

Everest Instruments Ltd.

34, Shakespeare St., Nottingham.
Tel. (0602) 45466

All prices quoted include p. & p., VAT, min. order
£1.50, CWO only.

Transformers

All 240v 50hz primaries

Volts	Amps	£ p	Silicone bridge rectifiers	40p
6-3	1.5	1-83	2a 50v rms	47p
6-3	3-0	2-09	1a 100v plv	25p
9-0	1-0	1-83	1a 400v plv	37p
12-0	0-5	1-83	3a 400v plv	46p
12-0	1-5	2-09		
12-0	3-0	3-02	Triacs	
6-0-6	0-5	1-96	2a 400v plv	54p
9-0-9	0-5	1-96	6a 400v plv	89p
9-0-9	1-0	2-23	10a 400v plv	107p
10-0-10	2-0	3-00	Diac	20p
12-0-12	1-0	2-23	Linear I.C.'s	
12-0-12	2-0	3-13	700P 8p D.I.L.	29p
12-0-12	3-0	4-32	741P 8p D.I.L.	39p
15-0-15	1-0	2-88	748P 8p D.I.L.	43p
15-0-15	2-0	3-78	555 timer	71p
18-0-18	2-0	4-32	74 series T.T.L.	
20-0-20	1-0	3-03	7400	15p
20-0-20	2-0	4-32	7401	15p
30-0-30	1-0	4-32	7402	15p
0-10-12-14			7403	15p
16-16	4-0	4-58	7408	22p
0-12-15-20			7409	22p
24-30	2-0	4-45	7410	15p
0-5-20-30			7413	43p
40-60	2-0	6-54	7420	15p
5mh 1 amp chokes	0-25	7425		48p
20mh 2 amp chokes	0-35	7427		47p
240v a.c. solenoid	0-30	7430		15p
Dual reed relay 35 ohm	0-50	7432		47p
coil 2 reeds N.O.	0-50	7440		15p
Bulk tape eraser	3-53	7441		85p
15-8-3 ohm 12 watt matching	1-71	7447		125p
Transistor driver		7450		15p
4:1-1	0-27	7460		15p
18 swg sheet aluminium	0-45 sq ft.	7470		35p
Cut in multiples of 6, i.e. 6 x 6, 6 x 12, 12 x 12, 12 x 18, etc.		7472		35p
Circuit etchant 250ml	0-55	7473		47p
1 lb ferric chloride	0-55	7475		61p
Etch resist pens	1-00	7480		70p
		7492		73p
		7496		100p
		74121		50p
		74122		85p
		74145		123p
		74154		213p
		74176		152p
		74177		152p
		L129 5v regulator		145p

Semiconductors

Diodes	0-40
IN1191 80v 30amp	0-40
BB113 LW/MW/SW triple varicap	0-40
IN4001	8p
IN4002	7p
IN4003	9p
IN4004	9p
IN4006	12p
IN4007	13p
OA70	6p
OA81	7p
OA90	6p
OA91	6p
OA202	7p
BA154	8p
BA156	13p
IN914	4p
IN4148	4p
400mw zeners 3v to 33v	10p

Electrolytics. Tubular with axial leads except where stated.

Mfd.	Volts	Pence
47	4	7
330	4	7
68	6-3	7
470	6-3	9
1000	6	11
25	10	7
47	10	7
220	10	7
330	10	9
15	16	7
33	16	7
68	16	7
220	16	9
220	16	9
330	16	12
1000	16	20
10	25	7
47	25	7
100	25	7
150	25	9
200	25	11
1250	25	24
5000	25	25
1000+1000	30	32
2500	40	40
6-8	40	7
16	40	7
100	40	9
1000	50	35
1	63	7
4-7	63	7
10	63	7
32	63	7
800	63	32
4700	63	140

FULL SPEC. LED'S

Packs of 5-line clips & data

	1/32" lens	1/8" lens	1/4" lens
RED	£0.75	£0.75	£0.75
GREEN	£1.20	£1.20	£1.20
YELLOW	£1.20	£1.20	£1.20
ORANGE	£1.20	£1.20	£1.20

ECONOMY QUALITY LED'S
MIXED BAGS ALL COLOURS OF ALL SIZES—
IDEAL FOR EXPERIMENTS

50—£5
100—£9

FULL SPEC LED SEVEN SEGMENT DISPLAYS

0-8" COMMON ANODE

L.H. DECIMAL
RED, GREEN, YELLOW
£1.35 ea inc data



ECONOMY QUALITY

0-8" COMMON ANODE—L.H. Dec. RED 73p ea.

PLASTIC BOXES—COLOUR GREY



ABS—Ribbed inside on 6mm centres for 1.5mm PCB. Brass Corner inserts for securing top with 3mm screws. 62mm x 112mm x 31mm 1-9 52p ea; 10+ 48p; 120mm x 65mm x 40mm 1-9 66p ea; 10+ 62p ea; 150mm x 80mm x 50mm 1-9 75p ea; 10+ 71p ea.

POLYSTYRENE—PLAIN INSIDE—TOP SECURED BY SELF TAPPING SCREWS
61mm x 112mm x 31mm 1-9 35p ea, 10+ 32p ea.

SPECIAL OFFER

SAMPLE PACK—4 BOXES—1 ea size £3-10
P. & P. 25p per £1—minimum 25p.

NEON INDICATORS

150mm lead out wires



Fit 8mm hole and include apire clip for fixing
RED, AMBER, CLEAR, OPAL —19p ea
GREEN —28p ea

TYPE MP

Fits 6-4mm hole—nut fixing
RED, BLUE, GREEN, AMBER, CLEAR, OPAL —28p ea

LAMPHOLDER DH



Takes either LES (with adaptor provided) or MIDGET FLANGE BULBS.

Fits 13mm hole—nut fixing
RED, BLUE, GREEN, AMBER, CLEAR, OPAL, ORANGE 25p ea (bulbs not provided)

QUOTATIONS FOR LARGER QUANTITIES ON REQUEST. ALL PRICES INCLUDE VAT AT 8% Unless otherwise stated please add 20p p. & p. on orders under £10. TERMS—CWO

MICHAEL WILLIAMS ELECTRONICS

47 Vicarage Avenue,
Cheadle Hulme, Cheshire SK8 7JP

G GIRO NO. 391 7055. Access and Barclaycard accepted C.W.O. only. Terms of business as in our catalogue Export Order enquiries welcome (£3 min.)

Official Orders accepted from Educational & Government Departments

ALL PRICES INCLUDE VAT AND P & P

SHOP HOURS—9-12.30, 1.30-5 pm 6 DAYS

66 Pages—3000 Items Fully Illustrated
★20p Credit Vouchers★All New Stock

★Satisfaction Guarantee
★Discounts
★New Price List No. 1—S.A.E.

20p plus 10p postage
ELECTRONIC COMPONENTS
Catalogue 4a
FOR LTD

- Resistors - Capacitors - Semiconductors - Boxes - Cases - Kits - PC materials - Tools - Test Meters - Books - Pots - Coils - Hardware - Audio Accessories - Solder Connectors - Veroboard Transformers - Screws - Knobs - Calculators - Audio - Modules - Audio Leads - Batteries - Heatsinks - S Dec Storage Units etc. etc.

SPECIAL RESISTOR KITS (CARBON FILM 5%). (Prices include post & packing).
1052 1W/2W or 3W/3W KIT: 10 of each E12 value, 22 ohms—IM, a total of £70 £5-29 net
25E12 1W/2W or 3W/3W KIT: 25 of each E12 value, 22 ohms—IM, a total of 1425 E12-64 net

SPECIAL CAPACITOR KITS
C280 Kit—PC Mounting polyester 250V. 5 of each value: 0-01, 0-022, 0-047, 0-1, 0-22µF. 2 of 0-47, 1µF. £1-98
C296 Kit—Tubular polyester. 400V. 5 of each value: 0-01, 0-022, 0-047, 0-1, 0-22µF. 2 of 0-47µF. £2-67

Ceramic Kit—square plaque. 50V. 5 of each value: 22, 33, 47, 100, 220, 330, 470, 1000pF, 2200, 4700pF. 0-01µF. £1-88
250V Paper Kit—Tubular metal case. 3 of each value: 0-05, 0-1, 0-25, 0-5, 1µF £1-41 net.

500V Paper Kit—Tubular metal case. 3 of each value: 0-025, 0-05, 0-1, 0-025, 0-5µF. £1-41 net
1000V Paper Kit—Tubular metal case. 3 of each value: 0-01, 0-025, 0-05, 0-1µF. £1-63 net

B. H. COMPONENT FACTORS LTD.

MULTIMETER U4323
22 Ranges plus AF/IF Oscillator for 20,000Ω/Volt.
Vdc—0-5—1000V in 7 ranges
Vac—2-5—1000V in 6 ranges
1dc—0-05—500mA in 5 ranges
Resistance—5Ω—1M Ω in 4 ranges.
Accuracy—5% of F.S.D.
OSCILLATOR—1 KHz and 485KHz (A. M.) at approx. 1 Volt
Size—160 x 97 x 40mm.
Supplied complete with carrying case, test leads and battery.
PRICE £3-64 net P. & P. 75p

U4323

MULTIMETER U4324
34 Ranges. High sensitivity. 20,000Ω/Volt.
Vdc—0-6—1200V in 9 ranges.
Vac—3—300V in 8 ranges.
1dc—0-06—3A in 6 ranges.
1ac—0-3—3A in 5 ranges.
Resistance—25Ω—5M Ω in 5 ranges.
Accuracy—dc and R—2½% of F.S.D. ac and db—4% of F.S.D.
Size—167 x 98 x 63mm.
Supplied complete with storage case, test leads, spare diode and battery.
PRICE £10-64 net P. & P. 75p.

U4324

MULTIMETER U4341
27 Ranges plus Transistor Tester. 15,700Ω/Volt.
Vdc—0-3—900V in 8 ranges.
Vac—1-5—750V in 6 ranges.
1dc—0-06—600mA in 5 ranges.
1ac—0-3—300mA in 4 ranges.
Resistance—2KΩ—2m Ω in 4 ranges. Accuracy—dc—2½% ac—4% of F.S.D.
hfe—10—350 in 2 ranges.
Size—115 x 215 x 90mm.
Complete with metal carrying case, test leads, and battery.
PRICE £11-88 net P. & P. 75p.

U4341

(P. W.) LEIGHTON ELECTRONICS CENTRE.
59 NORTH STREET, LEIGHTON BUZZARD.
LU7 7EG. Tel: Leighton Buzzard 2316 (Std. Code 05253).

TRIMMERS air spaced ceramic 20pf 10 for 80p. **TRIMMERS** miniature 3/10pf 10mm dia 5 for 50p. **FEEDTHROUGH CONDS** 1000pf/500v solder in type 10 for 50p. **ERIE** Feedthrough filtercons solder in type 1750pf/250v high spec filters 10 for £1. **HEADPHONE LEAD** with high to low res matching trans 5ft fitted standard jack £1.30. **EARPIECE** single unit 20 ohm with ext cord £1. **INSULATORS** small stand off ceramic 6ba stud, solder tag approx 11mm high 10 for 50p. **NUT & BOLT** pack approx 300 2 to 8Ba inc washers, solder tags etc £1.30. **MINIATURE COILS** with scr cans & slugs 5mm dia formers 10 for 50p. **MINIATURE RF** coupling trans as two windings one with ct wound on two ferrites 20 for 50p. **R.F. chokes** miniature wire ends 10 for 50p. **SPEAKER UNITS** small horn speaker for use on motorcycle 3 ohm with fix brk & cable size 5 x 3" £2.50. **EXTENDIBLE CORDS** 12" closed 36" open 6 core black 2 for £1. **REMOTE** Tx/Rx crystal chan sel provision for 6 Tx & 6 Rx crystals Hc6/u type plus 6 x BC108, 6x trimm swt diodes etc £1.60. **SWITCH** min rotary 2p 5w 1/2 x 1/2" shaft 2 for 60p. **HANDSETS** with press to talk swt low res earpiece & dynamic mike 4ft ext cable with plug £1.50. Also handset with press button & high res 4K mic £1.50 U.H.F. head unit with I.F. unit & crystal osc, 450/470Mc/s O/P at 10.7 Mc/s two items all transistor with circ £4.70. **CRYSTAL FILTERS** all 10.7 Mc/s min type 30Kc b.w. £1.30. 15 Kc b.w. & 12 Kc b.w. £1.60. **COAX CABLE** type UR57 heavy duty type 75 ohm approx 3/8th suitable 19/62 sets etc 20 mts for £3. **I.F. TRANS** miniature type 455Kc adjustable size 14 x 14 x 18mm 3 for 65p. **INTERGRATED CIRCS** three types CA3014 I.F. amp & disc wide band, ULN2111A wide band amp with product det, TAA300 audio amp 1 watt O/P into 3 ohm one of each with data sheets £1.50. V.H.F. Tx osc, multiplier drive ass all on one board 6 x 4 1/2" gives 500 Mill/W drive O/P in 70/90Mc/s range, as int phase mod, uses Hc6/u crystals, 2N3866 in final stage, some gen £3. **JACK PLUGS** min 2.5mm 5 for 50p. H.F. Trans 75 to 600 ohm 1 to 20Mc/s 70 watts fully enclosed £3.40. **HEAD & MIKE** sets for use with 19 set low res moving coil mike & headset, hand mike £3. **CABLE** multi core with 27 x 1 amp, 4 x 3 amp wires plus one screened pair & one single scr approx. 5/8th 18ft long £1.40. **CRYSTALS** FT243 type range 5.6 to 8.6Mc/s in 25Kc steps 5 different for £1.40. Also min wire ended type in range 13 to 19Mc/s ex equip 10 for £1.50. **METER CONT** No. 1 with mains P.U. & carrying case meter ind 1 to 10 Mill/Rongt tested with circ etc £8.50. **SIGNAL GENERATOR** Triplet 1632 range 100Kc to 120Mc/s in 10 bands, with xtal check, int mod, o/p meter etc for 115v 50c/s supplied with circ, inst book tested S/Hand £29.16. **IND UNIT** APN-9 as 3BP1 CRT, 34x octal valves, 100Kc xtal, in neat case 20 x 12 x 8" with CRT magnifier, I/P 115v 400c/s S/Hand with circ. £13.50. **CALIBRATOR** Unit general purpose with O/Ps at 100K, 1 & 10Mc/s harmonics to 25th, use 3 separate crystals, int mixing, for use on 240v mains with handbook, S/Hand tested fuller spec on request £19. **TAPE HEADS** 8 track for 1" tape low imp £1.20. **RX UNIT** crystal controlled 70/90Mc/s dual conversion 10.7 & 2Mc/s I.F.s o/p for speaker, 2 RF stages, supplied with 2nd osc crystal & circ S/Hand £3.75.

Above prices inc carr/postage & V.A.T.
all goods are new unless stated S/Hand.
SAE for list or enquiry. Shop open
Tues to Sat.

A. H. SUPPLIES

122 HANDSWORTH RD., SHEFFIELD S9 4AE
Ph. 444278 (0742)

ENGINEERS

FREE

YOURSELF FOR A

BETTER JOB WITH MORE PAY!

Do you want promotion, a better job, higher pay? "New opportunities" shows you how to get them through a low-cost, Home Study Course. There are no books to buy and you can pay as you learn.



This easy to follow GUIDE TO SUCCESS should be read by every ambitious engineer. Send for this helpful 76-page free book NOW! No obligation, nobody will call on you. It could be the best thing you ever did.

CHOOSE A BRAND NEW FUTURE HERE



CUT OUT THIS COUPON
Tick or state subject of interest.
Post to address below.

ELECTRICAL & ELECTRONICS

Practical Radio & Electronics (with KIT) ☐

Electronic Engineering Certificate ☐

General Elect. Eng. Certificate ☐

C. & G. Elect. Installations ☐

Elect. Install. & Work ☐

C. & G. Elect. Technicians ☐

RADIO & TELECOM-MUNICATIONS

Colour TV Servicing ☐

C. & G. Telecoms. Technician's Cert. ☐

C. & G. Radio, TV & Electronics Mech. Cert. ☐

Radio & TV Engineering Course ☐

Radio, Servicing & Repairs ☐

Radio Amateur's Exam. ☐

AUTO & AERO Motor Mechanics ☐

C. & G. Motor V. Mechanics ☐

General Auto Engineering ☐

A.M.I.M.I. ☐

Air Registration Board Certs. ☐

M.A.A./I.M.I. Dip. ☐

CONSTRUC-TIONAL

Heating, Ventilating & Air Conditioning ☐

Architectural Draughtsmanship & Design ☐

L.I.O.B. ☐

Carpentry & Joinery ☐

Plumbing Technology ☐

General Building ☐

Painting & Decorating ☐

MECHANICAL

A.M.S.E. (Mech.) ☐

General Mech. Eng. ☐

Inst. Engineers & Technicians ☐

Maintenance Engineering ☐

Welding ☐

MANAGEMENT & PRODUCTION

Computer Programming ☐

Inst. of Cost & Managements Accts. ☐

DRAUGHTS-MANSHIP & DESIGN

General Draughtsmanship ☐

A.M.I.E.D. ☐

Electrical Draughtsmanship ☐



G.C.E.

—58 'O' & 'A' Level Subjects
—over 10,000 Group Passes!

Aldermaston College

Dept. TPW 15, Reading RG7 4PF.

also at our London Advisory Office, 4 Fore Street Avenue, Moorgate, London EC2Y 5ET. Tel. 628 2721.

NAME (Block Capitals)

ADDRESS

Postcode.....

Other subjects of interest..... Age.....

Accredited by C.A.C.C. Member of A.B.C.C.

