-
470, 560, 680, 820, 1,000	5d.	3/7	7/9	24/-
1,500	6d.	4/-	8/8	26/8
2,200, 3,300, 4,700, 5,600	7d.	5/-	10/10	33/4
6,800, 8,200, 10,000, 15,000	8d.	6/-	13/-	40/-
22,000	9d.	6/9	18/-	45/4

POTENTIOMETERS (Carbon)

Miniature, fully enclosed, rear tags, carbon brush wiper. Long life, low noise. Body dia., 1/2 in. Spindle, 1/2 in. × 1/2 in. 1/2 W at 70°C. ±20% below 1/2 M. ±30% over 1/2 M. Lin. 100 ohms to 10 Megohms. Log. 5 Kohms to 5 Megohms. Prices—per ohmic value

each	10 off	25 off	100 off
2/-	18/4	41/8	150/-
8/-	70/-	162/6	575/-

GANGED STEREO POTENTIOMETERS (Carbon)

1/2 W at 70°C. Long Spindle.

Logarithmic and Linear: 5k + 5k to 1M + 1M.

Prices—per ohmic value	each	10 off	25 off	100 off
8/-	70/-	162/6	575/-	

SKELETON PRE-SET POTENTIOMETERS (Carbon)

High quality pre-sets suitable for printed circuit boards of 0-1 in. P.C.M. 100 ohms to 5 Megohms (Linear only). Miniature: 0-3W at 70°C. ±20% below 1/2 M. ±30% above 1/2 M. Horizontal (0-7 in. + 0-4 in. P.C.M.) or Vertical (0-4 in. × 0-2 in. P.C.M.). Subminiature: 0-1W at 70°C. ±20% below 2-5M, ±30% above.

Prices—per ohmic value	each	10 off	25 off	100 off
Miniature (0-3W)	1/-	8/9	18/9	66/8
Subminiature (0-1W)	10d.	7/1	14/7	46/8

RESISTORS

High stability, carbon film, low noise. Capless construction, molecular termination bonding.

Dimensions (mm.): Body: 1/2 W; 8 × 2-8
Leads: 35
1/2 W; 10 × 4-3

10% ranges; 10 Ohms to 10 Megohms (E12 Renard Series).
5% ranges; 4-7 Ohms to 1 Megohm (E24 Renard Series).

Prices—per Ohmic value.	each	10 off	25 off	100 off
1/2 W 10%	2d.	1/6	3/3	10/4
1/2 W 5%	2 1/2 d.	1/9	3/8	11/8
1/2 W 10%	2 1/2 d.	1/9	3/8	11/7
1/2 W 5%	3d.	2/-	4/-	12/10

SEMICONDUCTORS

Type	1 off	10 off	25 off	100 off	Type	1 off	10 off	25 off	100 off
AC107	3/6	26/3	63/-	232/9	OA5	2/-	15/-	36/-	133/4
AC127	2/6	18/9	45/-	166/3	OA81	2/-	15/-	36/-	133/4
AC128	2/6	18/9	45/-	166/3	OA202	2/-	15/-	36/-	133/4
AD140	8/-	60/-	144/-	533/4	OC23	7/4	58/8	132/-	497/8
AD149	9/-	67/6	162/-	600/-	OC25	6/-	45/-	108/-	399/-
AF115	2/6	18/9	45/-	166/3	OC28	9/-	67/6	162/-	598/6
AF116	2/6	18/9	45/-	166/3	OC35	6/-	45/-	108/-	399/-
AF117	2/6	18/9	45/-	166/3	OC44	3/-	22/6	54/-	199/6
BC107	3/6	26/3	63/-	232/9	OC45	2/6	18/9	45/-	166/3
BC108	3/-	22/6	54/-	199/6	OC71	2/-	15/-	36/-	133/4
BC109	3/6	26/3	63/-	232/9	OC72	2/6	18/9	45/-	166/3
BY234	2/9	24/3	52/4	177/-	OC75	2/4	17/6	42/-	155/4
BY235	3/-	26/3	56/3	187/6	OC81	2/-	15/-	36/-	133/4
BY236	3/3	28/8	61/9	208/4	OC81D	2/4	17/6	42/-	155/4
BY237	3/6	30/8	65/6	218/9	OC82D	2/4	17/6	42/-	155/4
BY238	3/9	34/4	71/6	227/6	OC139	3/4	25/-	60/-	221/8
BYZ10	6/-	45/-	108/-	399/-	OC170	2/6	18/9	45/-	166/3
BYZ11	5/4	40/-	96/-	354/8	OC171	2/6	18/9	45/-	166/3
BYZ12	4/8	35/-	84/-	310/4	2N2926	2/8	20/-	48/-	177/4
BYZ13	4/-	30/-	72/-	266/-	(Green)				

Thyristors (5 amp)—Stud mounting.

P.T.V.	1 off	10 off	25 off	100 off
100	8/-	60/-	144/-	532/-
200	10/-	75/-	180/-	665/-
400	15/-	112/6	270/-	997/-

VEROBOARD & ACCESSORIES

0-15 in. Matrix	1 off	10 off	25 off	0-1 in. Matrix	1 off	10 off	25 off
2 1/2 × 3 1/2 in.	3/3	30/-	67/9	2 1/2 × 3 1/2 in.	4/-	37/8	86/-
2 1/2 × 5 in.	3/11	35/10	80/9	2 1/2 × 5 in.	4/6	42/6	96/3
3 1/2 × 3 1/2 in.	3/11	35/10	80/9	3 1/2 × 3 1/2 in.	4/6	43/4	100/-
3 1/2 × 5 in.	5/6	50/-	114/7	3 1/2 × 5 in.	5/6	48/4	111/5
Spot Face Cutter 7/3				Pin Fitting Tool 9/6			
Terminal Pins 2/- (per 25 off): 6/9 (per 100 off)							

SEND S.A.E. FOR 1969 CATALOGUE

DUXFORD ELECTRONICS (PW) 97/97A MILL ROAD, CAMBRIDGE

Telephone: CAMBRIDGE (0223) 63687

(Visit us—at our new Mail Order, Wholesale and Retail Premises)

MINIMUM ORDER VALUE 5/-

C.W.O. Post and Packing 1/6

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 2s. 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.

EDUCATIONAL

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.

FOR SALE

SEEN MY CAT? Tools, Rod, Bar and Tube. Small Screws, mechanical and electrical gear. 21-years' trading £6,000 in vouchers given away. Free Cat. of 5,000 items. S.A.E. to: K.R. WHISTON, Dept. VCW, New Mills, Stockport.

YUKAN SELF-SPRAY 20 PROFESSIONAL FINE NEBULIZER AEROSOL MIST—

Get these **air drying GREY HAMMER** NOW! OR **BLACK WRINKLE (CRACKLE) finishes**

Yukan Aerosol spray contains 16 oz. fine quality durable spray. No stove baking required. Hammers available in grey, blue, gold, bronze. Modern Eggshell Black Wrinkle (Crackle) all at 15/11 at our counter or 16/11 carriage paid, per push-button self-spray can. Also Durable, heat and water resistant Black Matt finish (12 oz. self-spray cans only) 13/11 carriage paid.

SPECIAL OFFER: 1 can plus optional transferable snap-on trigger handle (value 5/-) for 18/11 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. M/10 **YUKAN, LONDON, W.2.** 307A, EDGWARE ROAD, W.2

We supply many Government Departments, Municipal Authorities, Institutes and Leading Industrial Organisations—We can supply you too.