HOME OF BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

Practical Wireless Classified Advertisements

Receivers and Components

BETA DEVICES MANUFACTURERS BRANDED PRODUCTS

TRANSISTORS	DIODES & RECT.	BRIDGE RECT.
AF125 0-20 IN914 0-04 1A 100V W01 0-20		
ASY299 0-25 IN4148 0-04 1A 200V W02 0-22		
BC107/8/9 0-09 IN4001/2 0-05 1A 600V W06 0-30		
BC109C 0-11 IN4003/4/5 0-05 2A 200V 22-00		
BC441 0-20 IN4006/7 0-08 ZENERS		
BC461 0-25 IN5401 0-11 BZY88C 3-3		
BCY70/71/72/13 0A91 0-05 33V 5% 0-09		
BFX86/7/8 0-20 3015F 1-00 200V 5% 0-15		
BFY50 0-12 DL747 2-45 L.E.D. 0-17		
BFY51/52 0-12 TL8480 0-20 200V-RED 0-17		
2N2646 0-30 T1A.800 0-50 LED CLIP 0-02		
2N2926G 0-09 555 Timer 0-50 OP. AMP. IC's		
2N3053 0-14 D.I.L. SOCKETS		
2N3055 0-38 D.I.L. SOCKETS		
OC28 0-45 5 Pin 0-12 709C D.I.L. 0-30		
OC35 0-35 14 Pin 0-12 741C D.I.L. 0-30		
OC36 0-45 18 Pin 0-14 741C D.I.L. 0-30		
OC36 0-35 18 Pin 0-14 728C D.I.L. 0-30		
TTP31A 0-60 ADD 17% V.A.T.		
TTP32A 0-65 747C D.I.L. 0-35		
		748C D.I.L. 0-35

NEW CAP-PAC 1 NEW
CONTENTS:—AL ELECTROLYTIC CAPACITORS
10mf 16V 6 pcs Value £1.65
22mf 16V 3 pcs
47mf 16V 3 pcs Now £1.00 (inc. VAT)
100mf 16V 6 pcs
25mf 25V 3 pcs

C.W.O. PLUS P.P. 15p TO BETA DEVICES,
4, Highbridge Street,
Waltham Abbey, Essex.

ENTHUSIASTS OF RADIO 1920 to 1945! For components, valves, service sheets & complete receivers, contact us. Monthly newsheet available upon receipt of S.A.E. Tudor Rees, 64, Broad St., Staple Hill, Bristol, BS16 5NL. 0272 565472.

HIGH STABILITY

QUARTZ CRYSTALS

4kHz TO 105MHz

CUSTOM DESIGNED OR PRODUCED IN A FULL RANGE OF INDUSTRIAL AND MOBILE SPECS.

WRITE OR TELEPHONE FOR DETAILS.

TRISDENE LTD.
46 CRANE ROAD, BILLINGHAM, WIRRAL, LANC. WMS 7EZ
ENGLAND. Tel: 051-342 4263

BRAND NEW COMPONENTS BY RETURN: Electrolytics—16V, 25V, 50V—0.47, 1.0, 2.2, 4.7, 10 mfdms.—5p. 22, 47—51p. (50V—6p) 100—7p. (50V—8p), 220—8p. (50V—10p), 500—11p. (50V—16p), 1000/25V—18p. Subminiature bead-type tantalums—0.1/35V, 0.22/35V, 0.47/35V, 1.0/35V, 2.2/35V, 4.7/35V, 10/20V, 22/16V, 47/6V, 100/3V.—11p. Mylar Film 100V.—0.001, 0.002, 0.005, 0.01, 0.02.—3p. 0.04, 0.05—31p. Mullard tubular polyester 400V E6 series 0.001-0.022—31p. 0.033-0.1—41p. Mullard miniature C333 ceramics 63V E12 series 2%, 1.8 pf.—47 pf.—3p. 56 pf.—330 pf.—31p. Polystyrene 63V E12 series 10 pf.—1000 pf.—3p. 1200 pf.—10,000 pf.—4p. Miniature Highstab. carbon film resistors 1/2W E12 series 5% 10-100M. (10% over 1M.) 1.2p. Postage 10p. Prices VAT Inclusive. The C.R. Supply Co., 127, Chesterfield Road, Sheffield S8.

RESISTOR BARGAINS

Brand New mixed value packs of 1 watt 5% carbon film resistors in the range 100ohms—1 Meg. No large quantities of high values.

Pack of	250	£2.00
	500	£3.50
	1,000	£5.00

THESE PRICES INCLUDE POST & PACKING AND VAT

Electronic Digital Clocks,
43a Chisstead Valley Road,
Coulson, Surrey. Tel: 01-688-8693.

500 COMPONENTS. Resistors, capacitors, diodes, transistors, pots, coils, etc. Identified, formed leads, fall-out, and surplus. Good value at £1.60. All inclusive (U.K. postal rates only). CWO please to L. Pensensy, PW Bankhead Farm, South Queensferry, West Lothian.

Precision Polycarbonate Capacitors

All High Stability—extremely Low Leakage			
440V AC RANGE	Dimensions	Price	Value µF
(µF)	(mm)	(pence)	(µF)
0.01µF	27 12-7	51p	0.01µF & 0.1µF
0.015µF	27 12-7	59p	0.022µF, 0.33µF, 0.47µF
0.022µF	33 16	64p	0.68µF
0.025µF	33 16	67p	1.0µF
0.033µF	33 16	75p	1.5µF
0.047µF	33 19	80p	2.2µF
0.05µF	33 19	87p	3.3µF
0.068µF	50-8 19	93p	4.7µF
0.1µF	50-8 19	103p	6.8µF
0.15µF	50-8 25-4	121p	10µF
0.22µF	50-8 25-4	144p	15µF
0.33µF	50-8 25-4	174p	22µF

TANTALUM BEAD CAPACITORS—Value available: 0.1, 0.22, 0.33, 0.47, 0.68, 1.0, 2.2, 3.3, 4.7, 6.8µF at 15V/25V or 35V; 10-0µF at 16V/20V or 25V; 22-0µF at 6V/10V or 16V; 33-0µF at 6V or 10V; 47-0µF at 3V or 6V; 100-0µF at 3V. ALL at 12p each; 10 for £1.10*. 50 for £5.00*. 100 for £9.00*.

TRANSISTORS V.L.C.'s			
BC107/8/9	8p	*BC212/212L 14p	2N3702/4 11p
*BC114 12p		*BC213/213L 11p	2N3055 50p
*BC147/8/9 10p		*BC214/214L 11p	OC71/2 12p
*BC163/154 12p		*NE555Timer 61p	
*BC157/8/9 12p		*BF194/5 12p	741C 8pin DIL 21p
*BC182/182L 11p		BFY50/1/2 20p	
*BC183/183L 11p		AP178 30p	ZN414 32p
*BC184/184L 12p		AN234 38p	SN76013ND £1.50

POPULAR DIODES—1N914 8p, 8 for 45p, 18 for 60p; 1N4001 8p, 8 for 45p, 18 for 60p; 1N4002 8p, 8 for 45p, 18 for 60p; 1N4003 8p, 8 for 45p, 18 for 60p; 1N4004 8p, 8 for 45p, 18 for 60p; 1N4005 8p, 8 for 45p, 18 for 60p; 1N4006 8p, 8 for 45p, 18 for 60p; 1N4007 8p, 8 for 45p, 18 for 60p; 1N4008 8p, 8 for 45p, 18 for 60p; 1N4009 8p, 8 for 45p, 18 for 60p; 1N4010 8p, 8 for 45p, 18 for 60p; 1N4011 8p, 8 for 45p, 18 for 60p; 1N4012 8p, 8 for 45p, 18 for 60p; 1N4013 8p, 8 for 45p, 18 for 60p; 1N4014 8p, 8 for 45p, 18 for 60p; 1N4015 8p, 8 for 45p, 18 for 60p; 1N4016 8p, 8 for 45p, 18 for 60p; 1N4017 8p, 8 for 45p, 18 for 60p; 1N4018 8p, 8 for 45p, 18 for 60p; 1N4019 8p, 8 for 45p, 18 for 60p; 1N4020 8p, 8 for 45p, 18 for 60p; 1N4021 8p, 8 for 45p, 18 for 60p; 1N4022 8p, 8 for 45p, 18 for 60p; 1N4023 8p, 8 for 45p, 18 for 60p; 1N4024 8p, 8 for 45p, 18 for 60p; 1N4025 8p, 8 for 45p, 18 for 60p; 1N4026 8p, 8 for 45p, 18 for 60p; 1N4027 8p, 8 for 45p, 18 for 60p; 1N4028 8p, 8 for 45p, 18 for 60p; 1N4029 8p, 8 for 45p, 18 for 60p; 1N4030 8p, 8 for 45p, 18 for 60p; 1N4031 8p, 8 for 45p, 18 for 60p; 1N4032 8p, 8 for 45p, 18 for 60p; 1N4033 8p, 8 for 45p, 18 for 60p; 1N4034 8p, 8 for 45p, 18 for 60p; 1N4035 8p, 8 for 45p, 18 for 60p; 1N4036 8p, 8 for 45p, 18 for 60p; 1N4037 8p, 8 for 45p, 18 for 60p; 1N4038 8p, 8 for 45p, 18 for 60p; 1N4039 8p, 8 for 45p, 18 for 60p; 1N4040 8p, 8 for 45p, 18 for 60p; 1N4041 8p, 8 for 45p, 18 for 60p; 1N4042 8p, 8 for 45p, 18 for 60p; 1N4043 8p, 8 for 45p, 18 for 60p; 1N4044 8p, 8 for 45p, 18 for 60p; 1N4045 8p, 8 for 45p, 18 for 60p; 1N4046 8p, 8 for 45p, 18 for 60p; 1N4047 8p, 8 for 45p, 18 for 60p; 1N4048 8p, 8 for 45p, 18 for 60p; 1N4049 8p, 8 for 45p, 18 for 60p; 1N4050 8p, 8 for 45p, 18 for 60p; 1N4051 8p, 8 for 45p, 18 for 60p; 1N4052 8p, 8 for 45p, 18 for 60p; 1N4053 8p, 8 for 45p, 18 for 60p; 1N4054 8p, 8 for 45p, 18 for 60p; 1N4055 8p, 8 for 45p, 18 for 60p; 1N4056 8p, 8 for 45p, 18 for 60p; 1N4057 8p, 8 for 45p, 18 for 60p; 1N4058 8p, 8 for 45p, 18 for 60p; 1N4059 8p, 8 for 45p, 18 for 60p; 1N4060 8p, 8 for 45p, 18 for 60p; 1N4061 8p, 8 for 45p, 18 for 60p; 1N4062 8p, 8 for 45p, 18 for 60p; 1N4063 8p, 8 for 45p, 18 for 60p; 1N4064 8p, 8 for 45p, 18 for 60p; 1N4065 8p, 8 for 45p, 18 for 60p; 1N4066 8p, 8 for 45p, 18 for 60p; 1N4067 8p, 8 for 45p, 18 for 60p; 1N4068 8p, 8 for 45p, 18 for 60p; 1N4069 8p, 8 for 45p, 18 for 60p; 1N4070 8p, 8 for 45p, 18 for 60p; 1N4071 8p, 8 for 45p, 18 for 60p; 1N4072 8p, 8 for 45p, 18 for 60p; 1N4073 8p, 8 for 45p, 18 for 60p; 1N4074 8p, 8 for 45p, 18 for 60p; 1N4075 8p, 8 for 45p, 18 for 60p; 1N4076 8p, 8 for 45p, 18 for 60p; 1N4077 8p, 8 for 45p, 18 for 60p; 1N4078 8p, 8 for 45p, 18 for 60p; 1N4079 8p, 8 for 45p, 18 for 60p; 1N4080 8p, 8 for 45p, 18 for 60p; 1N4081 8p, 8 for 45p, 18 for 60p; 1N4082 8p, 8 for 45p, 18 for 60p; 1N4083 8p, 8 for 45p, 18 for 60p; 1N4084 8p, 8 for 45p, 18 for 60p; 1N4085 8p, 8 for 45p, 18 for 60p; 1N4086 8p, 8 for 45p, 18 for 60p; 1N4087 8p, 8 for 45p, 18 for 60p; 1N4088 8p, 8 for 45p, 18 for 60p; 1N4089 8p, 8 for 45p, 18 for 60p; 1N4090 8p, 8 for 45p, 18 for 60p; 1N4091 8p, 8 for 45p, 18 for 60p; 1N4092 8p, 8 for 45p, 18 for 60p; 1N4093 8p, 8 for 45p, 18 for 60p; 1N4094 8p, 8 for 45p, 18 for 60p; 1N4095 8p, 8 for 45p, 18 for 60p; 1N4096 8p, 8 for 45p, 18 for 60p; 1N4097 8p, 8 for 45p, 18 for 60p; 1N4098 8p, 8 for 45p, 18 for 60p; 1N4099 8p, 8 for 45p, 18 for 60p; 1N4100 8p, 8 for 45p, 18 for 60p; 1N4101 8p, 8 for 45p, 18 for 60p; 1N4102 8p, 8 for 45p, 18 for 60p; 1N4103 8p, 8 for 45p, 18 for 60p; 1N4104 8p, 8 for 45p, 18 for 60p; 1N4105 8p, 8 for 45p, 18 for 60p; 1N4106 8p, 8 for 45p, 18 for 60p; 1N4107 8p, 8 for 45p, 18 for 60p; 1N4108 8p, 8 for 45p, 18 for 60p; 1N4109 8p, 8 for 45p, 18 for 60p; 1N4110 8p, 8 for 45p, 18 for 60p; 1N4111 8p, 8 for 45p, 18 for 60p; 1N4112 8p, 8 for 45p, 18 for 60p; 1N4113 8p, 8 for 45p, 18 for 60p; 1N4114 8p, 8 for 45p, 18 for 60p; 1N4115 8p, 8 for 45p, 18 for 60p; 1N4116 8p, 8 for 45p, 18 for 60p; 1N4117 8p, 8 for 45p, 18 for 60p; 1N4118 8p, 8 for 45p, 18 for 60p; 1N4119 8p, 8 for 45p, 18 for 60p; 1N4120 8p, 8 for 45p, 18 for 60p; 1N4121 8p, 8 for 45p, 18 for 60p; 1N4122 8p, 8 for 45p, 18 for 60p; 1N4123 8p, 8 for 45p, 18 for 60p; 1N4124 8p, 8 for 45p, 18 for 60p; 1N4125 8p, 8 for 45p, 18 for 60p; 1N4126 8p, 8 for 45p, 18 for 60p; 1N4127 8p, 8 for 45p, 18 for 60p; 1N4128 8p, 8 for 45p, 18 for 60p; 1N4129 8p, 8 for 45p, 18 for 60p; 1N4130 8p, 8 for 45p, 18 for 60p; 1N4131 8p, 8 for 45p, 18 for 60p; 1N4132 8p, 8 for 45p, 18 for 60p; 1N4133 8p, 8 for 45p, 18 for 60p; 1N4134 8p, 8 for 45p, 18 for 60p; 1N4135 8p, 8 for 45p, 18 for 60p; 1N4136 8p, 8 for 45p, 18 for 60p; 1N4137 8p, 8 for 45p, 18 for 60p; 1N4138 8p, 8 for 45p, 18 for 60p; 1N4139 8p, 8 for 45p, 18 for 60p; 1N4140 8p, 8 for 45p, 18 for 60p; 1N4141 8p, 8 for 45p, 18 for 60p; 1N4142 8p, 8 for 45p, 18 for 60p; 1N4143 8p, 8 for 45p, 18 for 60p; 1N4144 8p, 8 for 45p, 18 for 60p; 1N4145 8p, 8 for 45p, 18 for 60p; 1N4146 8p, 8 for 45p, 18 for 60p; 1N4147 8p, 8 for 45p, 18 for 60p; 1N4148 8p, 8 for 45p, 18 for 60p; 1N4149 8p, 8 for 45p, 18 for 60p; 1N4150 8p, 8 for 45p, 18 for 60p; 1N4151 8p, 8 for 45p, 18 for 60p; 1N4152 8p, 8 for 45p, 18 for 60p; 1N4153 8p, 8 for 45p, 18 for 60p; 1N4154 8p, 8 for 45p, 18 for 60p; 1N4155 8p, 8 for 45p, 18 for 60p; 1N4156 8p, 8 for 45p, 18 for 60p; 1N4157 8p, 8 for 45p, 18 for 60p; 1N4158 8p, 8 for 45p, 18 for 60p; 1N4159 8p, 8 for 45p, 18 for 60p; 1N4160 8p, 8 for 45p, 18 for 60p; 1N4161 8p, 8 for 45p, 18 for 60p; 1N4162 8p, 8 for 45p, 18 for 60p; 1N4163 8p, 8 for 45p, 18 for 60p; 1N4164 8p, 8 for 45p, 18 for 60p; 1N4165 8p, 8 for 45p, 18 for 60p; 1N4166 8p, 8 for 45p, 18 for 60p; 1N4167 8p, 8 for 45p, 18 for 60p; 1N4168 8p, 8 for 45p, 18 for 60p; 1N4169 8p, 8 for 45p, 18 for 60p; 1N4170 8p, 8 for 45p, 18 for 60p; 1N4171 8p, 8 for 45p, 18 for 60p; 1N4172 8p, 8 for 45p, 18 for 60p; 1N4173 8p, 8 for 45p, 18 for 60p; 1N4174 8p, 8 for 45p, 18 for 60p; 1N4175 8p, 8 for 45p, 18 for 60p; 1N4176 8p, 8 for 45p, 18 for 60p; 1N4177 8p, 8 for 45p, 18 for 60p; 1N4178 8p, 8 for 45p, 18 for 60p; 1N4179 8p, 8 for 45p, 18 for 60p; 1N4180 8p, 8 for 45p, 18 for 60p; 1N4181 8p, 8 for 45p, 18 for 60p; 1N4182 8p, 8 for 45p, 18 for 60p; 1N4183 8p, 8 for 45p, 18 for 60p; 1N4184 8p, 8 for 45p, 18 for 60p; 1N4185 8p, 8 for 45p, 18 for 60p; 1N4186 8p, 8 for 45p, 18 for 60p; 1N4187 8p, 8 for 45p, 18 for 60p; 1N4188 8p, 8 for 45p, 18 for 60p; 1N4189 8p, 8 for 45p, 18 for 60p; 1N4190 8p, 8 for 45p, 18 for 60p; 1N4191 8p, 8 for 45p, 18 for 60p; 1N4192 8p, 8 for 45p, 18 for 60p; 1N4193 8p, 8 for 45p, 18 for 60p; 1N4194 8p, 8 for 45p, 18 for 60p; 1N4195 8p, 8 for 45p, 18 for 60p; 1N4196 8p, 8 for 45p, 18 for 60p; 1N4197 8p, 8 for 45p, 18 for 60p; 1N4198 8p, 8 for 45p, 18 for 60p; 1N4199 8p, 8 for 45p, 18 for 60p; 1N4200 8p, 8 for 45p, 18 for 60p; 1N4201 8p, 8 for 45p, 18 for 60p; 1N4202 8p, 8 for 45p, 18 for 60p; 1N4203 8p, 8 for 45p, 18 for 60p; 1N4204 8p, 8 for 45p, 18 for 60p; 1N4205 8p, 8 for 45p, 18 for 60p; 1N4206 8p, 8 for 45p, 18 for 60p; 1N4207 8p, 8 for 45p, 18 for 60p; 1N4208 8p, 8 for 45p, 18 for 60p; 1N4209 8p, 8 for 45p, 18 for 60p; 1N4210 8p, 8 for 45p, 18 for 60p; 1N4211 8p, 8 for 45p, 18 for 60p; 1N4212 8p, 8 for 45p, 18 for 60p; 1N4213 8p, 8 for 45p, 18 for 60p; 1N4214 8p, 8 for 45p, 18 for 60p; 1N4215 8p, 8 for 45p, 18 for 60p; 1N4216 8p, 8 for 45p, 18 for 60p; 1N4217 8p, 8 for 45p, 18 for 60p; 1N4218 8p, 8 for 45p, 18 for 60p; 1N4219 8p, 8 for 45p, 18 for 60p; 1N4220 8p, 8 for 45p, 18 for 60p; 1N4221 8p, 8 for 45p, 18 for 60p; 1N4222 8p, 8 for 45p, 18 for 60p; 1N4223 8p, 8 for 45p, 18 for 60p; 1N4224 8p, 8 for 45p, 18 for 60p; 1N4225 8p, 8 for 45p, 18 for 60p; 1N4226 8p, 8 for 45p, 18 for 60p; 1N4227 8p, 8 for 45p, 18 for 60p; 1N4228 8p, 8 for 45p, 18 for 60p; 1N4229 8p, 8 for 45p, 18 for 60p; 1N4230 8p, 8 for 45p, 18 for 60p; 1N4231 8p, 8 for 45p, 18 for 60p; 1N4232 8p, 8 for 45p, 18 for 60p; 1N4233 8p, 8 for 45p, 18 for 60p; 1N4234 8p, 8 for 45p, 18 for 60p; 1N4235 8p, 8 for 45p, 18 for 60p; 1N4236 8p, 8 for 45p, 18 for 60p; 1N4237 8p, 8 for 45p, 18 for 60p; 1N4238 8p, 8 for 45p, 18 for 60p; 1N4239 8p, 8 for 45p, 18 for 60p; 1N4240 8p, 8 for 45p, 18 for 60p; 1N4241 8p, 8 for 45p, 18 for 60p; 1N4242 8p, 8 for 45p, 18 for 60p; 1N4243 8p, 8 for 45p, 18 for 60p; 1N4244 8p, 8 for 45p, 18 for 60p; 1N4245 8p, 8 for 45p, 18 for 60p; 1N4246 8p, 8 for 45p, 18 for 60p; 1N4247 8p, 8 for 45p, 18 for 60p; 1N4248 8p, 8 for 45p, 18 for 60p; 1N4249 8p, 8 for 45p, 18 for 60p; 1N4250 8p, 8 for 45p, 18 for 60p; 1N4251 8p, 8 for 45p, 18 for 60p; 1N4252 8p, 8 for 45p, 18 for 60p; 1N4253 8p, 8 for 45p, 18 for 60p; 1N4254 8p, 8 for 45p, 18 for 60p; 1N4255 8p, 8 for 45p, 18 for 60p; 1N4256 8p, 8 for 45p, 18 for 60p; 1N4257 8p, 8 for 45p, 18 for 60p; 1N4258 8p, 8 for 45p, 18 for 60p; 1N4259 8p, 8 for 45p, 18 for 60p; 1N4260 8p, 8 for 45p, 18 for 60p; 1N4261 8p, 8 for 45p, 18 for 60p; 1N4262 8p, 8 for 45p, 18 for 60p; 1N4263 8p, 8 for 45p, 18 for 60p; 1N4264 8p, 8 for 45p, 18 for 60p; 1N4265 8p, 8 for 45p, 18 for 60p; 1N4266 8p, 8 for 45p, 18 for 60p; 1N4267 8p, 8 for 45p, 18 for 60p; 1N4268 8p, 8 for 45p, 18 for 60p; 1N4269 8p, 8 for 45p, 18 for 60p; 1N4270 8p, 8 for 45p, 18 for 60p; 1N4271 8p, 8 for 45p, 18 for 60p; 1N4272 8p, 8 for 45p, 18 for 60p; 1N4273 8p, 8 for 45p, 18 for 60p; 1N4274 8p, 8 for 45p, 18 for 60p; 1N4275 8p, 8 for 45p, 18 for 60p; 1N4276 8p, 8 for 45p, 18 for 60p; 1N4277 8p, 8 for 45p, 18 for 60p; 1N4278 8p, 8 for 45p, 18 for 60p; 1N4279 8p, 8 for 45p, 18 for 60p; 1N4280 8p, 8 for 45p, 18 for 60p; 1N4281 8p, 8 for 45p, 18 for 60p; 1N4282 8p, 8 for 45p, 18 for 60p; 1N4283 8p, 8 for 45p, 18 for 60p; 1N4284 8p, 8 for 45p, 18 for 60p; 1N4285 8p, 8 for 45p, 18 for 60p; 1N4286 8p, 8 for 45p, 18 for 60p;