Closed all December for annual holidays.

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. 14 W.P.M. in 4 weeks guaranteed.

For details and course C.O.D. ring, s.t.d. 01-660 2896 send 8d. stamp for explanatory booklet to: **680HS (BOX 11), 45 GREEN LANE, PURLEY, SURREY**

VHF R/T system, 5 mobiles, 1 base set, 1 remote control. Offers Box No. 93.

RETIRED Service Engineer has a quantity of Valves, Service Sheets, Books & service components for sale. S. Timmings, 98 Marshbrook Rd., Birmingham, 24, erd 3059.

WANTED

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.

WE BUY New Valves and Transistors. State price. **A.D.A. MANUFACTURING CO.**, 116 Alfreton Road, Nottingham.

WANTED NEW VALVES, televisions, radio-grams, transistors, etc. **STAN WILLETTS**, 37 High Street, West Bromwich, Staffs. Tel.: WES 0186.

WANTED: New valves, transistors etc.; state prices. **E.A.V. Factors**, 202 Mansfield Road, Nottingham.

WANTED NEW VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD
103 North Street, Leeds 7

AVO METERS, MODELS 8 & 9, ANY QUANTITY, ANY CONDITION, ALSO WEE MEGGERS. SEND FOR PACKING INSTRUCTIONS. **HUGGETT'S LTD.**, 2/4 PAWSONS ROAD, W. CROYDON.

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.1118/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

MISCELLANEOUS

ETCHED PRINTED CIRCUIT BOARD KITS. Full instructions 19/6 C.W.O. 'Circuit-tetch', 12 Cambridge Road, St. Albans, Herts.

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.

UFO DETECTOR CIRCUITS, data. 10s. (refundable). Paraphysical Laboratory (UFO Observatory), Downton, Wilts.

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.

YOUR CALL SIGN ENGRAVED. White Letters Black Plate 6 x 1 1/2in. 5/6. 2 x 1 1/2in. Badge Pin, 4/- Post Free. C.W.O. Workshops for Disabled, Northern Road, Cosham, Portsmouth, PO6 3EP.

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.

SERVICE SHEETS

SERVICE SHEETS. RADIO, TV, 5,000 Models. List 1/6. S.A.E. Enquiries. TELRAY, 11 Maudland Bank, Preston, Lancs.

LARGE SUPPLIER OF SERVICE SHEETS

(T.V., RADIO, TAPE RECORDERS, RECORD PLAYERS, TRANSISTORS, STEREOGRAMS, RADIOGRAMS CAR RADIOS)

Only 5/- each, plus large S.A.E.

(Uncrossed P.O.'s please, 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 (continued)

SERVICE SHEETS (75,000) 5/- each: please add loose 4d. stamp: callers welcome; always open. THOMAS BOWER, 5 South Street, Oakenshaw, Bradford.

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.

RADIO, TELEVISION over 3,000 models. JOHN GILBERT TELEVISION, 1b Shepherds Bush Rd., London W.6. SHE 8441.

SITUATIONS VACANT

TV and Radio, A.M.I.E.R.E., City & Guilds, R.T.E.B. Certs., etc. on 'Satisfaction or Refund of Fee' terms. Thousands of passes. For full details of exams and home training Courses (including practical equipment) in all branches of Radio, TV, Electronics, etc. write for 132-page Handbook—FREE. Please state subject. BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY (Dept. 137K), Aldermaston Court, Aldermaston, Berks.

ENGINEERS. A TECHNICAL CERTIFICATE or qualification will bring you security and much better pay. Elem. and adv. private postal courses for C.Eng., A.M.I.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 TECHNOLOGY, (Dept. 169K), Aldermaston Court, Aldermaston, Berks.

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 or Hi-Fi Service and want a job that looks ahead phone Michael Adler at 01-636 9606.

ELECTRICAL

**240 VOLT
ELECTRICITY
ANYWHERE**



BEST EVER 200/240 VOLT "MAINS" SUPPLY FROM 12 VOLT CAR BATTERY
Exclusive World Scoop Purchase. The fabulous Mk. 2D American Heavy Duty Dynamotor 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. Gov't. by Delco-Remy. This magnificent machine is unobtainable elsewhere.
Brand New and Fully Tested, only £4.19.6, 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

150 NEW ASSORTED Capacitors, Resistors, Silvered Mica, Ceramic, etc. Carbon, Hystab, Vitreous, 1/20 watt, 12/6 Post Free. WHITSAM ELECTRICAL, 33 Drayton Green Road, West Ealing, W.13.

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.

RECEIVERS & COMPONENTS (continued)

WE ARE BREAKING UP COMPUTERS

EX COMPUTER PRINTED CIRCUIT PANELS
2in. x 4in. packed with semiconductors 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. 3/6. With a guaranteed minimum of 85 transistors. 100 boards 65/- P. & P. 7/6. With a guaranteed minimum of 350 transistors.

GIANT PANELS. 5 1/2 in. x 4 in. 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. 1/10W. 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. 100K, 500K, 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-eq. On Finned Heat Sink (10D). 4 for £1. P. & P. 5/-

DIODES. Ex-eq. Silicon. 150 PIV, 10 amp. 4 for 10/- 150 PIV, 20 amp. 4 for £1. Post free

OVERLOAD CUT OUTS. Panel mounting in the following values. 5/- each. 2, 3, 4 amp. P. & P. 1/-

MINIATURE GLASS NEONS, 12/6 doz. P. & P. 1/-

PAPST FANS. Powerful Extractor/Blower fans. 4 1/2 in. x 4 1/2 in. x 2in. 230/250V. 100 c.f.m., 2,800 r.p.m. 50/- post free

MICRO SWITCHES. Miniature button type. 10/- doz. P. & P. 1/6

NEW SPRAGUE. 0.22 µF 250V small capacitors. 5/- doz. P. & P. 1/-

NEW SPRAGUE ELECTROLYTICS. 4 µF 150V. 5/- doz. P. & P. 1/-

LARGE CAPACITY ELECTROLYTICS. 4 1/2 in. 2in. diam. Screw terminals

7/6 each post free.
4,000 µF 72V d.c. wkg.
10,000 µF 25V d.c. wkg.
25,000 µF 12V d.c. wkg.

4 1/2 in. x 1 1/2 in. Plessey 5,000 µF 55V d.c. wkg. 8/- ea.
3 in. x 1 in. Plessey 2,000 µF 25V d.c. wkg. 6/- ea.
4 1/2 in. x 1 1/2 in. screw terminals, 2,500 µF 55V d.c. wkg. 6/- ea.

KEYTRONICS 52 Earls Court Road, London, W.8. Mail order only

Tel. 01-478 8499

COMPONENTS

EVERYTHING you need—capacitors, trimmers, resistors, pots, VDR's, thermistors, meters, Veroboard, switches, solder, wires and cables, tagboards and strips, screws, nuts, knobs, panel lamps and bulbs, plugs and sockets, etc. etc., not to mention VALVES AND SEMICONDUCTORS.

Full price lists free on request

J. R. HARTLEY

78B High Street Bridgnorth Shropshire

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 5d in stamps to: AUDIOSCAN, Dept. PW, 4 Princes Square, Harrogate, Yorks.

INTEGRATED CIRCUITS at lowest price GE Type PA234 1 Watt Audio Amplifier 17/6d. each inc. data. Newest GE Silicon NPN plana transistor 2N5172. Epoxy for economy Passivated for reliability. 25 volt 200 mW hfe 100 min. 1/9d. each. C.W.O. P. & P. 1/-d. per order. JEF ELECTRONICS, 12 York Drive, Grappenhall, Warrington, Lancs. Mail Order Only.

RECEIVERS & COMPONENTS (continued)

STABILISED POWER SUPPLY

as described in this issue

Transformer 13/6d
Smoothing Capacitor 3/9d
Rectifier diodes (4) 6/0d
Zener diode 4/6d
Veroboard 2 1/2" x 3 1/2" 3/3d
Complete kit of above 27/6d

All parts as specified in article.
Postage and Packing 1/-

BELL,

59, Fairfield Drive,
Whitley Bay, Northumberland

BRAND NEW ELECTROLYTICS, 15/16 volt, 0.5, 1, 2, 6, 8, 10, 15, 20, 30, 40, 50, 100, 200 mfd. 8/- per dozen, postage 1/-. The C.R. Supply Co., 127 Chesterfield Road, Sheffield 8.

BARGAIN LIST

Transistors OC44, OC71, OC72, OC45, at 2/- each. OC140, BSY26, BY212, BY216 at 3/- each.
Metal Rectifiers, 12v lamp contact cooled tec. 3/9 each.
Metal Rectifiers, 12v 2amp at 3/9 each. Metal Rectifiers, 12v 4amp at 7/6 each. TV Metal Rectifiers, 250v 200mA at 4/6.
Edgewise Volume Controls 5k Jap Replacements, 3/6 each.
Panel Meters, new square Clear Plastic. 1.65 x 1.65 0-1mA Front at £1.0.0 each.
Panel Meters 500 micro amp at £1.4.0 each.
Toggle Switches SPST, 2/6. DPDT at 3/- each.
New Resistances small 1/2 watt, at 3d. each.
Transformers-Subminiature output 3 ohms for OC72 etc. at 8d. each.
Transformers-Subminiature Driver for above at 2/8 each.
Jack Plugs Standard at 2/- Jack Sockets at 1/9.
Pax Panels 6in. x 4in. x 1/16in. at 10d. 4in. x 6in. at 1/6 each.
Condensers 25mf 25v at 1/- 1/2 in. Iron just cores at 6d. per doz.
Miniature slide switches DPDT at 1/8 each.
Aluminium Panels 6in. x 4in. at 1/8. 8in. x 6in. at 2/- each.
Earpieces with lead and 3-5 mm Plug 1/9.
Mail Order Only. Post & Packing 1/- S.A.E. for List.

FALSE SERVICES

36 GLOUCESTER ROAD, FELTHAM, MIDDLESEX

PACKS of mixed 4BA and 6BA plated screws and nuts. Min. quantity of 150 items per pack. 10/- per pack incl. postage. For specific requirements send SAE. WESTEK, P.O. Box 7, Rickmansworth, Herts.

EMSAC BASIC ANTENNA SYSTEMS.
Two meter converter—assembly £10, kit £8.10.0. Send SAE for details of this and antenna systems, antenna tuning units, etc. to—Electronic & Mechanical Sub-Assembly Co. Ltd., Highfield House, West Kingsdown, Kent.

VALVE BARGAINS

Any 5-9/-, 10-14/-, 100 £5. 10. 0.

From the list below:

EC882, ECL80, EF80, EF85, EY86, PCC84, PCC89, PCF80, PCL82, PCL83, PL36, PL81, PL82, PL83, PY33, PY81, PY82, 30F5, 6-30L2, 30FL1, ALL VALVES SET TESTED P & P 1/-

S. ASHWORTH

Velco Electronics, 62 Bridge Street, Ramsbottom, Bury, Lancs.

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.4

Galleon Trading Co., 298A Lodge Lane, Romford, Essex.

SILICON PLANAR TRANSISTORS. 100% tested and full data supplied with orders. NPN types for organ projects, 25 for £1. PNP types similar to 2N3702 and germanium similar to ACY22, 50 for £1. Post free. WESTEK, P.O. Box 7, Rickmansworth, Herts.

RADIO TELEMETRY UNIT

These are a low freq. Rx working on 120 Kc for use on 230v mains. They can be modified to 200Kc Radio 2 or provide basis for swt tuned radio or gram amp. Uses valves EC82x3, 6BE6, 12BH7, 6BA8, as 3 1/2 spk, 2 low speed motors, tape head with tape loop, also relays coils swts etc. Complete in case size 14x7x6in. in good condition with circ and mods.

Price £3 5s. plus 7/6 carr.

RX UNIT 6449

This is an R.F. I.F. unit. The R.F. section tunes approx. 180 to 220 Mc/s. This is motor tuned by a small 24v motor. Uses valves EC91 RF, EF91 Mix, 6C4 L.O.: this is followed by a 6 stage 45 Mc/s I.F. strip with EF91 valves, EB91 Det and EL91 Vid O/P. A small 24v cooling blower is also fitted. These are ex equipment in good condition.

Price £4 plus 7/6 post.

AMPLIFIER UNIT 469

1/P 230v 50c/s. These are a record playback amp and use valves 6X4, 6AQ5, 12AT7, 6BA6 in the main amp. This has a 3 ohm motor O/P and a 15 ohm main O/P line, input is 600 ohm or 100K. There is also a mixer channel for injecting time markers with valves 12AT7x2 and 6AL5. An O/P voltmeter is also fitted, jack sockets for mike and replay monitor are fitted, also preset level controls. The normal O/P of these units is approx 2.5 watts: this can be increased to 5 watts. 2 P.O. relays are also fitted for remote control, also a 50v relay supply. These are a well made unit in good condition.

Price £4 plus 10/- carr.

SELECTOR UNIT 7003

These contain a number of useful parts as follows: Meter 1mA scaled 0 to 1 and 0 to 180°. 2 1/2in. sq. Motor P.M. 24v driving into a reduction gear the o/p operates a 24 way switch, 13 relays 24v 2 pole c/o fuse. ind. lamp etc. Complete in case with outer cover size 12x5 1/2x7 1/2in. Good condition.

Price 30/- plus 7/6 carr.

CONTROL UNIT 903

Contains 9 24v relays, 2 and 4 pole c/o, 2 12v relays, 2 and 4 pole c/o, small 400c/s motor driving into a small gearbox. The o/p operates a micro switch. Modern unit in good condition.

Price 17/6 plus 6/- post.

I.F. UNIT 215

This is a 45 Mc/s I.F. strip with 5 stages, also Det and Vid o/p stage valves EF50x6, supplied with coax and power plugs, ex equipment.

Price 15/- plus 5/- post.

E.H.T. P.U.

This is an R.F. EHT unit O/P 8Kv with valves CV2231 and CV4024 with H.V. connector, ex equipment.

Price 25/- plus 5/- post.

CONTROL PANEL

Contains 15 miniature pots as follows: 1 megx6, 100Kx8 and 1K. All have 1/2in. shafts with single nut fixing, min. shaft size 3/16in., body size 1 1/2x1 1/2in. Ex equipment, good condition.

Price 12/6 plus 3/- post.

MAINS TRANSFORMER

Pri. 230v 50c/s, sec. 350-310-0-310-350 at 220mA. 5v at 6a, 6.7v at 5a, 6.3v at 3a twice, 6.3v 1a twice. Potted type ex equipment.

Price 35/- plus 7/6 carr.