Service Sheets

SERVICE SHEETS—COLOUR TV MANUALS

Service Sheets for Black and White TV, Radios, Record Players and Tape Recorders 50p. Please send large Stamped Addressed Envelope.

We can supply manuals for most makes of Colour Television Receivers.
B.R.C. PYE ECKO PHILIPS ITT/KB SONY G.E.C. HITACHI BAIRD ULTRA INVICTA etc.
Please send a Stamped Addressed Envelope for a prompt reply.

G. T. TECHNICAL INFORMATION SERVICE
10 DRYDEN CHAMBERS, 119 OXFORD ST., LONDON W1R 1PA
MAIL ORDER ONLY

LARGE SUPPLIER OF SERVICE SHEETS

(T.V., RADIO, TAPE RECORDERS,
RECORD PLAYERS, TRANSISTORS,
STEREOGRAMS, RADIOGRAMS,
CAR RADIOS)
ALL AT 50p EACH

**"PLEASE ENCLOSE LARGE S.A.E.
WITH ALL ENQUIRIES & ORDERS"**

Otherwise cannot be attended to
(Uncrossed P.O. a please, original
returned if service sheets not available.)

PLEASE NOTE

We operate a "by return of post" service. Any
claims for non-delivery should be made within
7-days of posting your order.

C. CARANNA
71 BEAUFORT PARK
LONDON, N.W.11 6RX

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 with order.

Mail order or phone 01-458 4882
Large Stocks of Colour Manuals
NO OVERSEAS MAIL PLEASE

Educational

C AND G EXAMS

Make sure you succeed with an ICS home study
course for C and G Electrical Installation Work &
Technicians Radio/TV/Electronics Technicians,
Telecomms Technicians and Radio Amateurs.

COLOUR TV SERVICING

Make the most of the current boom! Learn the
techniques of servicing Colour and Mono TV sets
through new home study courses, approved by
leading manufacturers.

TECHNICAL TRAINING

Home study courses in Electronics and Electrical
Engineering, Maintenance, Radio, TV, Audio,
Computer Engineering and Programming. Also
self-build radio kits. Get the qualifications you
need to succeed.

Free details from:

**INTERNATIONAL
CORRESPONDENCE SCHOOLS,**
Dept. 776Q, Intertext House, London SW8 4UJ.
Or Phone 01-622 9911 (All Hours)

GO TO SEA as a Radio Officer. Write:
Principal, Nautical College, Broadwater,
Fleetwood FY7 8JZ.

TAPETALKS are the **CLEVER** way to
LEARN.

THIS MONTHS SPECIAL OFFER:—
TWO C60 Cassettes entitled
'INTRODUCING ELECTRONICS'
will be sent to you by return of post for
only £5.42 plus 55p. VAT/P.Pkg.
TAPETALK, P.O. BOX 99 (PW),
MILTON KEYNES MK3 5BR.
Tel: Milton Keynes (0908) 77710.

SERVICE SHEETS for Radio, TV,
Tape Recorders, Stereo, etc., with free
fault-finding guide, 50p and SAE,
Hamilton Radio, 47 Bohemia Road, St.
Leonards, Sussex.

BELL'S TELEVISION SERVICES for
service sheets, manuals & books on
radio/TV etc. Service sheets 50p plus
SAE. Service sheet catalogue 25p.
Back issues of magazines from April
'74 onwards cover price plus 12p post.
Free booklists on request. SAE with
enquiries please to B.T.S., 190 Kings
Road, Harrogate, Yorkshire. Tele-
phone Harrogate (code 0423) 55885.

SERVICE SHEETS, radio, TV etc.
10,000 models. Catalogue 24p, plus SAE
with orders, enquiries. Telray, 154
Brook Street, Preston PR1 7HP.

Situations Vacant

MEN!
£90 p.w.
can be yours

Tens of thousands of new computer
personnel needed over the next few
years alone. Now for the first time
anybody (no special qualifications
are needed) can train outside the
computer industry for an exciting
career as a computer operator in
only 4 weeks. It can pay around
£35 p.w. as a starter and can
reach over £90 p.w. We subscribe
to the code of practice for Com-
puter schools of the National Com-
puting Centre—a non-profit organi-
sation which was set up and spon-
sored by the British Government.
Write without obligation for FREE
details TODAY.

**London Computer Operators
Training Centre**

C27, Oxford Hse.,
9-15 Oxford St. W1. Tel: 01-734 2874

Books and Publications

Technical Books— Radio & Electronics

World's Radio & TV Stations (International Edit.)	E0-70
Audio Amplifiers	E0-75
Boys Book of Crystal Sets	E0-35
Television Timebase Circuits	E1-20
Radio TV and Industrial Tube & Valve Equip.	E0-70
How to get the best out of your Tape Recorder	E1-70
Practical Electronic Science Projects	E0-85
Jack Darr's Service Clinic	E1-60
Transistor Circuits for Modern Test Equipment	E0-70
Modern Tape Recording Handbook	E0-80
1st Book of Transistor Equip. and Substitutes	E0-80
Hi Fi, PA & Disco Amplifier Design Hdbk.	E0-87
Radio Servicing Problems	E0-75
Electronic Circuits for the Amat Photographer	E0-70
57 Projects using IC 741 or Equivs	E0-85
TV Fault Finding	E1-15
Transis Circuits for Rad. Control'd Models	E0-50
Practical Stereo & Quadrophony Handbook	E0-85
Radio Amateur Operator's Handbook	E0-85
Coil Design & Construction Manual	E0-60
Radio TV & Electronics Data Book	E0-70
79 Electronic Novelty Circuits	E0-85
The Complete Car Radio Manual	E0-85
Radio Technicians Bench Manual	E3-40
Servicing Transistor Radio Receivers	E0-95
1st Book of Hi Fi Loudspeaker Enclosures	E0-70
2nd Book of Hi Fi Loudspeaker Enclosures	E0-70
Manual of Electronic Circuits for the Home	E0-65
Modern Crystal Set Circuits for Beginners	E0-45
Electronic Novelities for the Motorist	E0-60
2nd Book of Transistor Equip. & Substitutes	E1-10
Handbook of Electronic Musical Novelities	E0-60
Transistorised Novelities for Hi Fi Enthusiast	E0-45
1st Book of Hi Fi Loudspeaker Enclosures	E1-00
Fault Location Exercises in Rad. & TV Vol.1	E1-60
Fault Location Exercises in Rad. & TV Vol.2	E2-80
Colour TV Picture Faults	E2-80
Practical Transistor Novelty Circuits	E0-50
Boys Book of Practical Radio & Electronics	E0-70
Radio Receiver Construction using ICs & Transis.	E0-70
ICs & Transistor Gadgets Construction Handb'k	E0-70
Integrated Circuits Equip. & Substitutes Hbk	E0-85
Audio Technicians Bench Manual	E3-40
Radio Antenna H'bk for Long Dist. Reception	E0-90
Guide to Printed Circuits	E3-40
Diode Characteristics Equip. & Substitutes	E1-10
Electronic Gadgets & Games	E0-90

All prices include Postage & Packing

RADIO BOOK SERVICE
40 Elwell Way, Beckenham BR3 2RZ

T.V. REPAIRS MADE EASY

4 easy to follow repair manuals cover the mono
sets and 3 cover the colour sets from the early
dual standards to date.
Priced at only £3.50 each, you just send make/
model no. (chassis type if possible plus cost to
receive manual covering the set by return. P & P
50p up to 3, £1 over 3.
British Colour T.V. Circuit Diagram Manuals
in 2 vols. cross referenced to the above repair
manuals at £8.50 (p. & p. £1) each. All mono
sets circuits in 1 huge manual for same price.

T.V. TECHNIC, 76 CHURCH ST., LARKHALL
LANARKS ML9 1HE
Tel. (0698) 883334.

Miscellaneous

TRANSMIT!

★ Unique **TRANSMITTER/RE-
CEIVER** Kit. No licence examina-
tions or tests required to operate
this transistorised equipment. Easy
to build. Get transmitting. Send
£7.95 for yours now!

★ **Psychedelic MINI-STROBE** Kit.
Take a pocket-sized lightning storm
to Disco's & parties. 'Brain-freeze'
'em with vari-speed stop-motion
flashes. Includes super case too.
Send £3.50 now!
(all prices include V.A.T., packing
& postage.)

Send remittance to:

BOFFIN PROJECTS,
4 CUNLIFFE ROAD,
STONELEIGH, EWELL, SURREY
(Mail order U.K. only)
Or for more details, send 20p for lists

**60KHz MSF RUGBY RADIO RE-
CEIVER.** Available in kit form or
assembled unit. Details from Toolex,
Bristol Road, Sherborne, Dorset.

STYLI-CARTRIDGES

FELSTEAD ELECTRONICS (PW97)

Longley Lane, Gattley, Cheadle, Ches. SK8 4EE
Our complete list with illus. stylus chart
and best values in cartridges, cassettes, tape,
audio leads, microphones, meters and multi-
testers, phones, plugs, sockets and many useful
accessories for radio, recording and hi-fi. Yours
FREE for S.A.E. Usual trustworthy service.
Most items available to callers in Manchester
at Trionix, 177 School Lane, Kingsway Cnr. 19

SUPERB INSTRUMENT CASES by Bazelli, manufactured from heavy duty PVC faced steel. Hundreds of people and industrial users are choosing the cases they require from our vast range, competitive prices start at a low 75p. Examples: width, depth, height, 8in x 5in x 3in, £1.55; 10in x 6in x 3in, £2.20; 10in x 8in x 3in, £2.75; 12in x 10in x 3in, £3.60; 8in x 4in x 4in, £1.80; 10in x 6in x 4in, £2.70; 12in x 8in x 4in, £3.60; 7in x 7in x 5in, £2.65; 8in x 10in x 6in, £3.60; 12in x 8in x 7in, £4; 12in x 12in x 7in, £4.40. Plus 62p postage and 8% VAT. Over 400 models to choose from. Prompt despatch. Free literature (stamp would be appreciated). Bazelli, Dept. No. 25, St. Wilfrid's, Foundry Lane, Halton, Lancaster LA2 6LT.

THE P.E. 'VARICAP' STEREO PUSH BUTTON TUNER



Using the latest Mullard modules for R.F. and I.F. circuits—pre-aligned for ease of construction—this KIT has an F.M. tuner with stereo decoder, push button tuning, self regulated power supply, etc., etc., for highest quality reproduction.

Price £34.50
inc. V.A.T. P & P

S.A.E. for FREE brochure

We also still supply ALL components for the P.E. 'GEMINI' STEREO AMPLIFIER. Send 55p + 12p P&P for a full constructional booklet containing performance details, specification assembly instruction and fault finding guide.

ELECTRO SPARES

Dept. P.W.
288, Ecclesall Road, Sheffield, S11 8PE

GLASS FIBRE P.C.B.'s. Send 1:1 master and 30p per board plus 7p per square inch tinned or plus 9p per square inch drilled and tinned. Discount for quantity. **PROTO DESIGN**, 4, Highcliffe Way, Wickford, Essex. SS11 8LA.

THE SCIENTIFIC WIRE CO

Copper - Nickel Chrome - Eureka - Manganin Wires.
Enamelled - Silk - Cotton - Tinned Coverings.
No minimum charges or quantities.
Trade and Export enquiries welcome.
S.A.E. Brings List.
P.O. BOX 30, LONDON, E4 9BW

NICKEL CADMIUM cylindrical accumulators for dry battery replacement. Buy no more dry cells. F/Scp. S.A.E. brings full details by return. Sandwell Plant Ltd, 1 Denholm Road, Sutton Coldfield, West Midlands. 021-354 9764.

BUILD YOUR OWN

You are invited to send S.A.E. for lists of our very extensive range of high quality amplifier, pre-amps, F.M. tuners, instruments, Radiocontrol ignition units and many other kits. Please state requirements.

TELERRADIO ELECTRONICS,
325 FORE STREET, EDMONTON,
LONDON N9

OVAL DIGITAL CLOCK CASES

Attractive stoneware pottery cases: 'oatmeal' glazed; suitable for most digital clock circuits that use 4 or 6 digit L.E.D. displays.

ONLY £3.50 inclusive

Send S.A.E. for full details of above and many others, to:

J. BARRIE-SMITH

56 Conifer Road, Coxford, Southampton, Hants. SO1 6FX.

RADIO. Learn from the beginning. 16 vintage circuit diagrams, receivers and transmitters with notes. £1. Allister, 58 Wavell Road, Maidenhead, Berks, SL6 5AD.

ENAMELLED COPPER WIRE

S.W.G.	1 lb reel	1/2 lb reel
10 to 19	2.40	1.35
20 to 29	2.45	1.40
30 to 34	2.60	1.50
35 to 40	2.85	1.60

All the above prices are inclusive of postage and packing in U.K.

COPPER SUPPLIES

102 Parrswood Road, Withington, Manchester 20 Tel: 061-445 8753

BUILD THE TREASURE TRACER
MK III Metal Locator

- Varicap tuning
- Britain's best selling metal locator kit: 4,000 sold
- Weights only 22oz. Fitted with Faraday shield.
- Speaker and earphone operation
- Knocks down to only 17in.
- Prebuilt search coil assembly
- Thoroughly professional finish
- As seen on BBC1 and BBC2 TV
- You only need soldering iron, screwdriver, pliers and snips
- Five transistor circuit

Send stamped, addressed envelope for leaflet

Complete Kit £12.50 Built & tested £17.50
Post 55p - £1.40 VAT 5% Post 55p - £1.40 VAT 5%
MINIKITS ELECTRONICS,
10 CLEVELAND ROAD,
LONDON, E12 2AN (Mail order only)

1lb PACKS OF ASSORTED SIZES OF COPPER LAMINATES for 80p plus p&p 30p. per pack. Min. order 1lb. Cash with order to: F.E.S. Norton Springs, Norton Canes, Cannock, West Midlands.

PRINTED CIRCUITS and HARDWARE

Readily available supplies of Constructors' hardware, Aluminium sheet and sections. Printed circuit boards, top quality for individual or published designs. Prompt service. Send 15p for catalogue.

Ramar Constructor Services,
Masons Road, Stratford on Avon,
Warwicks. Tel. 4879

JAYBEE FOR KITS

AMTRON, JOSTYKIT, ETC.

Send S.A.E. for full information

JAYBEE ELECTRONICS, Sarum Farm Est.
SARUM ROAD, WINCHESTER, HANTS
Telephone 0962-01806

Synthesiser "Sounds Supreme"

by Dewtron (25% VAT extra.)

Famous kits, e.g. waa-waa complete kit £4.50; Fuzz kit £6.50 P&P 25p under £10. Ring Modulator modules £11. 'Mister Bassman' Bass Pedal Units and whole range of synthesiser modules, musical novelties, etc. Catalogue 20p from D.E.W. Ltd., 254 Ringwood Road, Ferndown, Dorset.

AERIAL WIRE. High quality PVC-covered multi-strand copper, 50ft, 75p (12p); 75ft, £1.12 (15p); 100ft, £1.48 (18p); 150ft, £2.25 (28p); 200ft, £2.88 (30p); 250ft, £3.60 (33p); 300ft, £4.30 (36p). P&P in brackets. Longer lengths available. SAE all enquiries. Al Radio Components, 14 The Borough, Canterbury, Kent CT1 2DR.

MINI ACCUMULATORS

2 volt MULTI-USE Sealed Lead Acid Rechargeable Cells.
Size L450-1.4" x 1.1" x .44" 8 for £2.15 inc. P. & P.
Size GA2-1.7" x 1.3" x .5" 3 for £2.85 inc. P. & P.
Suite FI-Cord
GARFIELDS, 295 Rye Lane, London, S.E.15

DO-IT-YOURSELF loudspeakers for hi-fi are our speciality. Full range of components and accessories including chassis speakers, crossovers, sound absorbent, grille fabrics etc. always available. We stock the fabulous value Helme speaker kits complete with full and easy instructions, also Peerless and Wharfedale kits. Just about the lowest prices anywhere! Send 8½p stamp for bargain list to: Audioscan, Dept. PW375, 4 Princes Square, Harrogate, North Yorkshire.

FREE BAG OF COMPONENTS (WORTH £5)

Cut out this advertisement and take it along to the Heathkit Centre, 233 Tottenham Court Road, London W1. (Tel: 01-636 7349). In return for it we'll give you a free bag of electronic components (worth at least £5) which you should find invaluable for many projects. There's no catch. We just want to encourage you to look at the extensive Heathkit range of electronic kits. The World's largest in fact.

HEATH
Schlumberger

Please note: this offer applies to personal callers only (one bag per person). Offer valid until 31st March 1976 - while stocks last.

TEXAN AMPLIFIER PARTS
 Pack 1: Res. 88p. Pack 2/3: Caps. £3.50. Pack 6: Pots £1.50. Pack 7: Semi Conductors £8.25. P.C. Bd. £2.50. Chassis £3 (p.p. 50p). Case £3.50 (p.p. £1).
 p.p. 25p. Tax extra 25%.

TELERADIO ELECTRONICS
 325 FORD ST., LONDON N9. 807 3719

SEND S.A.E. FOR FURTHER INFORMATION AND DETAILS OF 1 WATT to 75W AMPLIFIERS & F.M. TUNERS.

HELME
 DO-IT-YOURSELF
 HI-FI STEREO
 SPEAKER KITS
 The best value around!
 Send for details
 HELME AUDIO
 PRODUCTS LTD.
 Dept. PW
 SUMMERBRIDGE
 HARROGATE YORKS
 Tel: Darley 279 (Std Code 6423 72)

'Tape Spools 5" and 5½" dia, with quick load slots in crystal polystyrene. Available ex-stock'.
Plasro Plastics Ltd.,
 38 Wates Way,
 Mitcham,
 Surrey.
 01 640 0145/9

PRINTED CIRCUIT BOARDS. Supplied complete for P.W. and P.E. projects. A soldering varnish finish for the protection and coating of printed circuits, all boards guaranteed (6p per sq in. p+p 20p). R. Darlison 1 Valentine Drive, Oadby, Leicester (0533 716273).

H. M. ELECTRONICS
 275a FULWOOD ROAD, BROOMHILL,
 SHEFFIELD S16, 3BD.
BEC CABINETS (illus'd)
 METAL CASES
 DRY TRANSFER LETTERING
 Send 15p for leaflets (Refundable)
 Trade enquiries invited

12 VOLT 21" 13 Watt Fluorescent Lighting
 (by Thorn/AEI) with diffuser & on/off switch. Ideal caravan, boat, emergency lighting, etc. Guaranteed.

£5.50 Inc. VAT & Post. List price £7.02 Inc. VAT

SALOP ELECTRONICS 23 Wyle Cop.
 Shrewsbury, Shropshire Tel. 53296

LOW-COST IC MOUNTING for any size DIL package. 100 pin sockets, 50p. 7 and 8 hole plastic supports, 5p/pair. Quantity rates. SAE details and sample. Trial pack, 50p. (P&P 10p/order.) PKG Electronics, Oak Lodge, Tansley, Derbyshire DE4 5FE.

RTTY FREQUENCY SHIFT CONVERTOR CV-49A/URA-8A. This must be the first quantity release of this most sought after Rty Converter. Brief description uses 15 BG9 & BG7 Valves, with a 2" C.R. Tuning Tube. Housed in Grey Alloy case size 17" x 5" x 15" deep. Input Supply fully filtered for interference. Requires 105-125 Volts A.C. A two position Selectivity or Filter Switch that enables to set up for any Narrow Shift from 10-200 Cycles, or any Wide Shift from 200 to 1000 Cycles. The Mean or Centre Frequency for the narrow shift is 1000 Cycles, for the wide shift is 2550 cycles. Normal Audio Input from Receiver 600 OHMS. The Converter will operate with an input of 60 Microwatts to 50 Milliwatts or about -14 to +18 DBM. Has internal Tone OSC Freq 595-1785 CPS. Mark Space Switch Normal or Reverse. Supplied in Good used condition, Checked complete, but not tested Electronically, £22.50. Carr £2.50 onwards.

We also have a few **COMPARATORS CM-22A/URA-8A** same colour and size, using 13 BG9 and BG9 Valves, made for use with above for Dual Diversity Reception. 105-125V A.C. Supply, Fully Filtered for interference. Used Good Condition, checked complete but not Tested Electronically. £10.00. Carr as above.

We have in stock a Clip on Fan Blower Cooler complete with Filter and Heat Switch that only switches on when Units get to a preselected Heat. Normally if units are used up to 24 hours a day. Housed in Alloy case £2.50. Post or Carr 50p.

TELEPRINTER CREED 7B. New or rebuilt as new by Gov. In original Gov Transit Case. Power 100-250V D.C., Few only at £22.50 ea Carr £3.50 or at cost.

SUPPLY UNIT 7 Input Voltage 12V D.C. or 100-250 A.C., Output 70-100 Volts 30M/A twice. 30-45V A.C. 40 M/A, 11-5-14V D.C., 2-4 amps. In small Box. These are mainly for supplying Relay Voltage for the Teleprinters. Brand New at £3.50 Carr or Post £1.00. If possible collect Ex Warehouse by appointment, and save Carr cost also Delivery time. Terms Cash with order, VAT 8%. Phone Morley, Code 0532-531179. JOHNS RADIO, 424 BRADFORD ROAD, BATLEY, YORKS.

Wanted
 WE BUY New Valves, Transistors and clean new components, large or small quantities, all details, quotation by return. **WALTON'S** 55 Worcester Street, Wolverhampton.

TOP PRICES PAID FOR NEW VALVES and TRANSISTORS
 popular T.V. and Radio types.
KENSINGTON SUPPLIES (C),
 367 Kensington Street, Bradford 8, Yorkshire.

For Sale
DISCOLIGHTS. Best! Cheapest! Reliable! Bumper catalogue: Aarvak Electronics, 12a(P) Bruce Grove, N17 6RA. 01-808 8923.

MICROPHONES: AKG D202EI, £45.00; AKG D190C or E, £20.00; AKG D224, £60.00; Sennheiser MD211N, £45.00. All brand new and boxed. Please add 25% for VAT. All other AKG and Sennheiser mikes, SAE for quote. J. J. Francis (Wood Green), Ltd., Manwood House, Matching Green, Harlow, Essex. Tel: Matching 476.

COPPER CLAD LAMINATE FOR PRINTED CIRCUITS
 Single sided 1/16" paper base—1 5/8" inch. Single sided 1/16" glass-epoxy—2 5/8" inch. Any rectangular sizes cut to your requirements. Please send cash with order. Price includes postage and packing.
 From: **SIMTECH ENGINEERING LTD**
 Dedham Road, Ardleigh, Colchester, Essex, C07 7QA
 Telephone 9206 230133

COLLECTORS ITEM. 1927 Cossor, Melody Maker wireless with eliminator for a.c. 240/250V. Batteries and speakers. Complete. Working. G. W. Smith, 30 Gaywood Hall Drive, King's Lynn, Norfolk.

Ladders
LADDERS. Varnished. 25½ ft extended. £24.05, carriage £1.40. Leaflet, aluminium ladders and loft stairways. Tel: Telford 586644.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for insertions. I enclose Cheque/P.O. for £..... (Cheques and Postal Orders should be crossed Lloyds Bank Ltd. and made payable to Practical Wireless).

NAME
 ADDRESS

Send to: Classified Advertisement Manager
PRACTICAL WIRELESS, Fleetway House,
 Farringdon Street, London EC4A 4AD
 Telephone 01-634 4451
 Rate
 14p per word, minimum 12 words. Box No. 35p extra.

Company registered in England. Registered No. 53626, Registered office: Tower House, 8/14 Southampton Street, London WC2E 9QX.

WATFORD ELECTRONICS

33/35, CARDIFF ROAD, WATFORD, HERTS, ENGLAND
MAIL ORDER, CALLERS WELCOME. Tel. Watford 37774

ALL DEVICES BRAND NEW AND FULLY GUARANTEED.
ORDERS DESPATCHED BY RETURN OF POST. TERMS OF
BUSINESS: CASH/CHEQUE/P.O.s OR BANKERS DRAFT
WITH ORDER. GOVERNMENT AND EDUCATIONAL
INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE
AND EXPORT INQUIRY WELCOME. P & P ADD 25p* TO
ALL ORDERS UNDER £10.00. OVERSEAS ORDERS POSTAGE
AT COST. AIR/SURFACE.

VAT Applicable to U.K. Customers only. All prices are exclusive of
VAT. Please add 8% to devices marked * To the rest add 25%.
Callers welcome to our New Shop at 33, Cardiff Road, behind Watford Football
Ground. Monday to Saturday. Ample Free Car Parking space available.

POLYESTER CAPACITORS: Axial lead type. (Values are in μ F).
40V: 0.001, 0.0012, 0.0015, 0.0018, 0.0022, 0.0033 4p; 0.0047, 0.0068, 0.01, 0.015,
0.022 5p; 0.033, 0.047, 0.068 6p; 0.1, 0.15, 0.22, 9p; 0.33, 13p; 0.47, 17p; 180V: 0.1,
0.15 4p; 0.22 5p; 0.33 6p; 0.47 9p; 0.68 13p; 1.0 14p; 1.5 22p; 2.2 24p; 0.1 μ F/1000V 20p.

POLYESTER RADIAL LEAD P.C. TYPE (Values are in μ F).
250V: 0.01, 0.015, 0.022, 0.033 4p; 0.047, 0.068, 0.1 5p; 0.15 6p;
0.22, 0.33 8p; 0.47 9p; 0.68 10p; 1.0 14p; 1.5 22p; 2.2 24p. **FEED THROUGH CAPACITORS**
1000pF/350V 8p

ELECTROLYTIC CAPACITORS: Axial lead type (Values are in μ F).
25V: 100 μ F, 40p; 100V: 20, 6p; 50V: 0.47, 1.0, 1.5, 2.2, 2.5, 3.3, 4.7, 6.8, 10, 15,
22, 6p; 47, 68, 10p; 100, 12p; 50V: 1.0, 6p; 220, 15p; 1000, 42p; 40V: 33, 100, 6p;
470, 22p; 2200, 40p; 35V: 1000, 38p; 30V: 3500, 41p; 25V: 5, 10, 22, 68, 150, 6p;
11p; 470, 13p; 640, 18p; 1000, 24p; 2200, 34p; 3000, 39p; 4700, 47p; 18V: 10, 10,
125, 250, 6p; 470, 11p; 1000, 1500, 18p; 4700, 46p; 10V: 4, 10p; 6p; 640, 10p; 1000, 14p;
2200, 18p.

TAG-END TYPE: 70V: 2500, 98p; 4700, 111p; 50V: 2000, 72p; 25V: 4700, 48p;
18V: 4700, 36p.

TANTALUM BEAD CAPACITORS
35V: 0.1 μ F, 0.22, 0.33, 0.47, 0.68, 1.0,
2.2 μ F, 3.3, 4.7, 6.8, 25V: 1.5, 10, 18V:
10 μ F, 22, 10V: 15 μ F, 33, 6V: 47 μ F,
3V: 100 μ F.
Price: 11p each.

MYLAR FILM CAPACITORS
100V: 0.001, 0.002, 0.005, 0.01 μ F 4p
0.015, 0.02, 0.04, 0.05 μ F, 0.1 μ F 5p
0.15, 0.2 50V: 0.47 μ F 5p

CERAMIC CAPACITORS
50V d.c. Platequette body 25mm leads.
Range: 0.5pF to 10,000pF 3p.
0.015 μ F, 0.022 μ F, 0.033 μ F, 0.047 μ F 4p

JACKSON'S VARIABLE CAPS.
Dielectric 0.1-365 240p
100pF 80p
300pF 88p
500pF 95p
C804 5, 10, 15,
20, 25, 50pF
Dilemin 120p
300pF 125p
500pF 125p
611 Ball Drive 323p
4511/DAF 97p 00-3x25pF 372p

CERAMIC TRIMMER CAPACITORS
2-7pF, 4-15pF, 6-25pF;
8-30pF 17p each
MINIATURE
3-10pF; 3-30pF; 10-40pF
15p
COMPRESSION TRIMMERS
3-40pF 18p
20-250pF 25p
100-500pF 32p
Compact CASSETTES
Low Noise, screwed
type
C80 only 35p each
C90 only 50p each
C120 only 65p each

DENCO COILS
Dual Purpose "DP"
Rng. 1-5 B.Y.R.W 69p
1-6 B.Y.R.W 69p
1-5 Green 74p
Transistor Tuning coils
"T" Type
Rng. 1-5 B.Y.R.W 78p
Sockets for above 20p
IFT 13/14/15/16/17 70p
IFT 18/19/20/21/22 70p
TOC 1 75p
MW 5FR 72p
MW/LW 5FR 84p

ALUM. BOXES
with lid*
23x31x1 50p
4x4x1 50p
4x23x1 50p
4x51x1 58p
4x23x2 50p
3x2x1 44p
6x4x2 78p
7x5x2 84p
3x6x3 106p
10x7x3 122p
10x4x3 110p
12x5x3 120p
12x8x3 150p

PLASTIC BOXES (VERO)*
Size X W X H (mm) Price
120 65 40 135p
150 80 50 155p
188 110 60 205p
71-5 49 24-5 30p

WITH ALUM. F & R PANELS*
205 140 40 244p
205 140 75 274p
205 140 109 355p

WITH SLOPING ALUM. F/PANEL*
220 174 (F52) (R100) 359p

EARPHONES
(With Cord and Jack
Plug) Magnetic:
2.5 mm plug 15p
3.5 mm plug 15p
Crystal:
3.5 mm plug 30p
SPEAKERS
8 Ω 0.3W 3" 52p
2 1/2" 52p 58p
64 Ω 2 1/2" 58p

POTENTIOMETERS (AB) Carbon
Track, 0-25W Log & 0-5W Linear values
1K Ω (LIN. only) Single gang 17p
5K Ω -2M Ω single gang 17p
5K Ω -2M Ω single gang D/P switch 37p
5K Ω -2M Ω dual gang stereo 50p

SLIDER POTENTIOMETERS
0-25W log and linear values 60mm
1K Ω -500K Ω single gang 42p
50K Ω -500K Ω Dual gang 50p
50K Ω Lin 150mm WS 150 £3.00

PRESET POTENTIOMETERS
0-1W 500 Ω -2.5M Ω Sub Min Vert. only 6p
0-25W 100 Ω -2.2M Ω Horizontal 7p
0-25W 200 Ω -1M Ω Vertical 7p

RESISTORS—Erie make
Carbon, Miniature, High Stability, Low Noise
POWER Tol. RANGE Val. 1-99 100+
0-25W 5% 2-2 Ω -4-7M E24 1p 0-8p
0-5W 5% 2-2 Ω -4-7M E12 1p 0-8p
1W 5% 2-2 Ω -10M E12 3p 2p
100 off price per value not mixed.