METERS

Two types available, edgewise reading type 1 mA scaled 0 to 2000 yds linear scale 10 divisions scale 2 1/2x1 1/2in., 3 1/2in. deep. Ex equipment, also 500 uA scaled 0 to 5 2 1/2 OSD req. 2in. hole. Ex equipment.

Price both types 17/6 plus 2/6 post.

A. H. Supplies

57 Main Road, Sheffield S9 5HL.
Open to callers Mon, Wed, Fri and Sat only

METAL WORK

METAL WORK: All types cabinets, chassis, racks etc., to your specifications. PHILPOTTS METAL WORKS LTD., Chapman Street, Loughborough.

AERIALS

BAKER and BAINES FOR TELEVISION AND F.M. AERIALS

Examples to prices: F. M. dipole 21/-, H 38/- BBC dipole 30/-, X 38/-, H 42/-, 3 ele 89/-, ITA 3 ele 36/-, 5 ele 34/-, 8 ele 47/6, 11 ele 57/6, double 8 112/-, double 11 140/-, combined BBC/ITV 1 + 5 45/-, H + 5 69/-, X + 5 75/-, BBC 2 ele 29/-, 14 ele 37/-, 18 ele 54/-, 22 ele 63/-, double 22 ele 142/-, Loft special BBC/ITA 1 + 5 ele complete with pole and brackets 37/-, Prices include clamps & PP. CWO, state channels please. SAE enquiries. Coax, duplexes, poles, lashings etc. available.

11 DALE CRESCENT, TUPTON, CHESTERFIELD

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
8 1/2"	4 1/2"	18 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 15 6	1 18 9
12 1/2"	3 1/2"	1 1 0	1 6 6	1 11 0
12 1/2"	5 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"	9 1/2"	2 3 0	2 15 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

s. d.		s. d.		s. d.	
6"×3"	5 6	10"×7"	8 6	14"×3"	7 3
6"×4"	5 9	12"×3"	6 9	14"×9"	14 6
8"×3"	6 6	12"×5"	7 6	16"×6"	10 9
8"×6"	7 9	12"×8"	10 9	16"×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

PLEASE MENTION
"PRACTICAL WIRELESS"
WHEN REPLYING TO
ADVERTISEMENTS

PADGETTS RADIO STORE

OLD TOWN HALL, LIVERSEDGE,

YORKS. Tel. Cleckheaton 2886

Indicator Unit Type 26. Size 12x9x9in. With Outer Case fitted with 2 1/2in. CRT Type CV1526 9 B7G Valves. Clean condition but not tested. 32/6, p. & p. 10/-.

Aircraft Sighting Head with Gyro Unit complete with Transit Case. Condition fair. 18/6, carriage B.R.S. 12/-.

Oscillator Type 37. Complete with AC230 Volt Power Pack, Circuit and Grid Ref. Map condition good 37/6, carriage B.R.S. 12/-.

N.S.F. Toggle Switches D.P.D.T. Ex Units 1/-, post 1/-; 12 for 10/- post paid.

Ex Washing Machine Motors. Single phase 230 volt 1425 R.P.M. All perfect 26/-, post and packing 10/-.

Model Makers Motor with Train of Gears. 24 volts. Will run off 12 or 6 volts at slower speeds. 5/-, post and packing 3/6.

Speakers removed from T.V. Sets. All PM and 3 ohm. 6in. round 3/-, p. & p. 3/-; 6 for 24/- post paid. 6x4in. 3/-, p. & p. 3/-; 6 for 24/-, post paid. 5in. round 3/-, p. & p. 3/-; 6 for 24/- post paid. 7x4in. 5/-, p. & p. 3/-; 6 for 34/- post paid. Slot Speakers 8x2 1/2in. 5/-, p. & p. 3/-; 6 for 30/- post paid.

Reclaimed T.V. Tubes, with 6 months' guarantee 17in. Type AW43/80, AW43/88 40/-, MW43/69 30/-, 14in. Type 17/-.

All Tubes 12/- carriage. T.V. Tubes as above with slight scratch on face £1 each. Carriage 12/-.

Silicon Rectifier 500 MA 800 PIV. 2/6 post paid. 24/- per dozen post paid.

Jap Earpiece. Magnetic 8 ohm. Small and Large Plug 1/11 post paid.

G.P. Diodes 3/6 per dozen, post paid. Top Grade Mylar Tapes. 7in. Standard 11/6. 7in. Long Play 14/-, 7in. Double Play 19/6. 5in. Standard 7/9. 5in. Long Play 10/- plus post on any tape 1/9.

VALVE LIST—Ex Equipment. 3 months guarantee Single Valves Post 7d., over 3 Valves p. & p. paid

ARF12	1/6	PCL82	4/-	6B8	1/8
EB91	9d.	PCL83	5/-	6BW7	2/6
EF85	3/-	PL36	5/-	6K7	1/0
EBF80	3/-	PL38	6/-	6U4	5/-
EC081	3/-	PL81	4/-	6P28	5/-
EC082	3/-	PY33	5/-	10P13	2/6
EC083	3/-	PY31	1/8	18ST	8/6
EC083	4/-	PY82	1/8	20D1	3/-
ECL80	1/6	PZ30	5/-	20P1	5/-
EF50	1/-	U191	5/-	20P3	2/6
EF80	1/6	U281	5/-	30P11	5/-
EF91	9d.	U282	5/-	30P12	5/-
EY86	5/-	U301	5/-	30F5	2/6
PC084	2/-	U329	5/-	30FL1	5/-
PCF80	2/-	U251	5/-	6/30L2	5/-

NEW VALVES!

Guaranteed and Tested
24-HOUR SERVICE

IR5	5/8	DL94	5/8	EY81	6/8	PL84	6/8
IR5	4/8	DL96	6/8	EY86	5/8	PL800	12/8
IT4	2/8	DY86	5/8	EZ80	3/8	PL504	13/8
384	5/8	DY87	5/8	EZ81	4/8	PY32	10/-
3V4	5/8	EAB080	5/8	KT61	8/8	PY33	10/-
6AQ5	4/8	EB041	9/8	KT68	15/8	PY81	5/-
6V8G	3/-	EBF80	6/-	N78	17/-	PY82	5/-
26LGT	4/8	EBF89	5/8	N80	6/8	PY83	5/8
30C18	8/8	EC082	4/-	PC86	10/8	PY88	6/8
30FL1	18/8	EC083	4/8	PC88	10/8	PY800	6/8
30FL12	14/8	EC085	5/8	PC87	8/8	PY801	6/8
30FL14	11/8	ECH35	5/8	PC900	7/-	R19	6/8
30P4	11/8	ECH42	10/8	PC84	6/8	U26	12/8
30P19	11/8	ECH81	5/8	PC889	9/8	U26	11/8
30P11	18/8	ECL80	6/8	PCF80	5/11	U191	12/-
30P15	14/8	ECL82	6/8	PCF801	6/8	U193	8/8
CC83	9/8	ECL86	7/8	PCF802	8/8	UAB080	6/8
CL33	17/8	EF37A	6/-	PCF805	8/8	UBC41	8/8
DAC32	6/8	EF39	4/8	PCF808	11/8	UBF89	8/8
DAP91	4/8	EF80	4/8	PCF82	6/8	UC086	6/8
DAF96	5/8	EF85	4/8	PCF83	8/8	UCH42	10/8
DF3	7/8	EF86	6/8	PCF84	7/-	UCH81	6/-
DF91	2/8	EF89	4/8	PCL85	8/8	UCL82	6/8
DF96	6/8	EF183	5/8	PCL86	8/-	UF41	10/8
DK32	5/8	EF184	5/8	PFL20011/8	9/8	UF89	8/8
DK91	5/8	EH90	6/-	PL36	5/8	UL41	10/8
DK96	6/8	EL33	8/8	PL81	7/-	UL84	8/8
DL55	4/8	EL41	10/8	PL82	5/8	UY41	8/8
DL92	5/8	EL84	4/8	PL83	6/8	UY85	8/8

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

0-0005mFd TUNING CONDENSER
Proved design, ideal for straight or reflex circuits 2/6 each. 24/- doz.