HEAT SINKS*
TO18/18F 8p
TO66/TV2 15p
TO3/TV3 15p
Insulation Kit 6p
(Mica & 2 washers)

DIL SOCKETS*
Low profile
8 or 14 pin 13p
16 pin 14p
24 pin 16p

ELCOM I.C. EXTRACTION TOOL*
ONLY 45p

VEROBOARD* Pitch
0-1 0-15 0-15
(copper clad) (plain)
2 1/2x3 32p 24p 15p
2 1/2x5 35p 35p 15p
3 1/2x3 35p 35p 15p
3 1/2x5 40p 40p 29p
3 1/2x7 105p 79p 61p
4 1/2x7 185p — 110p

VEROBOARD* Pitch
0-1 0-15 0-15
(copper clad) (plain)
2 1/2x3 32p 24p 15p
2 1/2x5 35p 35p 15p
3 1/2x3 35p 35p 15p
3 1/2x5 40p 40p 29p
3 1/2x7 105p 79p 61p
4 1/2x7 185p — 110p

FERRIC CHLORIDE
1lb Bag* 65p+ 30p (p & p)

COPPER CLAD SRBP LAMINATE*
Single Sided 8 1/2x9 1/2 48p
Double Sided 4 1/2x7 1/2 35p
FIBREGLASS BOARD:
Single Sided 6x6 84p
Single Sided 12x6 115p

TRANSISTORS

AC125*	28	BC109C*	12
AC126*	14	BC117	20
AC127*	14	BC147	7
AC128*	14	BC148	7
AC141*	24	BC149	9
AC142*	25	BC154	20
AC176*	14	BC157	13
AC187*	14	BC158	12
AC188*	15	BC159	13
AC189*	15	BC161	12
AC191	35	BC162	12
AC192	35	BC169	12
AC193	35	BC170	11
AC194	35	BC171	11
AC195	35	BC172	11
AD140*	33	BC173	11
AD141*	33	BC178*	16
AD149*	48	BC179*	20
AD181*	37	BC182	12
AD162*	37	BC182L	10
AD163*	37	BC183	12
AD115*	18	BC183L	11
AD116*	18	BC184	12
AD117*	18	BC184L	12
AD118*	40	BC186	22
AD121*	33	BC187*	28
AD122*	33	BC188*	28
AD125*	30	BC192*	13
AD126*	30	BC193	11
AD127*	30	BC213L	13
AD136*	33	BC214	14
AD137*	33	BC215	14
AD138*	59	BC241*	30
AD180	55	BC241*	30
AD181*	58	BC462*	40
AD185	60	BCV31	65
AD186	46	BCV32	92
AD193*	138	BCV33	28
AD194	138	BCV43	28
AD195	138	BCV58	18
AD196	31	BCV59	18
AD197	40	BCV70*	18
AD198	115	BCV71*	18
AD199	115	BCV72*	18
BC107*	9	BD115*	52
BC108*	9	BD121*	115
BC108B*	12	BD123*	95
BC108C*	12	BD124*	75
BC109*	12	BD125*	75
BC109B*	12	BD130*	40

(Continued from other side)

SIGNAL INJECTOR SE250B Only 395p	FREEZER SPRAY CAN Only 80p	PP3 Battery Connectors * 6p	JACK PLUGS		SOCKETS	
			Screened chrome	Plastic body	Open metal	Moulded with break contacts
KNOBS* fits 1/2" shaft with grub screw, except K2 (push fit) & K8 (for sliders)			2-5mm 3-5mm Std. MONO Std. STEREO	8p 14p 10p 13p 18p	8p 8p 15p 17p 22p	
K1 Black & White pointer type			9p			
K2 Slim silvered aluminium			10p			
K3 Black 1 1/2" with chrome rim			15p			
K4 Black serrated, Metal top with line indicator 33mm diam.			20p			
K5 Black fluted metal top and skirt calibrated 0-10, 37mm diam.			22p			
K6 PK2 as K5, pointer on skirt			22p			
K7 Black, knurled, tapered. Metal top & skirt. Calib. 0-10, 30mm			22p			
K8 Black or silvered for slider pot			7p			
PANEL METERS* Full scale 108 x 82 x 5 38mm, reg. 60mm hole 0-100uA. Price £3-25 each 59x 46 x 35mm reg. 1 1/2" hole						
0-50uA	0-100mA	500uA-0-50uA				
0-100uA	0-500mA	100uA-0-100uA				
0-500uA	0-1 Amp	500uA-0-500uA				
0-1mA	0-50V DC	£3-05 each				
0-5mA	0-300V DC	EDGEWISE				
0-10mA	"S"	98 x 82 x 70mm				
0-50mA	"VU"	0-1mA 0-500uA				
Price £2-85 each.		1 Price £4-14				
TRANSFORMERS MAINS			(p&p)			
Primary 220-240V						
6-0-6 (Miniature) 100mA		90p				
9-0-9 (Miniature) 100mA		90p				
12-0-12 (Miniature) 100mA		90p				
24-0-24 500mA		220p (25)				
30-24-20-15-12-0 (MT79AT) 1A*		285p (48)				
30-24-20-15-12-0 2A*		340p (62)				
5-15-15 1A*		190p (48)				
6-3V 1A*		330p (48)				
0-3V 1A 240V/50mA*		234p (48)				
0-3V 12-12 500mA*		237p (48)				
12-12-12 1A*		185p (48)				
ITT Pulse Transformer 1:1		110p				
6-3V 1A Heater/Cathode Short*		330p (48)				
L734 Mini Drive. Pri 20K Sec 1K		54p				
L7700 Mini O/P Pri 1-2K Sec 3-2K		54p				
MOT Mini O/P Pri 1-2K Sec 8Q		42p				
(P & P) shown is to be added to normal postal charges						
DIN 2 pin Loudspeaker 3, 4, 5 (180° & 240°)						
CO-AXIAL (TV)						
PHONO assorted colours						
Metal screened						
BANANA 4mm 12mm						
LAMP HOLDERS AND LAMPS*						
LES HOLDER Dome shaped, Red, Blue, Green, Yellow, White						
LES BULBS 6v and 12v						
MES HOLDERS Chrome cover, Red or Amber, jewelled top						
MES BULBS 3-5V 6V 12V						
NEON - 1/2" Square top, Red or Green. Round top Red sealed with Resistor Neon with leads						
SWITCHES*						
TOGGLE:						
	SPST 20p					
	DPDT 24p					
SUB-MIN TOGGLE						
	SP changeover 45p					
	SPST on/off 40p					
	DPDT 6 tag. 50p					
	DPDT Centre off 80p					
SWITCHES* PUSH BUTTON:						
	Push on/Push off, spring loaded					
	Miniature Non Locking					
	Push to Make					
	Push to Break					
ROCKER (white): 10A 250V						
	SP changeover centre off					
	Push on (black) on/off 10A 250V					
ROCKER: Illuminated (white)						
	lights when on. 0A 240V					
ROTARY: 1p/2w, 2p/6w, 2p/2w, 2p/4w, 3p/3w, 3p/4w, 4p/2w, 4p/3w						

ENGINEERS

FREE

YOURSELF FOR A

BETTER JOB ^{WITH} MORE PAY!

Do you want promotion, a better job, higher pay? "New Opportunities" shows you how to get them through a low-cost home study course. There are no books to buy and you can pay-as-you-learn.

This helpful guide to success should be read by every ambitious engineer. Send for this helpful 76 page FREE book now. No obligation and nobody will call on you. It could be the best thing you ever did.

POST NOW

CUT OUT THIS COUPON ■ ■ ■ ■ ■
CHOOSE A BRAND NEW FUTURE HERE!

Tick or state subject of interest. Post to the address below.

Build-As-You-Learn
PRACTICAL RADIO
AND ELECTRONICS
(with kit) ☐
Electrical ☐
Engineering ☐
Electrical Installations
and wiring ☐
Electrical
Draughtsmanship ☐
Electrical
Mathematics ☐

**Electronic
Engineering
Computer Electronics
Computer
Programming
Colour TV Servicing
C&G Radio, TV & Ele-
tronic Mechanics
General Radio and
TV Engineering
Radio Servicing,
Maintenance and
Repairs**

Transistor Technology ☐
 CITY AND GUILDS ☐
 Installations and Wiring ☐
 CITY AND GUILDS ☐
 Electrical Technicians ☐
 CITY AND GUILDS ☐
 Telecommunications ☐
 Radio Amateurs' Exam etc. etc. ☐

To ALDERMASTON COLLEGE Dept. EPW-13, Reading RG7 4PF **EPW 13**
Also at our London Advisory Office, 4 Fore Street Avenue, Moorgate
London, EC2Y 5EJ Tel: 01-828 2721

NAME (Block Capitals Please)

ADDRESS _____

POST CODE

[illegible]Other subjects Age
Associated to A.G.C. Member of A.B.C.C.

Accredited by E.A.C.C. Member of A.B.C.C.

HOME OF BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

INDEX TO ADVERTISERS

Ambit International	...	...	996
Anxex	...	...	951
A.S.P. Ltd.	...	...	924
Astro Electronics Ltd.	...	...	942
A.H. Supplies	...	...	1001
Bamber, B.	...	...	1008
Barclay Electronics	...	...	985
Barrie Electronics	...	...	914
Barrie-Smith, J.	...	...	1004
Bentley Acoustic Corp. Ltd.	...	...	992
Beta Devices	...	...	1003
B.H. Component Factors Ltd.	...	...	1000
Bi-Pak Ltd.	...	922-923	922
Bi-Pre-pak Ltd.	...	...	926
Birkett, J.	...	...	908
Boffin Projects	...	...	1003
British Institute of Engineering Technology	...	982, 1001	1007
British National Radio & Electronics School	...	917, 920	984
J. Bull (Electrical) Ltd.	...	...	991
Bywood Electronics	...	...	992
Chromasonic Electronics	...	...	Cover iii
Caranna, C.	...	...	1003
C.J.D. Ltd.	...	...	924
Codar Radio Co.	...	...	986
Colomer (Electronics) Ltd.	...	...	932
Copper Supplies	...	...	1004
Combined Precision Components	...	...	944
Cox Radio	...	...	1000
Crescent Radio Ltd.	...	...	997
Crofton Electronics	...	...	992
C.T. Electronics	...	...	Cover ii
D.E.W. Ltd.	...	...	1004
Doram	...	...	916, 919
Eaton Audio	...	...	952
Electronics Design Associates	...	...	920
Electronic Digital Clocks	...	...	1002
Electronic Mail Order Ltd.	...	...	996
Electronic Supplies (Print-a-Kit)	...	...	920
Electrosbares	...	...	1004

Electrovalue Ltd. ....	...	...	984
Everest Instruments Ltd. ....	...	...	1000
Feistead Electronics ....	...	...	1003
Flairline Supplies ....	...	...	990
G.T. Technical Information Service ....	...	...	1003
Garfield ....	...	...	1004
Geenbank Electronics ....	...	...	990
Greenwell Electronics ....	...	...	916
H.A.C. Short-wave Supplies ....	...	...	992
H.M. Electronics ....	...	...	1005
Harversons Surplus ....	...	...	993
Heath (Gloucester) Ltd. ....	...	...	943
Heathkit Centre	943,	1003	1003
Helme Audio ....	...	...	1005
Henry's (Radio) Ltd. ....	...	...	947
Home Radio ....	...	...	999
I.L.P. Electronics Ltd. ....	...	...	987
Intertext I.C.S. ....	...	928,	1003
Jaybee Electronics ....	...	...	1004
John's Radio ....	...	...	1005
Juniper Electronics ....	...	...	1002
Kensington Supplies ....	...	...	1005
K.K.S. Trading ....	...	...	996
Lewis Radio ....	...	...	944
Linear Products ....	...	...	932
London Computer Operators Training Centre ....	...	...	1003
Lynx Electronics ....	...	...	986
Manor Supplies ....	...	...	924
Mack's Electronics ....	...	...	933
Maplin Electronic Supplies	Cover	...	995
Marco Trading ....	...	...	1002
Marshall, A. & Sons ....	...	...	928
Minikits Electronics ....	...	...	1004
Newmart Electronics ....	...	...	988
E. R. Nicholls ....	...	...	927
Partridge Electronics Ltd. ....	...	...	998
Plasro Plastics Ltd. ....	...	...	1005

Pulse Electronics	918
Precision Petite	948
Radio Component Specialists	925
Radio Constructor	918
Radio Book Service	1003
Radio Exchange Ltd.	978
Ramar Constructor Services	1004
R.S.C. (Hi-Fi)	914, 915
Radio Society of G.B.	927
R.S.T. Valve Mail Order Co.	921
Radio & T.V. Components Ltd.	994, 995
Salop Electronics	1005
Sales Team, The	989
Saxon Entertainments Ltd.	930, 931
Scientific Wire Company, The	1004
Simtech Engineering Ltd.	1005
Sinclair Radionics Ltd.	966, 967
Sintel	916
Southern Valve Co.	984
Surplronics	948
Swanley Electronics	948
Tape Talk	1003
T.V. Technical Publications	1003
Technomatic Ltd.	952
Teleradio Electronics	1004-1005
Trampus Electronics	942
Trisidene Ltd.	1002
Tuac Ltd.	929
Ultron Components	988
Vero Electronics	952
Watford Electronics	1006, 1007
Web Europa	990
West London Direct Supplies	992
Wentworth Radio	1002
Michael Williams Electronics	1000
Wilmslow Audio	983
Wrights, S. G.	944
Xeroza Radio	998
Z. & I. Aero Services	1008

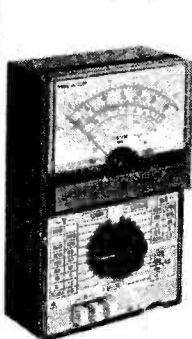
Head Office and Warehouse
44A WESTBOURNE GROVE
LONDON W2 5SF
Tel: 727 5641/2/3

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail-Orders to Head Office

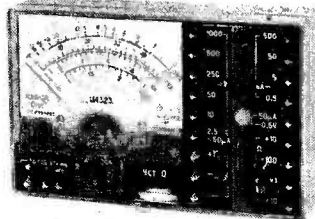
Retail Shop
85 TOTTENHAM COURT ROAD
LONDON W1
Tel: 580 8403
Open all day Saturday

MULTIMETERS—MADE IN USSR

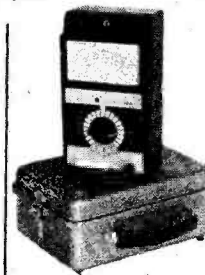


AC/DC MULTIMETER TYPE U4324
33 ranges covering
D.C. current
60μA to 3A;
AC current
300μA—3A;
DC voltage: 0.6—1200V
AC voltage: 3—900V
Resistance:
500Ω—500kΩ
Level: —10 to +12db
Sensitivity:
20,000 o.p.v. DC,
4,000 o.p.v. A.C.

Instrument is powered by re-chargeable nickel cadmium batteries.
PRICE £10.85



AC/DC MULTIMETER TYPE U4323
Apart from usual multimeter facilities the instrument incorporates fixed frequency Audio (1kHz) and I.F. (465kHz) Oscillators. 22 ranges covering AC Voltage 2.5—1000V; D.C. Voltage 0.5—1000V; D.C. current 50μA to 500mA and resistance 0 to 1MΩ. Sensitivity 20,000 o.p.v. Oscillator output voltage—1V minimum.
PRICE: £9.20



AC/DC MULTIMETER TYPE U4315

42 ranges covering:

D.C. current 50μA—2.5A; A.C. current: 500μA—2.5A; AC/DC voltage: 1—1000V; Resistance 300Ω—500kΩ; Capacity up to 0.5μF; Transmission level: —15 to +2db; Sensitivity: 20kΩ/V DC, 2kΩ/V AC.

PRICE £11.25

PLEASE NOTE THAT NO OVERLOAD PROTECTION IS INCORPORATED IN ANY OF THESE INSTRUMENTS.

Full description of the above, as well as other instruments, is available in our illustrated 126-page catalogue, which also includes price list of comprehensive range of transmitting and receiving valves, semiconductors and passive components. Please send £0.20 for your copy.

All prices are exclusive of V.A.T. When remitting cash with order please add £1.00 per instrument for packing and postage and appropriate rate of V.A.T. (at present 8%) to the total. No C.O.D. orders accepted. Mail orders are dealt with within 48 hours.

B. BAMBER ELECTRONICS

Dept PE, 5 STATION ROAD, LITTLEPORT, CAMBS., CB6 1QE
Telephone: ELY (0353) 860185 (2 lines) Tuesday to Saturday

PLEASE ADD 8% VAT (unless otherwise stated)

MINIATURE 2 PIN PLUGS AND SOCKETS
(fit into tin hole, pins enclosed, wire covers for chassis mounting, or can be used for in-line connectors). Bargain pack of 3 plugs + 3 sockets + covers, 50p.

PROGRAMMERS (magnetic devices). Contain 5 microswitches (suitable for mains operation) with 9 rotating cams, all individually adjustable. Ideal for switching disco lights, displays, etc., or industrial machine programming. (Need slow motion motor to drive cams, not supplied) 9 switch version £1.50, or 15 switch version £2. 10 WAY PUSH-BUTTON UNITS. Tin square buttons, marked 0-9, cancelling type, mounted on one PCB for easy fixing, ex-equip. 50p. **HEAVY DUTY HEATSINK BLOCKS**, undrilled, base area 2 1/2 in x 2 in, with 6 fins. total height 2 1/2 in 50p each.