ELLIOT SEALED CONTACT REED RELAY

Three circuits closed by 3V or 100MA. 8/6 each.

SLIM TUBULAR MICROPHONE
For hand holding or frontal suspension—lever switch—high impedance with lead and plugs for cassette tape recorder but suitable for most amplifiers. 19/6.

500 MICRO AMP MOVING COIL METER

2in. flush mounting round meter, ex Government but unused and perfect. 17/6.

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.

5000mFd 12V CONDENSER

Tubular size 3in. x 1in. dia. made by Plessey. 4/9 each, 48/- doz.

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. 120 boxes post free.

5in. x 5in. Printed Circuit Board
Ideal for dozens of projects. Heavy copper on 3/32in. sheet, 1/6 each or 15/- per dozen.

MAINS MOTOR

Precision made—as used in record decks and tape recorders—ideal also for extractor fan, blower, heaters etc. New and perfect. Ship at 9/6. Postage 3/- for first one then 1/- for each one ordered. 12 and over post free.

Horstmann "Time and Set" Switch

(A 15 amp switch). Just the thing if you want to come home to a warm house without it costing you a fortune. You can delay the switch on time of your electric fires, etc., up to 14 hours from setting time or you can use the switch to give a boost period of up to 3 hours. Equally suitable to control processing. Regular price probably around £5. Special ship price 29/6, p. & ins. 4/6.

ATLAS SLIMLINE FLUORESCENTS THE TWENTYLITE



A Fluorescent lighting unit made by the famous Atlas company, with super silent polyester filled choke and radio suppressed starter. The tube springs in and out and the whole unit is beautifully made and finished white enamel. Amazingly economical. If left on all the time costs only one penny per day (uses 1 unit). Measures 2ft. long. Is ideal in Kitchen, Bedroom, Hallway, Porch, Loft, etc. Don't miss this amazing offer. 39/6 with tube. Assembled ready to install. Postage and insurance 6/6 extra.

1 WATT AMPLIFIER & PREAMP

5 transistors—highly efficient, made for use with tapehead (14 but equally suitable for microphone or pick up—limited quantity 39/6. Full circuit diag. also shows tape controls 5/-



DREAMLAND CLOCK SWITCH

The wonderful DREAMLAND mains operated clock switch will automatically switch your blanket on and off each evening and you will always have a warm bed. It's luminous; you can always see the time and it's a really beautiful unit. An ideal gift. Can also control tape recorder, radio, lamp, etc., up to 500 watts. 39/6 plus 3/6 post & ins.



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.

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. R.A.E. with enquiries please.

OUT OF SEASON BARGAIN

Famous Norvic electric blanket claimed to be the most reliable in Britain. We offer at less than wholesale price "Corona de luxe" model, this has flame resistant super safe element and double thick fleecy cover attached by press studs—just undo the press studs to wash cover—double bed size 60 x 48in.—with control switch giving choice of three heats—in presentation box showing regular price £9.3.9—we offer at £5.19.6, post and ins. paid.

THERMAL CUTOUT

A miniature device 1in. dia. on one screw fixing mount—can be used for motor overload protection—fire alarm—soldering iron switch off, etc., etc.—16 amp contacts open with flame—radiant or conducted heat. 1/8 each, 15/- doz. £5 100.

STEREO CABINET

Size 25 x 14 x 9 1/2in. deep—speaker compartment each end—centre portion with hinged lid and removable bottom has platform for autotuner and room for amplifier—two tone (red and grey) velux covered by loud speaker ends need metal grille—with handle and clips—22/6, carriage and packing 15/-.



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 blows cold for summer cooling—adjustable thermostat acts as auto control and safety cut-out. Complete kit £3.15.0. Post and ins. 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. £8 doz. post paid.

500W IMMERSION HEATER

For small process tanks, etc. 200/240V 4 1/2in. into tank, 2 1/2in. outside of tank, dia. approx. 1 in., chrome plated 14/6. Post and insurance 4/6.



ELECTRONICS (CROYDON) LTD

Dept PW 266 London Road, Croydon CRO-2TH

Also 102/3 Tamworth Road, Croydon

COME OUT OF THE COLD AND ADD £££'s TO THE VALUE OF YOUR HOME!

EXTRA SPECIAL 48-PAGE HEATING SUPPLEMENT!

with invaluable, comprehensive how-to-do-it features on:

- Designing Your Own System
- Installing Warm Air Central Heating
- Installing a High-Output Back Boiler

And . . . a full run-down on the latest boilers, heaters, single-room heaters, accessories, fittings and controls!

TOWN FLAT FACE LIFT How a working couple carried out a low-cost transformation of their town flat.

GIVE YOUR KITCHEN THE BEAUTY TREATMENT with Ceramic Tiles. Cover the floor and walls in easy-clean hygienic tiles, tone in the rest of the kitchen with the same luxurious colour scheme and your kitchen takes on instant glamour! PRACTICAL HOUSEHOLDER shows you just how easy it is to attain beautiful results.

TIMBER DECAY A money-saving article showing how to recognise insect and fungus attack before it is too late.

SPECIAL OFFER

All-wool blankets. 70in. by 90in. for 61/6 and 90in. by 100in. for 88/-

PRACTICAL HOUSEHOLDER

LESS THAN A 1d A DAY . . . add £££'s TO THE VALUE OF YOUR HOME 2/-

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	6/8	6AT6	5/-	6DK6	8/6	6Z4	5/6
OA3	9/-	6AU4GT	12/-	6DQ6B	12/-	9BW6	8/6
OB2	6/8	6/8	9/-	6D84	15/-	10C2	10/-
OB3	10/-	6A15GT	6/8	6EA8	11/-	10D1	8/-
OC3	7/-	22/8	22/8	6EH7	6/8	10D2	8/-
OD3	6/8	6AU6	5/-	6EJ7	7/-	10P1	18/-
1B3GT	7/8	6AV5GT	6/1	6F1	14/-	10P9	10/-
1L4	3/6	6F6G	5/-	6F6G	5/-	10P18	8/-
1N5GT	8/6	6AV6	6/8	6F11	6/8	10L1	8/-
1Q5GT	10/-	6AW8A11/-	11/-	6F12	4/6	10LD11	11/-
1R4	6/8	6AX4GTB	6/8	6F13	7/-	10P13	11/-
1R5	7/-	9/-	9/-	6F14	12/-	10P14	20/-
1S4	5/8	6AX5GT	6/8	6F15	11/-	12AB5	10/-
1S5	5/8	6BA6	13/6	6F18	8/-	12AC6	7/6
1T4	4/6	6BE6	5/-	6F22	6/8	12AD6	7/6
1U4	6/8	6BF5	18/-	6F23	15/8	12AH7	5/6
1U5	9/8	6BF6	9/-	6F24	13/8	12A15	7/-
1V2	9/8	6BGG	12/-	6F25	15/-	12A16	7/6
1X2B	7/8	6BHG	8/6	6F26	14/-	12A17	6/8
1Y2	12/-	6BHG	8/6	6F28	14/-	12A18	6/8
2D21	6/8	6BJ6	8/6	6F29	6/8	12A19	6/8
3A3	11/-	6BK4	21/-	6F30	7/-	12A20	6/8
3A4	4/6	6BK7A	10/-	6F31	9/8	12A21	7/6
3A5	10/-	6BL7GA	6/8	6F32	6/8	12A22	7/6
3A8GT	10/-	12/-	12/-	6F33	6/8	12A23	7/6
3Q4	8/6	6BL8	13/-	6F34	6/8	12A24	7/6
3Q5GT	10/-	6BN4	13/-	6F35	6/8	12A25	7/6
384	7/-	6BN5	8/6	6F36	6/8	12A26	7/6
3V4	8/6	6BN6	8/6	6F37	6/8	12A27	7/6
5R4GY	11/-	6BQ5	5/-	6F38	6/8	12A28	7/6
5U4G	9/8	6BQ6GT	6/8	6F39	6/8	12A29	7/6
5U4GB	7/8	6BQ7	13/-	6F40	6/8	12A30	7/6
5V4G	8/6	6BQ7A	7/6	6F41	6/8	12A31	7/6
5V3GT	6/8	6BR7	17/-	6F42	6/8	12A32	7/6
5Z3	9/8	6BR8	13/-	6F43	6/8	12A33	7/6
5Z4G	7/8	6BR9	13/-	6F44	6/8	12A34	7/6
6Z4GT	8/6	6B9	17/8	6F45	6/8	12A35	7/6
6B0L2	15/-	6BX7	13/8	6F46	6/8	12A36	7/6
6A8G	6/8	6BZ6	6/8	6F47	6/8	12A37	7/6
6A8A	6/8	6C4	6/8	6F48	6/8	12A38	7/6
6A7	4/6	6C4	6/8	6F49	6/8	12A39	7/6
6A7A	9/8	6C5GT	7/8	6F50	6/8	12A40	7/6
6A7B	10/-	6C6	17/8	6F51	6/8	12A41	7/6
6A7C	10/-	6C6A	5/8	6F52	6/8	12A42	7/6
6A7D	10/-	6C6B	5/8	6F53	6/8	12A43	7/6
6A7E	10/-	6C6C	5/8	6F54	6/8	12A44	7/6
6A7F	10/-	6C6D	5/8	6F55	6/8	12A45	7/6
6A7G	10/-	6C6E	5/8	6F56	6/8	12A46	7/6
6A7H	10/-	6C6F	5/8	6F57	6/8	12A47	7/6
6A7I	10/-	6C6G	5/8	6F58	6/8	12A48	7/6
6A7J	10/-	6C6H	5/8	6F59	6/8	12A49	7/6
6A7K	10/-	6C6I	5/8	6F60	6/8	12A50	7/6
6A7L	10/-	6C6J	5/8	6F61	6/8	12A51	7/6
6A7M	10/-	6C6K	5/8	6F62	6/8	12A52	7/6
6A7N	10/-	6C6L	5/8	6F63	6/8	12A53	7/6
6A7O	10/-	6C6M	5/8	6F64	6/8	12A54	7/6
6A7P	10/-	6C6N	5/8	6F65	6/8	12A55	7/6
6A7Q	10/-	6C6O	5/8	6F66	6/8	12A56	7/6
6A7R	10/-	6C6P	5/8	6F67	6/8	12A57	7/6
6A7S	10/-	6C6Q	5/8	6F68	6/8	12A58	7/6
6A7T	10/-	6C6R	5/8	6F69	6/8	12A59	7/6
6A7U	10/-	6C6S	5/8	6F70	6/8	12A60	7/6
6A7V	10/-	6C6T	5/8	6F71	6/8	12A61	7/6
6A7W	10/-	6C6U	5/8	6F72	6/8	12A62	7/6
6A7X	10/-	6C6V	5/8	6F73	6/8	12A63	7/6
6A7Y	10/-	6C6W	5/8	6F74	6/8	12A64	7/6
6A7Z	10/-	6C6X	5/8	6F75	6/8	12A65	7/6
6A8	10/-	6C6Y	5/8	6F76	6/8	12A66	7/6
6A9	10/-	6C6Z	5/8	6F77	6/8	12A67	7/6
6B	10/-	6C7	5/8	6F78	6/8	12A68	7/6
6B1	10/-	6C8	5/8	6F79	6/8	12A69	7/6
6B2	10/-	6C9	5/8	6F80	6/8	12A70	7/6
6B3	10/-	6D	5/8	6F81	6/8	12A71	7/6
6B4	10/-	6D1	5/8	6F82	6/8	12A72	7/6
6B5	10/-	6D2	5/8	6F83	6/8	12A73	7/6
6B6	10/-	6D3	5/8	6F84	6/8	12A74	7/6
6B7	10/-	6D4	5/8	6F85	6/8	12A75	7/6
6B8	10/-	6D5	5/8	6F86	6/8	12A76	7/6
6B9	10/-	6D6	5/8	6F87	6/8	12A77	7/6
6BA	10/-	6D7	5/8	6F88	6/8	12A78	7/6
6BB	10/-	6D8	5/8	6F89	6/8	12A79	7/6
6BC	10/-	6D9	5/8	6F90	6/8	12A80	7/6
6BD	10/-	6DA	5/8	6F91	6/8	12A81	7/6
6BE	10/-	6DB	5/8	6F92	6/8	12A82	7/6
6BF	10/-	6DC	5/8	6F93	6/8	12A83	7/6
6BG	10/-	6DD	5/8	6F94	6/8	12A84	7/6
6BH	10/-	6DE	5/8	6F95	6/8	12A85	7/6
6BI	10/-	6DF	5/8	6F96	6/8	12A86	7/6
6BJ	10/-	6DG	5/8	6F97	6/8	12A87	7/6
6BK	10/-	6DH	5/8	6F98	6/8	12A88	7/6
6BL	10/-	6DI	5/8	6F99	6/8	12A89	7/6
6BM	10/-	6DJ	5/8	6F100	6/8	12A90	7/6
6BN	10/-	6DK	5/8	6F101	6/8	12A91	7/6
6BO	10/-	6DL	5/8	6F102	6/8	12A92	7/6
6BP	10/-	6DM	5/8	6F103	6/8	12A93	7/6
6BQ	10/-	6DN	5/8	6F104	6/8	12A94	7/6
6BR	10/-	6DO	5/8	6F105	6/8	12A95	7/6
6BS	10/-	6DP	5/8	6F106	6/8	12A96	7/6
6BT	10/-	6DQ	5/8	6F107	6/8	12A97	7/6
6BU	10/-	6DR	5/8	6F108	6/8	12A98	7/6
6BV	10/-	6DS	5/8	6F109	6/8	12A99	7/6
6BW	10/-	6DT	5/8	6F110	6/8	12A100	7/6