9V RELAYS, Continental type, 2 pole change over, 35p.

RUBBER MAGNETS 1/2 in square, with mounting hole, 20 for 30p.

SPERRY 7-SEGMENT P.G.D. DISPLAYS, digit height 0.3 in red, with decimal points, 150V to 200V (nominal 180V) operation. These are high-volt industrial type and therefore brighter than normal displays. All brand new. AT THE BARGAIN PRICE OF 50p PER DIGIT. TYPE 332 (two digits in one mount) £1 each. TYPE 333 (three digits in one mount) £1.50. (Sorry, no single digit available.) Data Supplied.

BSX20 Transistors, 3 for 50p.
BC108 (metal can), 4 for 50p.
PBC 108 (plastic BC108), 5 for 50p.
OC220 Transistors, 6 for 50p.
BSY25A Transistors, 5 for 50p.
BFY51 Transistors, 4 for 50p.
BCY72 Transistors, 4 for 50p.
PNP audio type TOS Transistors, 12 for 25p.

Rotary switches, min. 4 pole 2-way, 2 for 50p.
Telephone type switches (earr), 50p.
1 1/2 in polythene chassis mounting fuseholders, 6 for 30p.
LES Lamps, 24V 1.2W, 10 for 40p.
Mullard Tubular ceramic trimmers, 1—18pF, 6 for 50p.
I.C.s, some coded, 14 DIL type, untested, mixed, 20 for 45p.
Miniature slider switches, 2 pole 2-way, 5 for 50p.

TRANSISTOR HEATSINKS, to take 2 x TO18 (fit into tin hole, pins enclosed, wire covers for chassis mounting, or can be used for in-line connectors). Bargain pack of 3 plugs + 3 sockets + covers, 50p.

HIGH QUALITY SPEAKERS, 8 1/2 in x 6 in elliptical, only 2 in deep, inverse magnet, 4 ohms, rated up to 10W, £1.50 each, or 2 for £2.75 (qty. discount available). + 25% VAT.

Coils on tin dia. 1 1/2 in long paxolin formers, 5 for 20p.

Valveholders, mixed bag of 10 for 50p.

Spring, 1 in long x 1/4 in dia. per pack 25p.

LF chokes on tin x 2 in cores, 5 for 30p.

2-8pF, 10mm circular ceramic trimmers (for VHF/UHF work) 3 pin mounting, 5 for 50p.

TCO2 transistor insulator sets, 10 for 50p.

PC Board Withdrawal handles, mixed coil, 8 for 50p.

Solder, 20 SWG, 60/40 alloy, approx 8 yds for 25p.

Multiturn Pots, 10 turn, 1/2 in spindle (ex-equip), following values available, 20kΩ, 50kΩ, 400kΩ, £1 each.

Lead suppressors (10kΩ) for mobile plug leads, 4 for 50p.

1mA Meters, 2 in square, plastic fronts (these have a paper scale stuck over the original marked 0-1mA which is easily peeled off and an internal 18k resistor which is easily removed), £1.75 each or 2 for £3.

Situm 100μA Meters. Black rectangular type 24, 2 1/2 in x 2 1/2 in (modern Pye type) marked 0-50, 0-100, 0-150, 0-250, all on one scale (supplied separately) with scale, £2.75.

R/S Midget 3 pole 4 way, rotary switches, 40p each.

SPECIAL OFFER.
Miniature 500mΩ Coax, high quality, PTFE insulation and blue PTFE cover, solid silver plated inner, and silver plated braid, approx 3m overall diameter (ideal for unit wiring of RF stages up to 23cm, etc.), 4 metres for 50p.

PLUGS & SOCKETS.
BNC Socket (Single-hole mounting type) Ex-equipment (special offer) 3 for 50p.
N-Type Plug 50 ohm, 60p each, 3 for £1.50.
N-Type Sockets (4-hole chassis mounting, 50 ohms (a small coax lead type), 50p each.

Greenpar (GE30015) Chassis Lead Terminations (these are the units which bolt on to the chassis, the lead is secured by screw cap, and the inner of the coax passes through the chassis), 30p each, 4 for £1.

PL259 Plugs (PTFE), brand new, packed with reducers, 85p or 5 for £3.

SO239 Sockets (PTFE), brand new (4-hole fixing type), 50p each or 5 for £2.25.

25-way ISEP Plugs and Sockets, 40p set (1 plug + 1 socket).

Plugs and sockets sold separately at 25p each.

Bulgian Round Free Scks, 3 pin, for mains input on test equipment, etc., 25p each.

BNC Insulated Sockets (single hole type), 65p each.

Bulgian Flat 2-pin Flex Connectors non-reversible 40p each.

Mobile Converters, 24V DC input 13.8V at approx 3-4A DC output, fully stabilised, £2.50 each (ideal for running 12V car radio from 24V lorry battery).

Pkts. of 25A Nuts (the self-locking ones with the nylon insert) 100 for 50p.

We now stock Spiraltux Tools for the electronic enthusiast: Screwdrivers, Nut Spanners, BA and Metric sizes, pop rivet guns, etc. S.A.E. for list.

I.F. Cans, 1/2 in square, suitable for rewind, 6 for 50p.

Miniature earphones with min. jack plug, 2 for 50p.

Dubilier Electrolytics, 50μF, 450V, 2 for 50p.

Oublier Electrolytics, 100μF, 275V, 2 for 50p.

Plessey Electrolytics, 470μF, 63V, 3 for 50p.

TCC Electrolytics, 1000μF, 30V, 3 for 60p.

Plessey Electrolytics, 1000μF, 180V, 40p each (3 for £1).

Dubilier Electrolytics, 5000μF, 35V, 50p each.

Dubilier Electrolytics, 5000μF, 50V, 85p each.

Dubilier Electrolytics, 5000μF, 70V, 85p each.

ITT Electrolytics, 6800μF, 25V, high grade, screw terminals, with mounting clips, 50p each.

Plessey Cathodray Capacitors, 0-0.4μF at 12-5kV DC, screw terminals, £1.50 each.

PLEASE ADD 25% VAT TO ALL CAPACITORS

A LARGE RANGE OF CAPACITORS AVAILABLE AT BARGAIN PRICES. S.A.E. FOR LIST.

PLEASE ADD 8% VAT (unless otherwise stated)

SPECIAL OFFER!
MAINS TRANSFORMER, TYPE 14/4, 14V at 4A, £2.50.

DIECAST BOXES (approx size in inches)

4-3 x 2-3 x 1-2	85p
4-8 x 2-3 x 1-5	75p
4-8 x 3-8 x 1	85p
4-8 x 3-8 x 2	£1.00
6-8 x 4-8 x 2	£1.45
4-8 x 3-8 x 3	£1.55
6-8 x 4-8 x 3	£2.25
6-8 x 4-8 x 2	£1.85
10-6 x 8-8 x 2	£2.25

Please add 8% VAT

WELLER SOLDERING IRONS.
EXPERT. Built-in spotlight illuminates work. Pistol grip with fingertip trigger. High efficiency copper soldering tip.

EXPERT SOLDER GUN, £8.80 + VAT (54p).

EXPERT SOLDER GUN KIT (spare bits case, etc.), £9.80 + VAT (78p).

SPARE BITS, PAIR, 20p + VAT (2p).

MARKSMAN SOLDERING IRONS
SP15D 15W £2.52 + VAT (20p)

SP25D 25W £2.52 + VAT (20p)

SP35D 35W + bits, etc, kit £3.12 + VAT (25p)

BENCH STAND with spring for Marksmen Irons, £1.80 + VAT (14p)

SPARE BITS
MT8 for 15W, 42p + VAT (3p).

MT4 for 25W, 35p + VAT (3p).

TCPI TEMPERATURE CONTROLLED IRON.
Temperature controlled iron & PSU, £18.45 + VAT (£1.47).

SPARE TIPS
Type CC single flat, Type K double flat fine tip, 90p each + VAT (8p).

ALL SPARES AVAILABLE

MULTICORE SOLDER
Size 5 Savbit 18 s.w.g. in alloy dispenser, 32p + VAT (3p).

Size C15AV18 Savbit 18s.w.g., 54p + VAT (4p).

Size 12 SAVBIT 18s.w.g. on plastic reel £1.80 + VAT (15p).

MINIATURE PLIERS High quality "Crescent", made in USA, £4.35 + VAT (35p).

BID CUTTERS, high quality "Crescent", made in USA, £3.45 + VAT (44p).

Terms of Business: CASH WITH ORDER. MINIMUM ORDER £1. ALL PRICES INCLUDE POST & PACKING (UK ONLY). SAE with ALL ENQUIRIES Please. PLEASE ADD VAT AS SHOWN. ALL GOODS IN STOCK DESPATCHED BY RETURN.

Published on approximately the 7th of each month by IPC Magazines Limited, Fleetway House, Farringdon Street, London EC4A 4AD. Printed in England by Index Printers, Dunstable, Beds. Sole Agents for Australia and New Zealand—Gordon and Gotch (Asia) Ltd., South Africa—Central News Agency Ltd. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been 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, excluding Hire where the selling price is subject to V.A.T., and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

Dept. 1. 56, Fortis Green Road
Muswell Hill, London, N10 3HN.
telephone: 01-883 3705

LINEAR I.C.'s

100

www.americanradiohistory.com

More than just a catalogue!

PROJECTS FOR YOU TO BUILD

4-digit clock, 6-digit clock, 10W high quality power amp., High quality stereo pre-amp., Stereo Tuner, F.M. Stereo decoder, etc., etc.

CIRCUITS ... Frequency Doublers, Oscillators, Timers, Voltmeters, Power Supplies, Amplifiers, Capacitance Multiplier, etc., etc.

Full details and pictures of our wide range of components, e.g. capacitors, cases, knobs, veroboards, edge connectors, plugs and sockets, lamps and lampholders, audio leads, adaptor plugs, rotary and slide potentiometers, presets, relays, resistors (even 1% types!), switches, interlocking pushbutton switches, pot cores, transformers, cable and wire, panel meters, nuts and bolts, tools, organ components, keyboards, L.E.D.'s, 7-segment displays, heatsinks, transistors, diodes, integrated circuits, etc., etc., etc.

Really good value for money at just 40p.



132 Pages

PW 'Easybuild' STEREO DISCO



YOU MUST
SEE OUR PRICES BEFORE YOU BUY (S.A.E. please for details)

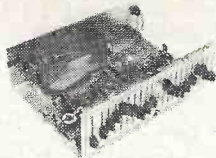
The 4600 SYNTHESISER



We stock all the parts for this brilliantly designed synthesiser, including all the PCB's, metalwork and a drilled and printed front panel, giving a superb professional finish. Opinions of authority agree the ETI International Synthesiser is technically superior to most of today's models. Complete construction details in our booklet now available price £1.50, or S.A.E. please for specification

GRAPHIC EQUALIZER

A really superior high quality stereo graphic equaliser as described in Jan. 1975 issue of ETI. We stock all parts (except woodwork) including all the metal work drilled and printed as required to suit our components and PCB's. Complete reprint of article—price 15p.



ELECTRONIC ORGAN

Build yourself an exciting Electronic Organ. Our leaflet MES51, price 15p, deals with the basic theory of electronic organs and describes the construction of a simple 49-note instrument with a single keyboard and a limited number of stops. Leaflet MES52, price 15p, describes the extension of the organ to two keyboards each with five voices and the extension by an octave of the organ's range.

Solid-state switching and new footages along with a pedal board and a further extension of the organ's range are shown in leaflet MES53, priced at 35p (Pre-publication price 15p)



NO MORE DOUBTS ABOUT PRICES

Now our prices are **GUARANTEED** (changes in VAT excluded) for two month periods. We'll tell you about price changes in advance for just 30p a year (refunded on purchases). If you already have our catalogue send us an s.a.e. and we'll send you our latest list of **GUARANTEED** prices. Send us 30p and we'll put you on our mailing list — you'll receive immediately our latest price list then every two months from the starting date shown on that list you'll receive details of our prices for the next **GUARANTEED** period **before** the prices are implemented! — plus details of any new lines, special offers, interesting projects — and coupons to spend on components to repay your 30p

NOTE: The price list is based on the Order Codes shown in our catalogue so an investment in our super catalogue is an essential first step.

Call in at our shop, 284 London Road, Westcliff on Sea, Essex. Please address all mail to



**MAPLIN ELECTRONIC
SUPPLIES**

P.O. Box 3 Rayleigh Essex SS6 8LR.

I enclose Cheque/P.O. value _____
For _____ copy/copies of your Catalogue

Name _____

Address _____

PW

MAPLIN ELECTRONIC SUPPLIES P.O. Box 3 Rayleigh
Essex SS6 8LR.

PRACTICAL WIRELESS

MARCH
1976

35p

TUNER CASSETTE

**Add
Radio
to your
player!**



also:

CMOS Crystal Calibrator

Up-dating PW's Home Telephone Exchange

**ALL MAIL ORDER BY
RETURN.C.O.D.SERVICE
WELCOME**

C.T. ELECTRONICS

Tel: 01-994 6275

All mail order and enquiries to 270 Acton Lane, Chiswick, London W4 5DG

V.A.T.

Unless otherwise stated all prices are exclusive of V.A.T. Please check whether the goods you are ordering are 25% or 8% Carriage orders under £5 please add 33p. Order over £10 post free in U.K. only. This is to be at our discretion.

SEMICONDUCTORS

AA212	25p	BC214	14p	IS100	15p
AC107	35p	BC214L	15p	IS103	15p
AC125	25p	BC238	15p	MJ340	50p
AC126	25p	BC239	15p	MJ481	95p
AC127	25p	BC300	30p	MJ2801	£1.25
AC128	25p	BC301	30p	MJ2901	£1.25
AC176	25p	BC302	30p	MJE340	50p
AC187	27p	BC303	35p	MJE370	75p
AC188	27p	BCY31	35p	MJE371	90p
ACV17	25p	BCY32	95p	MJE520	65p
ACV18	25p	BCY33	65p	MJE525	£1.20
ACV19	25p	BCY34	65p	MJE3055	75p
ACV20	25p	BCY35	65p	MM1613	45p
ACV21	25p	BCY39	95p	MM1712	60p
AD140	60p	BCY55	£1.50	MPF102	45p
AD142	60p	BCY70	20p	MPF103	45p
AD161	45p	BCY71	20p	(2N5457)	35p
AD162	45p	BCY72	20p	MPF110	35p
AF114	25p	BD121	75p	(2N5458)	35p
AF115	25p	BD123	85p	MPF105	40p
AF116	25p	BD124	70p	(2N5459)	40p
AF117	25p	BD131	40p	OA47	10p
AF118	50p	BD132	50p	OA70	10p
AF124	30p	BD135	50p	OA79	10p
AF239	60p	BD136	50p	OA79	10p
BA102	30p	BD139	75p	OA90	10p
BA112	50p	BD140	87p	OA91	10p
BA144	16p	BD153	80p	OA200	10p
BA155	16p	BD156	80p	OA202	10p
BA156	15p	BDY17	£1.50	OA210	35p
BC107	13p	BDY18	£1.75	OA211	35p
BC108	13p	BDY19	£1.90	OC16	90p
BC109	14p	BDY20	£1.20	OC19	85p
BC109c	16p	BF152	20p	OC22	55p
BC113	13p	BF166	30p	OC28	65p
BC114	13p	BF178	35p	OC28	60p
BC115	15p	BF180	35p	OC35	60p
BC116	15p	BF181	35p	OC36	60p
BC117	20p	BF195	16p	OC42	40p
BC118	15p	BF196	16p	OC44	20p
BC119	30p	BF197	16p	OC45	25p
BC143	25p	BF200	35p	OC70	15p
BC147	12p	BF224	18p	OC71	12p
BC148	12p	BF244	18p	OC72	20p
BC149	12p	BF245	18p	OC75	25p
BC149c	14p	BF259	55p	OC76	25p
BC157	14p	BFX29	30p	OC77	40p
BC158	14p	BFX34	30p	OC81	25p
BC159	15p	BFX85	30p	OC83	25p
BC167	14p	BFX86	30p	OC85	25p
BC168	14p	BFX88	30p	OC89	30p
BC169	14p	BFY10	35p	OC170	25p
BC169c	15p	BFY44	50p	OC171	30p
BC172	13p	BFY50	25p	OC200	60p
BC182	12p	BFY51	25p	OC201	60p
BC182L	12p	BFY52	25p	OC202	75p
BC183	12p	BFY53	25p	OC202	75p
BC183L	12p	BFY90	65p	OC202	75p
BC184	12p	BSV68	70p	OC202	75p
BC184L	12p	BSW63	65p	OC202	75p
BC185	35p	BSW68	80p	OC202	75p
BC186	27p	BSX19	15p	OC202	75p
BC212	12p	BSX20	15p	OC202	75p
BC212L	14p	BSX21	25p	OC202	75p
BC213	12p	BY127	20p	OC202	75p
BC213L	12p	BY164	65p	OC202	75p