First Quality

Fully Guaranteed



ELECTRONIC VALVES

20P3	12/-	85A1	25/-	DY802	10/-	EL822	6/8	
20P4	20/-	85A2	25/-	EL801	6/8	EL823	12/6	
20P5	20/-	90A0	48/-	EL802	6/8	EL824	12/6	
20P6	20/-	90A1	48/-	EL803	6/8	EL825	12/6	
21L6GT	7/6	90C1	12/-	EL804	6/8	EL826	12/6	
22Z4C	6/-	90C25	25/-	EAC808/8	6/8	EF37A	9/8	
22Z5GT12	9/-	90C01	25/-	EAF42	10/-	EF39	8/8	
30A5	8/-	807	9/6	EAC801	9/8	EF40	9/8	
30A03	8/-	806A4	9/6	EFB33	9/8	EF41	12/6	
30C14	15/-	8050	27/6	EBCA1	10/-	EF42	14/6	
30C15	15/-	8146	30/-	EBCA1	6/8	EF85	13/6	
30C17	16/-	8146B	47/8	EBG90	5/8	EF80	6/8	
30C18	15/-	8287	6/8	EBG91	9/8	EF82	12/6	
30F5	17/-	8300	6/8	EBF30	7/8	EF85	7/8	
30F12	17/-	8392	42/-	EBF83	6/8	EF86	6/8	
30FLP12	18/6	7199	15/-	EBF89	8/8	EF89	5/8	
30FL13	10/-	7591A	20/-	ELB13	25/-	EF91	5/8	
30FL4	15/-	9002	6/8	EC	53	10/-	EF92	4/8
30L1	7/-	9003	6/8	EC88	12/-	EF94	5/8	
30L15	17/-	AZ31	10/-	EC88	12/-	EF94	5/8	
30L17	17/-	CHB1	16/-	EC90	6/8	EF95	8/8	
30P12	16/-	CBL13	17/-	EC92	6/8	EF96	4/8	
30P18	7/-	CY31	17/-	EC93	9/6	EF97	4/8	
30P19	15/-	CY31	17/-	EC94	9/6	EF183	6/8	
30P20	15/-	DL41	11/-	EC90A	11/-	EF184	7/8	
30P13	18/-	DAF91	5/-	EC881	6/6	EF800	20/6	
30PL14	17/-	DAF92	9/8	EC82	6/8	EF804	20/6	
35A3	10/-	DC90	7/8	EC83	6/8	EF811	15/6	
35A5	11/-	DC96	9/8	EC84	6/8	EF812	15/6	
35B5	18/-	DK10	10/-	EC85	5/6	EF814	13/6	
35C5	7/-	DK40	10/-	EC86	9/8	EK90	5/8	
35D5	13/-	DK91	7/-	EC89	11/-	EL34	10/6	
35LW	9/-	DK92	9/-	EC91	4/-	EL36	8/8	
36G4	5/-	EK96	8/-	EC92	4/-	EL38	8/8	
32Z3	11/-	EL90	6/8	ECF82	7/8	EL41	11/6	
32Z5	7/-	EL92	9/8	ECF83	15/-	EL42	11/6	
32Z6	7/-	EL93	9/8	ECF86	12/6	EL41	10/6	
35A5	13/-	EL94	8/8	ECF80A	10/-	EL83	8/8	
50B0	7/-	EL95	8/8	ECF442	13/-	EL84	8/8	
50C5	7/-	EL96	7/8	ECF443	13/-	EL85	8/8	
50CD6G	8/-	EL97	6/8	ECF83	9/6	EL86	8/8	
	30/-	DY70	12/-	ECF84	9/8	EL90	6/8	
50LGT8	8/-	DY86	6/6	ELC80	9/8	EL91	5/8	
83A1	14/-	DY87	7/8	ECL81	8/6	EL95	5/8	

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 — Draughts-
manship — 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 — Draughtsman-
ship — Metallurgy — Pro-
duction 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 IN-
CLUDING CHEMICAL ENG., AERO ENG., MANAGEMENT, INSTRU-
MENT 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.,
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

Basic Practical and Theoretic 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

INCLUDING TOOLS

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

B.I.E.T.

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

Published on or about the 7th of each month by I.P.C. MAGAZINES LIMITED, Tower House, Southampton Street, London, W.C.2. at the recommended maximum price shown on the cover. Printed in England by Index Printers, Dunstable, Beds. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia) Ltd. South Africa: CENTRAL NEWS AGENCY LTD. Rhodesia, Malawi and Zambia: KINGSTONS LTD. East Africa: STATIONERY & OFFICE SUPPLIES LTD. Subscription rate including postage for one year: To any part of the World £2.2s.0d.

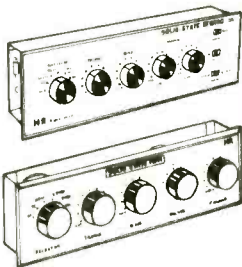
ENGLANDS LEADING COMPONENT & EQUIPMENT CENTRES

SOLID STATE-HIGH FIDELITY 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 FROM £15.5.0

THE FINEST VALUE IN HIGH FIDELITY—CHOOSE A SYSTEM TO SUIT YOUR NEEDS AND SAVE POUNDS



All units available separately.

SEND FOR FREE BROCHURE (No. 21) TODAY!
DEMONSTRATIONS DAILY AT '303' EDGWARE ROAD



MA7 MONO £8.10.0

OR THE STEREO POST PACKING 5/- EITHER MODEL

INTEGRATED TRANSISTOR AMPLIFIERS
MA66 12 WATTS STEREO
We are pleased to offer two new designs with the choice of either mono or stereo systems. These BRITISH DESIGNED UNITS favour the user in so many ways—with fantastic power and quality with far greater adaptability, with freedom for battery or mains operation.

For complete listening satisfaction choose either—

MA66 £16.10.0 OPTIONAL MAINS UNIT PS20 62/8d. p.p. 4/-

Illustrated leaflets 12 and 14 FREE on request.



DO IT YOURSELF MW/LW PORTABLE

New printed circuit design with full power output. Fully tuneable on both mw/lw bands. 7 transistors plus diode, push-pull circuit. Fitted 5 inch speaker, large ferrite aerial and Mullard transistors. Easy to build with terrific results. All local and Continental stations.
TOTAL COST £6.19.6 P.P. 4/6
TO BUILD Send for Brochure 1



NEW MODELS NOMBREX TRANSISTORISED Test Equipment

MODEL	PRICE	Leaflet
29a RF Gen	21 0 0	35
29a Xial RF Gen	29 10 0	35
30 Audio Generator	19 10 0	24
31 R.F. Generator	12 10 0	26
32 C.R. Bridge	10 10 0	28
33 Inductance Bridge	20 0 0	29

ELECTRONIC ORGANS KITS TO BUILD YOURSELF AND COMPLETE UNITS

The MAYFAIR

A completely new development in portable electronic musical instruments and a new field for the home constructor. The MAYFAIR produces a multitude of the most pleasing sounds with a wide range of tone colours suitable for classic or popular music. The organ is fully polyphonic, at full cords can be played over the entire keyboard. Includes 165 transistors, printed circuits panel, special fully sprung and depth of touch adjusted keyboard, attractive vinyl covered cabinet with carry handle. A complete detailed and illustrated construction manual is provided with circuits and full parts list. All items may be purchased separately. Full after sales service.



THE MAYFAIR 99 GNS BROCHURE 9

The GROSVENOR

is designed for the more ambitious musician and has a much wider range than most commercial organs. It comprises two four-octave (48 note) keyboards and a thirteen-note pedal board. It has four pitches (i.e. Bb, 4b, 2b, 1b) on the upper or solo keyboard, three pitches (i.e. 1b, 8b, 4b) on the lower or accompaniment keyboard, two pitches (i.e. 1b, 8b) on the pedal board. Variable sustain on the solo keyboard and variable vibrato on both keyboards. It has 15 voices in the solo tone forming unit, 10 voices in the accompaniment tone forming unit and 4 voices in the pedal tone-forming unit. All components and kit sections are available separately including the Oak Console at £65.18.0.