QTY. DISCOUNTS: 12+ 10%; 25+ 15%; 100+20%

TIP29B	54p	2N2369A	50p
TIP30B	60p	2N2477	30p
TIP31B	65p	2N2646	50p
TIP32B	77p	2N2846	£1.50
TIP33B	£1.06	2N2903	30p
TIP34B	£1.62	2N2905	30p
TIP35B	£2.71	2N2906	25p
TIP36B	£3.50	2N2907	25p
TIP41B	78p	2N2926	13p
TIP42B	85p	2N3053	25p
TIP29C	68p	2N3055	50p
TIP30C	72p	2N3232	£1.35
TIP31C	80p	2N3252	£1.10
TIP32C	£1.00	2N3553	£1.40
TIP33C	£1.20	2N3643	30p
TIP34C	£1.80	2N3702	12p
TIP35C	£3.00	2N3703	12p
TIP38C	£3.74	2N3704	12p
TIP41C	90p	2N3705	12p
TIP42C	£1.00	2N3708	12p
TIS50	40p	2N3707	12p
ZTX107	15p	2N3708	14p
ZTX300	15p	2N3709	14p
ZTX500	16p	2N3771	£1.50
ZTX501	20p	2N3772	£1.60
ZTX504	20p	2N3792	£1.80
ZTX531	10p	2N3794	30p
ZTX550	25p	2N3819	35p
IN659	8p	2N3820	55p
IN914	8p	2N3823	70p
IN916	8p	2N3866	85p
IN4001	8p	2N3904	22p
IN4002	8p	2N3905	22p
IN4003	9p	2N3906	25p
IN4004	10p	2N4014	80p
IN4005	12p	2N4036	62p
IN4006	14p	2N4037	44p
IN4007	16p	2N4058	14p
IN4148	7p	2N4059	14p
IN656	25p	2N4060	12p
IN697	25p	2N4061	12p
IN698	25p	2N4062	12p
IN706	12p	2N4126	18p
IN708A	14p	2N4286	25p
IN708B	15p	2N4287	25p
IN709	22p	2N4288	27p
IN712	20p	2N4289	30p
IN713	20p	2N4290	25p
IN7132	20p	2N4291	32p
IN7133	20p	2N4302	45p
IN7134	20p	2N4444	£1.90
IN7135	20p	2N4571	35p
IN7136	30p	2N4503	£1.30
IN7137	30p	2N4504	£1.30
IN7138	30p	2N4505	£1.30
IN7139	30p	2N4506	£1.30
IN71613	30p	2N5191	96p
IN71711	30p	2N5194	£1.10
IN71890	60p	2N5195	£1.10
IN72146	15p	2N5245	45p
IN72150	15p	2N5296	55p
IN72160	80p	2N5309	55p
IN72217	25p	2N5457	35p
IN72218	25p	2N5458	35p
IN72219	25p	2N5459	40p
IN72222	25p	2N5485	55p
IN72223	25p	2N5485	55p
IN72236	70p	2N5495	65p
%		2N3772	

PRACTICAL WIRELESS

VOL. 51 NO. 11

ISSUE 829

MARCH 1976

BRITAIN'S PREMIER MAGAZINE FOR THE DO-IT-YOURSELF RADIO AND ELECTRONICS CONSTRUCTOR

EDITOR

Lionel E. Howes, G3AYA

ASSISTANT EDITOR

Eric Dowdeswell, G4AR

ART EDITOR

Peter Metalli

PRODUCTION & NEWS EDITOR

Colin Riches

TECHNICAL SUB-EDITOR

Bill Tull

TECHNICAL ARTIST

Alan Martin

SECRETARIAL

Jill Austin

ADVERTS MANAGER

01-634 4293 Roy Smith

CLASSIFIED ADVERTS

01-634 4301 Colin R. Brown

Published by IPC Magazines Ltd.,
Fleetway House, Farringdon Street,
London EC4A 4AD. Tel. 01-634 4444

BINDERS

Binders (£1.90) and indexes 30p (inc. VAT) can be supplied by the Binders Dept at Carlton House, 66-68 Great Queen Street, London, WC2 5DD.

BACK NUMBERS

We regret that we are unable to supply back numbers of Practical Wireless. Readers are recommended to enquire at a public library to see copies. Requests for specific back numbers of Practical Wireless and Television can be published in our CQ Column.

COPYRIGHT AND QUERIES

© IPC Magazines Limited 1976. Copyright in all drawings, photographs and articles published in "Practical Wireless" is fully protected and reproduction or imitation in whole or in part is 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.

We regret that we cannot answer technical queries by telephone nor can we provide information or advice on manufacturers' products other than that given in the magazine. We will endeavour to assist readers who have queries relating to articles published but we cannot offer advice on modifications to our published designs. All correspondents expecting a reply should enclose a stamped addressed envelope.

Practical Wireless, March 1976

● NEWS & COMMENT

935 NEWS ... NEWS ... NEWS ...

941 HOTLINES on recent developments—*Ginsberg*

954 LETTERS—a word from some of our readers

959 NEXT MONTH IN PRACTICAL WIRELESS

964 KINDLY NOTE—notes on published articles

976 PRODUCTION LINES—news on products of interest—
Colin Riches

979 ON THE AIR

979 Broadcast Bands, MW—*Charles Molloy*

980 Amateur Bands—*Eric Dowdeswell, G4AR*

981 Broadcast Bands, SW—*Derek Bell*

982 TELEVISION—what's in our sister magazine this month?

● CONSTRUCTIONAL

936 GENERAL COVERAGE RECEIVER, Part 2—*F. G. Rayer, G3OGR*

945 UPDATING PW's HOME TELEPHONE EXCHANGE—
G. M. Rossetti

960 TUNER CASSETTE—*Stephen Mukaloff*

968 CMOS CRYSTAL CALIBRATOR—*M. E. Theaker, B.Sc.*

● OTHER FEATURES

934 READERS PCB SERVICE

949 RADIO BREAK-THROUGH, Part 2—*H. Leeming, G3LLL, FSERT, T. Eng. (CEI)*

955 GENERAL SERVICING, Part 2, Car Radios, by *Les Lawry-Johns*

965 GOING BACK—earlier days of wireless—*Colin Riches*

973 SPECIAL PRODUCT REPORT—HEATHKIT HD-1410 ELECTRONIC KEYS

975 TECHNICROSS No. 12—PUZZLE

TRANSFORMERS

ALL EX-STOCK—SAME DAY DESPATCH				VAT 8%			
MAINS ISOLATING				12 and or 24 Volt			
PRI. 120/240V. SEC. 120/240.				PRIMARY 240-250 VOLTS			
CENTRE TAP WITH SCREEN							
Ref. No.	VA (Watts)	£	p & p	Ref. No.	Amps	£	p & p
07*	20	3.77	0.58	111	0.5	0.25	1.54
149	60	4.69	0.72	213	1.0	0.5	1.86
150	100	5.33	0.85	71	2	1	2.41
151	200	8.54	1.12	18	4	2	2.97
152	250	10.32	1.41	70	6	3	4.43
153	350	12.47	1.41	108	8	4	5.09
154	500	14.31	1.61	72	10	5	5.50
155	750	21.94	1.81	116	12	6	5.80
156	1000	30.57	2.01	17	16	8	7.48
157	1500	34.89	2.21	115	20	10	10.91
158	2000	38.92	2.41	187	30	15	14.20
159	3000	61.48	3.61	226	60	30	17.67

30 VOLT RANGE

Prim. 200-240V

Sec. 0-12-15-20-24-30V

Ref. No.	Amps	£	p & p
112	0.5	1.90	0.58
79	1.0	2.52	0.72
3	2.0	3.77	0.72
20	3.0	4.70	0.85
21	4.0	5.36	0.85
51	5.0	6.73	0.97
117	6.0	7.52	1.25
88	8.0	10.20	1.25
89	10.0	10.36	1.41

60 VOLT RANGE

Prim. 200-240V

Sec. 0-24-30-40-48-60V

Ref. No.	Amps	£	p & p
124	0.5	2.48	0.72
126	1.0	3.68	0.72
127	2.0	5.33	0.85
125	3.0	7.90	0.97
123	4.0	9.19	1.41
40	5.0	10.24	1.25
120	6.0	12.07	1.41
121	8.0	15.75	1.81
122	10.0	19.40	2.01
189	12.0	20.25	2.21

SCREENED MINIATURES

Ref. No.	VA (Watts)	£	p & p
238	200	3.0-3	1.62
212	1A	0.6-0.6	1.93
13	100	9-9	1.56
235	330	330-0.9-0.9	1.64
207	500	500-0.8-0.8	2.02
208	1A	0.8-0.9	3.07
236	200	0.15-0.15	1.56
214	300	0.20-0.20	2.07
221	700(DC)	20-12-0.2-0.2	2.38
206	1A	0.15-0.20	3.63
203	500	0.15-0.27	3.15
204	1A	0.15-0.27	4.14
5112	500	12, 15, 20, 24, 30	1.97

BRIDGE RECTIFIERS

Ref. No.	VA (Watts)	£	p & p
50V	2A	35p	
100V	2A	40p	
200V	1A	45p	
400V	1A	65p	
600V	2A	50p	
500V	10A(PM 7A6)	£2.35	

TEST METERS

Ref. No.	£
AVO 8 MK5	£55.88
AVO 72	£21.72
U4313*	£13.85
U4315*	£11.80

ANTENX SOLDERING IRONS

Ref. No.	£
15W	£2.68
18W	£2.45
25W	£2.26
SOLDERING IRON KIT	£3.61
STAND FOR ABOVE	£1.13

MAGNETIC TO CERAMIC

CARTRIDGE CONVERTOR

OPERATING VOLTAGE 20-45V

ONLY £2.65 P & P 18p. VAT 25%

BSR MINI-DECK

4 SPEED AUTO CHANGER £6.00

P & P 72p. VAT 25%

NEW STEREO 30

Complete Stereo Chassis inc.:

7+7W RMS. Amp. Pre-amp.

Power Supply. Front Panel.

Knobs (only needs Mains Trans).

Stereo 30 £15.75. Mains Trans

£2.45. Teak veneered cab. £3.65.

P & P 85p VAT 25%.

PLEASE ADD VAT AFTER P. & P.

AUDIO ACCESSORIES & BARGAIN COMPONENT PAKS

SEMICONDUCTOR STOCKIST

Callers Welcome (Mon-Fri.) or send stamp for lists.

Barrie Electronics Ltd.

3, THE MINORIES, LONDON EC3N 1BJ

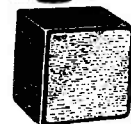
TELEPHONE: 01-488 3316/7/8

NEAREST TUBE STATIONS: ALDGATE & LIVERPOOL ST

RSC

DISCO SYSTEM

40 WATT



Consisting of Twin Turntable Console with Pre-Amp and built-in Power Output.

carr. £3

£99.99

Sep. vol. controls for each T/table. H/phone monitoring facilities. Sep. Bass and Treble controls. Mic. Vol. control. Neon Mains Indicator. Plus Pair 12" Spkrs. in matching Rexine covered cabinets.

Terms: Dep. £15.99 and 18 fortnightly payments. £5.38. (Total £112.83)

AS ABOVE LESS SPEAKERS £79.95

Terms: Dep. £9.00 and 18 fortnightly payments £4.61 (Total £81.88).

MOBILE DISCO CONSOLE £59.95

MIC., JACK, PHONE JACK, MONITOR VOL. CONTROL, MONITOR SELECTOR DECK (1) Vol. control, DECK (2) Vol. control, Mic. Vol. control, Treble Control, Bass Control ON/OFF Switch, Neon Indicator, Twin Turntables.

carr. £3



Terms: Dep. £7.95 and 18 fortnightly payments. £3.33. Total £67.89.

POWER (SLAVE) AMPLIFIER 100 WATT

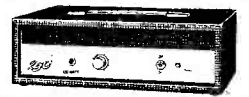
Suitable for use with above or other

Disc-Consoles.

Also for increasing output

of lower-powered Amplifiers.

Terms: Dep. £9.00 and 8 mthly payments of £5.22 (Total £50.76) carr. £1



TITAN GROUP/DISCO SPKRS



Guaranteed for 5 yrs.

Rec. Price

RSC Price

T12/35 12" 35w

£13.00

£10.95

T12/60 12" 60w

£20.00

£14.95

T12/100 12" 100w

£35.00

£25.95

T15/70 15" 70w

£27.00

£19.95

T15/100 15" 100w

£38.50

£27.95

T18/100 18" 100w

£42.50

£29.95

Imp. 8-15 Ω

SPECIAL OFFER FOR ONE MONTH ONLY

FANE CRESCENDO

12-B Super Guitar Speaker.

List Price £49.95.

Our Price

£33.95

Carr. Free

R.S.C. TRANSFORMERS, L.F. CHOKES & RECTIFIERS

FULLY GUARANTEED. Impregnated and interleaved where necessary.

Primaries 200-250v. 500v. Screened ALL PRICES INCLUDE VAT

MIDGET CLAMPED TYPE

250v. 60mA 6.3v. 2a.

£1.75

250v. 250v. 60mA 6.3v. 2a.

£1.85

FULLY SHROUDED UPRIGHT MOUNTING

250v. 250v. 60mA 6.3v. 2a. 0.5-6.3v. 2a.

£2.60

250v. 250v. 100mA 6.3v. 4a. 0.5-6.3v. 3a.

£4.25

300v. 300v. 130mA 6.3v. 4a. C.T. 6.3v.

£5.20

1a. for Mullard 510 Amplifier

£5.20

350v. 350v. 100mA 6.3v. 4a. 0.5-6.3v. 3a.

£4.25

350v. 350v. 150mA 6.3v. 4a. 0.5-6.3v. 3a.

£5.20

425v. 425v. 200mA 6.3v. 4a. C.T. 6.3v. 3a.

£9.85

425v. 425v. 200mA 6.3v. 4a. 6.3v. 4a. 5v. 3a.

£10.00

450v. 450v. 250mA 6.3v. 4a. C.T. 5v. 3a.

£10.45

TOP SHROUDED DROP-THROUGH TYPE

250v. 250v. 70mA 6.3v. 2a. 0.5-6.3v. 2a.

£2.60

250v. 250v. 100mA 6.3v. 3a.

£3.20

250v. 250v. 100mA 6.3v. 2a. 6.3v. 1a.

£3.20

250v. 250v. 80mA 6.3v. 2a. 0.5-6.3v. 2a.

£3.20

250v. 250v. 100mA 6.3v. 4a. 0.5-6.3v. 3a.

£4.25

300v. 300v. 100mA 6.3v. 4a. 0.5-6.3v. 3a.

£4.25

300v. 300v. 130mA 6.3v. 4a. 0.5-6.3v. 1a.

£5.20

350v. 350v. 100mA 6.3v. 4a. 0.5-6.3v. 3a.

£4.25

350v. 350v. 150mA 6.3v. 4a. 0.5-6.3v. 3a.

£5.20

FILAMENT OR TRANSFORMER POWER PACK

Type: 12v. 1a. £1.10. 6.3v. 1.5a. £1.06. 6.3v. 2a.

£1.10 6.3v. 3a. £1.70. 6.3v. 4a. £2.60. 12v. 3a. or 24v.

1.5a. £2.60 0.9-1.8v. 11a. £2.25. 0-12-26-42v. 2a.

£3.19

AUTO (STEP UP/STEP DOWN) TRANSFORMERS

0-10/120v. 200-230-250v. 50-80v. £2.90 150

watts £5.20, 250 watts £6.27, 500 watts £9.84

CHARGER TRANSFORMERS

0-9-15v. 11a. £2.02. 21a. £2.55. 3a. £2.32. 5a. £2.84.

6a. £3.19. 8a. £3.45

OUTPUT TRANSFORMERS

Standard Pentode 5000 to 3 ohm, or 7000 ohm to

3 ohm £1.12. Push Pull 6 watts EL84 to 3 ohm or

15 ohm £1.68. Push Pull 10-12 watts 6v. 6 to 3

ohm or 15 ohm £2.61. Push Pull 10-12 watts to

match 6v. 6 to 3. 5 or 15 ohm £2.72. Push Pull

EL84 to 3 or 15 ohm 10-12 watts £2.81. Push

Pull Ultra Linear for Mullard 510 etc. £4.25.

HI-FI

ITEMS

PREVIOUSLY

ADVERTISED

INCLUDING

DISCOUNT

LINE

are still

available

ALL RSC PRICES

INCLUDE VAT

Practical Wireless, March 1976

RSC 100 WATT DISCO SYSTEM

50 WATT SPEAKER

AT FANTASTIC LOW PRICES!

HEADPHONE MICROPHONE

TWIN TURNTABLE WITH PRE-AMP and POWER AMPLIFIER Complete with lid

50 WATT SPEAKER

SYSTEMS UP TO 300 WATTS OUTPUT

at unbeatable Prices. Send for Catalogue.

DISCOMASTER TWIN TURNTABLE POWER CONSOLE £119-95

Twin, McDonald MP80 type turntables. Sonotone or Aco's cartridges with diamond styl. Facilities as TDI Console but with built-in 100 watt Power Amp. 22-50 p.f. filter, complete with lid. Or Dep. £18-95 and 18 fortnightly pymts £8-78 (Total £135-95)

STEREO VERSION £155 or DEPOSIT £25 and 18 fortnightly pymts £8-30 (Total £174-40). Carr. £3

R.S.C. COLUMN SPEAKERS

All types 15 Ohms covered in Vynide & Vynair

TYPE C132 40-50 WATTS £27-95

Incorporating two exceptionally efficient 13" x 8" speaker units. Dep. £3-95 and 8 monthly payments £3-50 (Total £31-95) Carr. 55p

IDEAL FOR VOCALISTS AND PUBLIC ADDRESS

TYPE C370 70 WATTS. Fitted three 12" 25 watt highly sensitive high flux speakers with high power voice coils. Size approx. 54" x 14" x 11". Dep. £5-11 and 8 monthly pymts. £5-11 (Total £45-99) Carr. 85p

ALL RSC PRICES INCLUDE VAT

INTEREST on Credit Purchases REFUNDED settled in 3 months

SUPER MINSTREL 10 W GUITAR AMP.

Incorporating Tremolo and 10" Speaker. Output 10 watts R.M.S. Continuous. 3 Jack Inputs for Microphone and Instrument. Main Controls: Volume, Tone, Tremolo Speed, Tremolo Intensity. Terms: DEPOSIT £7-73 and 8 monthly payments £3-40 (Total £24-93) Carr. free

F.A.L. MAESTRO COMBINED 30W AMP. AND 12" SPEAKER £55-95

For Lead Guitar, Mic, Gram, Radio, Tape (Not for use with Bass instruments) Inc. 3 inputs and 2 vol controls plus Treble & Bass, TREMOLO with associated controls. Attractively finished in black with silver-finished fascia. Compact size Fitted carrying handle. Deposit £9-25 and 8 monthly payments £6-78 (Total £28-33)

RSC PHANTOM 50 COMBINED AMP. AND SPEAKER £59-95

Rating 50 watts. 3 inputs, 2 vol. controls. Bass, Treble, Presence Carr. £1-50 Dep. £7-95 and 8 monthly pymts. £7-48 (Total £28-79)

FAL PHASE 50-4 AMPLIFIER 50 WATT

Solid state. 4 Sep. controlled inputs Plus master vol. control. Incl. Bass and Treble Controls. Protection against serious o/p overloading. O/p for spkrs. 8 to 15 ohms. Size 17" x 7" x 7 1/2". 200-250V. A.C. mains. O/p 50w

R.M.S. Deposit £8-60 £48-60

& 8 monthly payments £5-75. Total £54-60 Carr. Free.