THE GROSVENOR KITS FROM £220 terms available BROCHURE 9B

PRACTICAL ELECTRONICS - ELECTRONIC ORGAN KIT

We are able to supply Parts as described in this series. Details on request.

ORGAN COMPONENTS: COMPLETE RANGE IN STOCK. 48 AND 61 NOTE KEYBOARDS. 2 TO 5 AMF GOLD CONTACTS. COILS AND CHOKES. REVERBERATION SPRINGS AND UNITS. STOP TABS AND ASSEMBLIES. PEDAL BOARDS. RHODIUM AND GOLD CLAD WIRE. ALSO PRINTED CIRCUITS ETC. COMPLETE RANGES FOR TRANSISTORISED ORGANS. ASK FOR NEW PRICE LISTS WITH DETAILS. LEAFLET 9B. ALL ENQUIRIES TO: DNGAN DEPT. MR. ELVINS



QUALITY CAR RADIOS

A precision engineered car radio that is perfect companion for long hours on the road. Has quick push-button operation for immediate station selection and choice of Medium or Long wave frequency. Output of 30 watts and more, top quality sound even at high motorway speeds. Includes full accessories and instructions.
Once built the MAYFAIR or GROSVENOR will then provide years of enjoyable entertainment.
Call in—See them for yourself.

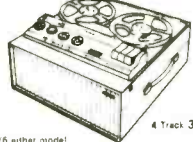


SCOPI STARR RECORD PLAYER

Deck. Plays 33, 45, 78 records. 9 volt operated. With mono cartridge. Brand new. As illustrated. 59/6 post 3/6.
MULLARD 1 WATT AMPLIFIER
9 volt, 5 transistor unit complete with volume control. Output to 3 ohms. Ideal for use with Starr record Deck. 45/- post 3/6. Send for leaflet 2.

BUILD A QUALITY TAPE RECORDER

To get the best out of your MAGNAVOX DECK, you need a MARTIN RECORDAR. 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 needed down to the last screw. FOR MAKING A SUPERB TAPE RECORDER which when built will compare favourably with instruments costing twice as much, yet you need no experience or technical skill to bring this about. THE INSTRUCTIONS MANUAL MAKES BUILDING EASY AND SUCCESS ASSURED.



P.P. 22/6 either model.
Kit comprises: Deck, Amplifier, Cabinet and speaker, with MICROPHONE 7 in 1, 200 ft tape, spare spool.
ALL UNITS AVAILABLE SEPARATELY.
ASK FOR BROCHURE 8.

VHF FM SUPERHET TUNER MKII

15 MULLARD TRANSISTORS & 4 DIODES - 300 Kc/s BANDWIDTH - PRINTED CIRCUIT CONSTRUCTION - HIGH FIDELITY REPRODUCTION MONO AND STEREO.
A popular VHF FM Tuner now used throughout the country for quality reception of mono and stereo broadcasts. There is no doubt about it—VHF FM gives the real sound. Excellent stability, economically priced.
PARTS TOTAL COST £6.19.6
DECODER £6.19.6 (CABINET 20/- EXTRA) ASK FOR LEAFLET 3.



MANUFACTURERS—DISTRIBUTORS
We publish a QUANTITY, SEMI-CONDUCTOR BULLETIN listing over 500 different devices available FROM STOCK in medium to large quantities at KEEN PRICES coupled with PROMPT DELIVERIES. TO OBTAIN YOUR COPY, WRITE TO US (on Company Headed Newspaper, please) requesting our SEMI-CONDUCTOR BULLETIN. For TELEPHONE QUOTATIONS, PHONE (01) 723 1008/9 Extn 4 (01) 723 0401 Extn 4.
We purchase medium to large quantities of Transistors and Devices excess to Manufacturers and Distributors requirements.
Write or phone 723-0401 extn 4.

NEW—MALLORY LONG LIFE MERCURY BATTERIES

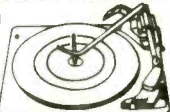
50% OFF LIST PRICES
*RM12 1.35 volt 3600 mAh OUR PRICE 5/- each size 2 x 1 1/2 dia.
*RM625 10.35 volt 350 mAh Pack of 8 Size 2 1/2 x 1 1/2 dia.
OUR PRICE 10/- each.
Easily split into eight 1.35v cells. These cells are ideal for any application where SMALL SIZE, HIGH CAPACITY and LONG LIFE are required. QUANTITIES AVAILABLE.

TRANSISTORS—SEMICONDUCTORS

COMPLETELY NEW 1969 LIST OF 1000 types. Send for your FREE COPY TODAY. (list 36)

S.C.R.'s from 5/-
Field Effect Transistors from 7/6
Power Transistors from 5/-
Diodes and Rectifiers from 1/6

GARRARD RECORD DECKS

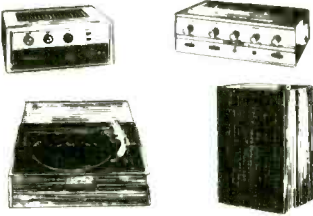


BRAND NEW
All below 11st price £ s d
2025 Mono/Stereo GK5 25 8 8 0
3000LM Mono/Stereo 9 TAHC 9 16 6
SP25 Mk II 9 19 6
A160 Mk II 13 0 0
AP75 19 0 0
SL65 11 19 6
SL65 14 14 0
SL75 29 0 0
SL95 35 0 0
A70 Mk II 12 12 0
B.S.R. UA25 Mono 5 19 6
MA65 9 19 6
MA70 12 12 0
MA75 15 5 0
401 Garrard 28 10 0
Carriage Packing 7/6d all models
Complete range of accessories available
Send for New 8-page brochures 16/17

Hi-Fi equipment to suit EVERY POCKET

VISIT OUR NEW HI-FI CENTRE at 309 EDGWARE ROAD AND SAVE UP TO £400 ON SEPARATE UNITS OR THE SYSTEM OF YOUR CHOICE for all leading makes

**AMPLIFIERS
TUNERS
DECKS
SPEAKERS
MICROPHONES
TEST EQUIPMENT
HEADPHONES
CARTRIDGES, etc.**



All with Terrific Savings
It will PAY YOU to pay us a VISIT!

COMPLETE SYSTEMS from £46 - Saves £12.10.0!
Send for now 8-page illustrated Hi-Fi list 16/17.

Fully Illustrated CATALOGUE

COMPLETELY NEW 9th EDITION (1969)

The most COMPREHENSIVE—CONCISE—CLEAR COMPONENTS CATALOGUE

Complete with 10/- worth discount vouchers
FREE WITH EVERY COPY
• 32 pages of transistors and semi-conductor devices, valves and crystals
• 210 pages of components and equipment.
• 70 pages of microphones, decks and Hi-Fi equipment.



6,500 ITEMS 320 BIG PAGES **Send today 7'6** Post etc 2/-

HENRY'S RADIO LTD
OPEN MON.-SAT. 9 a.m.-6 p.m. THURS. 9 a.m.-1 p.m.

303 Edgware Road, London, W.2. Mail Order Dept. all types of Components, Organ Dept. (01) 723-1008/9
309 Edgware Road, London, W.2. High Fidelity Sales, P.A. and Test Equipment, Record Decks (01) 723-6963