REGENT 50X 50 WATT AMP.

A powerful high quality unit for lead, rhythm guitar, vocalists, gram, radio, tape. 50w Peak O/P rating. Not for Bass Guitar.

★ Two Fane heavy duty high flux 12in. spkrs. ★ Four Jack inputs and two Volume Controls for instant use of up to four pick-ups or 'mikes'. Bass and Treble controls. Send S.A.E. for leaflet. Carr. £2-50 Deposit £9-95. & 18 fortnightly payments of £4-15 (Total £28-45)

REGENT 50B for Bass Guitar and general purposes. Or Dep. £9-00 & 18 fortnightly payments £4-61 (Total £29-98). Carr. £2-50

FANE CRESCENDO SPEAKERS

FULL RANGE AVAILABLE AT ALL BRANCHES



- Units listed below
- (a) DISCOMASTER TWIN TURNTABLE CONSOLE with integral 100W amplifier
 - (b) PAIR OF HI-FI 'H' PHONES
 - (c) MATCHING 'MIKE'
 - (d) PAIR 50 WATT SPEAKERS Black Rexine covered Cabinets Size approx. 18" x 18" x 8"

(a) (b) (c) & (d) Carr. £4-00

DEP. £19-99 & 18 fortnightly payments of £9-75 (Total £195-49)

STEREO VERSION

of Above System Or DEPOSIT £34-95 and 18 fortnightly pymts. £11-19 (Total £226-37) Carr. £5-00

TDI DISCO CONSOLE

Incorporating twin BSR MP80 type turntables and Sonotone or Aco's Cartridges with diamond styl. Separate Vol. controls for each turntable. Also MONITORING FACILITIES, plus Treble and Bass Controls. Separate input for 'mike' with vol. control. Black Vynide covered Cabinet with lid. Or-DEP. £29-95 and 18 fortnightly pymts. £5-11 (Total £101-93) Carr. £1-50

TD2S STEREO VERSION OF ABOVE

Terms DEPOSIT £20 and 18 fortnightly payments £8-71 (Total £140-78) Carr. £1-60

FANE DISCO 60C SPKR UNITS

Supplied with above in lieu of L12/50 units. Fabulous specialist range Spkrs in heavy Vynide covered for cabinets with protective Corner pieces. List Price £85 pr. £25 extra

FANE ULTRA HIGH POWER SPEAKERS & KITS

All power ratings are R.M.S. continuous. 2 YEARS' GUARANTEE High flux ceramic magnets. ALL CARRIAGE FREE. *SPECIAL PRICE

'POP' 100	'POP' 60	'POP' 50T
18" 100 Watt 14,000 gauss 8/15Ω	15" 60 Watt 14,000 gauss 8/15Ω	12" 50 Watt 13,000 gauss 8/15Ω
£38-95	*£19-99	*£14-95
Dep. £6-85 and 8 monthly payments £4-60 (Total £43-75)	Dep. £3-95 and 8 monthly payments £2-87 (Total £26-91)	Dual Cone. Terms for pairs Dep. £3-90 & 8 monthly payments £4-24. Total £37-82 PAIR SUITABLE ALL PURPOSES

FOR BASS GUITAR, ELECT. ORGAN, ETC.

'POP' 25/T12" 25W

Dual cone. 15 ohm Imp. (Not for Bass Guitar use). Terms for Pairs: Deposit £3-98 and 8 monthly payments of £2-75 (Total £25-98)

HIGH POWER TWEETER PH50

Response 3KHz-20KHz with 2 to 4 mid. Non elect. filter available 55p. Rating 50 Watt Imp 8Ω

D40 50 WATT DISCO KIT

ALL PURPOSE FULL RANGE

Consisting of 12" 13,000 Gauss Bass Unit. HPX1 Cross over and PH50. Tweeter as above. Imp 8/15Ω (Bass Guitar requires pair in one cabinet). Terms: Dep. £3 x 8 mthly. pymts. £2-75 (Total £25)

HIGH QUALITY L'SPEAKER UNITS

ALL 2-TONE VYNIDE & VYNAIR FINISH L12/2 50-WATT Fitted pair of 12" 30 watt high flux speakers. Imp. 8-15 ohms. Car. £1-50. Terms: Dep. £5-11 & 8 mthly pymts. of £5-11. Total £45-99. L12/50 12" 50 WATT 13,000 lines 15 ohms. Terms: Dep. £3-95 and 8 mthly. pymts. £3-37 (Total £30-91) Carr. 55p.

LIQUID WHEEL from PROJECTORS £29-95

'SOUND TO LIFE' SYSTEM PULSAR special price complete kit £106-95

Dep. £14-95 and 18 fortnightly pymts. £5-93. (Total £121-69). Super 8L Unit, 1000 watt per channel. Manual override buttons, 2 spotbanks with 6 bulbs (3 sep. colours) 5 yd. and 10 yd. leads, fitted plugs. Units sold sep.

FAL SOUND-TO-LIFE UNIT £21-60

3-WAY SPOT BANK Excluding Bulbs Each £16-20 COMPLETE SYSTEM Carr. £1-50. £55

Incl. 2 Spotbanks and bulbs.

New Branches at YORK CARLISLE, DEWSBURY and PRESTON

OPEN ALL DAY SATURDAYS (5 Day Week)

BRADFORD 10 North Parade (Closed Wed.). Tel. 25349
BOLTON 23 Deansgate. (Closed Wed.). Tel. 33512
BIRMINGHAM 30/31 Great Western Arcade. Tel. 021-236 1279 (Closed Wed.).

CARLISLE 8 English Street. (Closed Thurs.).

COVENTRY 17 Shelton Sq. The Precinct. Tel. 25983

DERBY 97 St. Peter's Street. (Closed Wed.). Tel. 41361

DARLINGTON 19 Northgate (Cl. Wed.). Tel. 68043

DEWSBURY 9/11 Kingsway (Closed Tues.).

DONCASTER 3 Queensgate, Waterdale Centre. (Closed Thurs.). Tel. 63069

RSC EDINBURGH

GLASGOW 326 Argyle St. (Cl'd Tues.). Tel. 248 4158

HULL 7 Whitefriargate (Closed Thurs.). Tel. 20505

LEICESTER 32 High Street (Closed Thurs.). Tel. 56420

LEEDS 5-7 County (Mecca) Arcade, Briggate (Closed Wed.). Tel. 458252

LIVERPOOL 73 Dale St. (Closed Wed.). Tel. 236 3573

LONDON 238 Edgware Road, W.2. (Closed Thurs.). Tel. 723 1629

MANCHESTER 60A Oldham Street (Closed Wed.). Tel. 236 2774

MIDDLESBROUGH 108 Newport Road. Tel. 47098

103 Linthorpe Rd. Tel. 210585. (Both closed Wed.)



Barclaycard and Access accepted

All items subject to availability.

Prices correct at 9.1.76 E. & O.E.

101 Lothian Rd. (Closed Wed.).

Tel. 229 9501

Tel. 248 4158

Tel. 20505

Tel. 56420

Tel. 458252

Tel. 236 3573

Tel. 723 1629

Tel. 236 2774

Tel. 47098

Tel. 210585. (Both closed Wed.)

MAIL ORDERS & EXPORT ENQUIRIES TO:-

AUDIO HOUSE, HENNINGER LANE, LEEDS, 18.

Tel: Pudsey (09786) 7768.

MAIL ORDERS MUST NOT BE SENT TO SHOPS

TERMS C.W.O. or C.O.D. No C.O.D. under £1.

POSTAGE 40p PER ORDER OR AS QUOTED.

TRADE SUPPLIED. LARGE S.A.E. REQUIRED FOR FREE CATALOGUE.

NEWCASTLE UPON TYNE 24 Newgate Shopping Centre (Closed Wed.). Tel. 21488

NOTTINGHAM 19/19A Market Street (Closed Thurs.). Tel. 48088

PRESTON 41 Friargate Walk, St. Georges Shopp Prec. Tel. 51978

SHEFFIELD 13 Exchange Street (Castle Mkt. Bldg.) (Closed Thurs.). Tel. 20716

STOCKPORT 8 Little Underbank (Closed Thurs.). Tel. 480-0777

SUNDERLAND 5 Market Sq. (Closed Wed.). Tel. 70573

YORK 5 CHURCH ST. (Closed Wed.). Tel. 34355

GREENWELD

HAVE MOVED TO LARGER PREMISES AT:
443 MILLBROOK ROAD, SOUTHAMPTON, SO1 0HX.
TEL: (0703) 772501

All mail order and callers to this address, please—callers only to 21 Deptford Broadway, SE8 (01-692 2099) and 38 Lower Addiscombe Rd, Croydon (01-688 2950).

BARGAIN PACKS

12 BC107 £1.20 25 1N4001 £1.20
 12 BC108 £1.20 22 1N4002 £1.20
 12 BC109 £1.20 20 1N4003 £1.20
 12 BC148 £1.20 18 1N4004 £1.20
 12 BC149 £1.20 16 1N4005 £1.20
 12 BC157 £1.20 14 1N4006 £1.20
 12 BC158 £1.20 12 1N4007 £1.20
 12 BC159 £1.20 10 1N4148 £1.20
 2 2N2640 £1.20 3 2N3055 £1.20
 10 BC328 £1.20 1 SN7660 £1.20
 12 BF194 £1.20 1 SN76013 £1.20
 7 BF173 £1.20 7 741C £1.20
 5 BF181 £1.20 2 555 £1.20
 12 BF195 £1.20 6 BY103 £1.20
 12 BC548 £1.20 16 BC348B £1.20

All new marked full spec devices.

PC ETCHING KIT Mk II

Contains 1lb Ferric Chloride, 100 sq ins copper clad board, DALO Quick Dri Etch resist pen, abrasive cleaner, 2 miniature drill bits, etching dish and instructions. £3.65.

71B BARGAIN PARCELS

Hundreds of new components—pots, resistors, capacitors, switches, PC Boards with transistors, diodes and zeners, loads of odds and ends. Only £3.25.

TRANSISTOR PACKS

200 asstd. mainly out of spec. transistors, mostly unmarked—NPN PNP plastic, TO5 TO18 RF AF Small signal and TO3 power devices. About 75% useable devices. Only £1.00. 1,000 unmarked 1N4148 diodes, 95% OK. Only £4.00. 100 unmarked BC108, untested £2.10.

RE-SETTABLE COUNTERS

4 digit 24V operation, 68mA. Speed up to 10 impulses/sec. £1.50.

CALCULATOR KEYBOARDS

4 different types—All have 0-9 and DP keys, + the following: Type A has 10 function keys and 5 position slide switch, size 200 x 35mm. Price £1.50. Type B has 13 function keys and 5 position slide switch, size 200 x 135 mm. Price £1.65. Type C has 14 function keys and 7 position slide switch and a 3 position slide switch. Size 185 x 115mm £1.80. Type D has 19 function keys and 8 position slide switch. Size 220 x 125mm. Price £2.10.

HEAT SINKS

Large (155 x 135 x 60mm) with 2 x OC29 Weight 3lbs. £1.30.

ODDS AND ENDS

80V 10A rectifiers—4 mounted on heat sink, ideal for battery charger £1.20.

Screw mixture—Approx. 500 assorted screws 2BA to 8BA + some self-tapping, few nuts and washers etc. £1.00. Telephone handsets, brand new, but old type so only £1.20/pr. 115V 65W soldering iron £1.20. 230V 700W immersion heater £1.90. VHF power transistor by Texas, type 2N3375 £1.20.

RESISTOR AND CAPACITOR PACKS

400 asstd. carbon resistors £1.50
 250 HI-Stabs, 1, 2, 5% 2-1W £1.40
 100 Wirewounds 2-15W £2.00
 200 Miniature resistors, 1/4, 1/2 and 3/4W mostly carbon film £1.10
 200 poly, mica, ceramic caps £1.10
 100 Polyester, .01-2.2µF £1.30
 200 miniature electrolytics, but many unmarked so only £1.10
 15 Air-spaced and compression trimmers £1.90

JUMBO PACK: 1 each of the above 8 packs, £10.00 value for only £8.50!

TRANSFORMERS

All have mains primaries. 6.0-6V 100mA 90p; 9.0-9V 100mA 95p; 12.0-12V 50mA 90p; 12.0-12V 100mA £1.00; 24.0-24V 500mA £2.95; MWJ tapped transformer to give 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24 or 30V, or 12.0-12, or 15.0-15V. 1A version £3.15; 2A Version £4.45; 30.0-30V 1A £2.25; 6.0-6V 1A £1.95; 12.0-12V 1A £2.15; 25V 1.75A £2.00.

All prices quoted include VAT and UK/BFPO postage. Most orders prices despatched on day of receipt. S.A.E. with enquiries or for List please. Send 10p for Multimeter catalogue—free on request with orders over £3. Official orders accepted from Schools etc. Export/Wholesale enquiries welcome. Surplus components always wanted.

COMPUTER PANELS

Large quantity always available; 3lb asstd. £1.75; 7lbs £3.65; 56lb £16. Pack with about 500 components inc. at least 50 transistors £1.00; Pack with 12 High quality panels, inc. IC's, power transistors, multitrans trim pots, hundreds of small signal transistors, resistors, zeners, capacitors, etc. Only £2.75.

FERRIC CHLORIDE

Anhydrous technical quality in 1lb double sealed packs. 1lb 95p; 3lbs £1.90; 10lbs £4.80; 100lbs £36.00.

VEROBOARD

100sq ins asstd. sizes and pitches, about 8 pieces (All 0-1" if requested) £1.20.

RELAYS

Lots of different types available to callers. Miniature plug-in types, 430+430 ohm coil, 4 c/o contacts 60p. PO 3000 type 500 ohm coil (operates on 6V) 1 heavy duty make contact 60p. Omron 11 pin plug-in type. Mains coil, 3 c/o contacts rated 10A. £1.20. PE Gas Ignitor Kit as featured in July 75 edition. Still only £3.00.

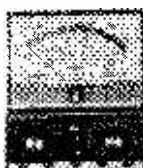
VEROBXES

Professional quality, two tone grey polystyrene boxes with threaded inserts for mounting PC Boards. 120 x 65 x 40 £1.52; 150 x 50 x 50mm £1.75; 185 x 110 x 60mm £2.40. Sloping front type: 220 x 174 x 100/52mm £4.20.

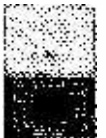
DEVELOPMENT PACKS

50V ceramic plate capacitors, 5%, 10 of each value 22pF to 1000pF, total 210 caps. £3.90.
 CR25 carbon film 1/3rd watt resistors, 5%, 10 of each value 10 ohms to 1M Total 610 resistors £7.50. Electrolytics, wire ended 25V working 10 each of: 1, 2, 2.4, 7, 10, 22, 47 and 100µF. 70 capacitors for £3.60. 400mW zeners 5%, 10 each 3V to 30V, 260 in all. Only £14.00.

MULTIMETERS



MODEL C7080 An instrument for the professional! Incorporates a 130mm long mirror scale, really well laid out easy to read scales. A top quality meter for anyone seriously interested in electronics. Overload protection, 20,000 ohms/V. Ranges: DC Volts, 0-0.25-1-2-5-10-50-250-1000-5000 AC Volts, 0-2-5-10-50-250-1000-5000 DC Current, 0-50µA-1-10-100-500mA-10A Resistance, 0-2-200-20000k (Mid Scale 12-1-2k-120k) dB's from, -20 to +50. Size, 185 x 160 x 80mm. £19.50.



MODEL LT22 Probably one of the lowest priced meters featuring a mirror scale, overload protection and 20,000 ohms per volt sensitivity. A modern styled meter with unusually clear scale markings. Ranges: DC Volts 0-0.5-2-5-10-50-250-1000 AC Volts 0-10-50-250-1000 DC Current 0-50µA-25mA-250mA Resistance 0-50k-500k-5M (Mid Scale 300-3k-30k) dB's 4 ranges -20dB to +42dB. Size 130 x 90 x 42mm. £9.00.

BUILD YOURSELF A 25W AMP FOR ONLY

£29-95
 + 4-05 VAT

COMPLETE KIT SUPPLIED

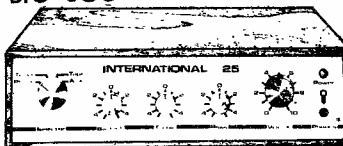
DORAM, one of Britain's leading mail-order distributors of audio accessories & components brings you the 'INTERNATIONAL 25'—a 25W per channel Stereo Amp— that you can build yourself!

This 'real-value for money' kit is supplied with just assembly instructions and reliable components to give you a big grin and a big proud ol'!

- * Triple Op-amp pre-amplifier
- * Power Darlington's in output stage
- * 25W per channel into 8 ohms
- * Modern, elegant styling

Originated and designed by 'ETI'

GENUINE
 BIG-SOUND VALUE!



MANY MORE INTERESTING
 AUDIO KITS AND COMPONENTS
 LISTED IN DORAM'S CATALOGUE
 PRICED AT ONLY 60p.

DORAM

DORAM ELECTRONICS LTD
 P.O. Box TR8, Leeds LS12 2UF
 Tel: Leeds (0532) 34222

An Electrocomponents Group Company

ADVANCED CLOCK KIT

Complete kit including attractive slim case for 6 digit alarm clock with bleep alarm, snooze, high brightness driving of Jumbo LED displays, automatic intensity control—with optional add-ons of touch switch snooze control and crystal control/battery back-up. £27-95

P.E. CAR CLOCK with Journey Timer

6 digit clock for use in any car with 12V battery, with an independent journey timer incorporated. Bright Jumbo LED display comes on with ignition—automatic intensity control. Complete kit of all parts needed including case, PCB's and all components. Full instructions. £43-32

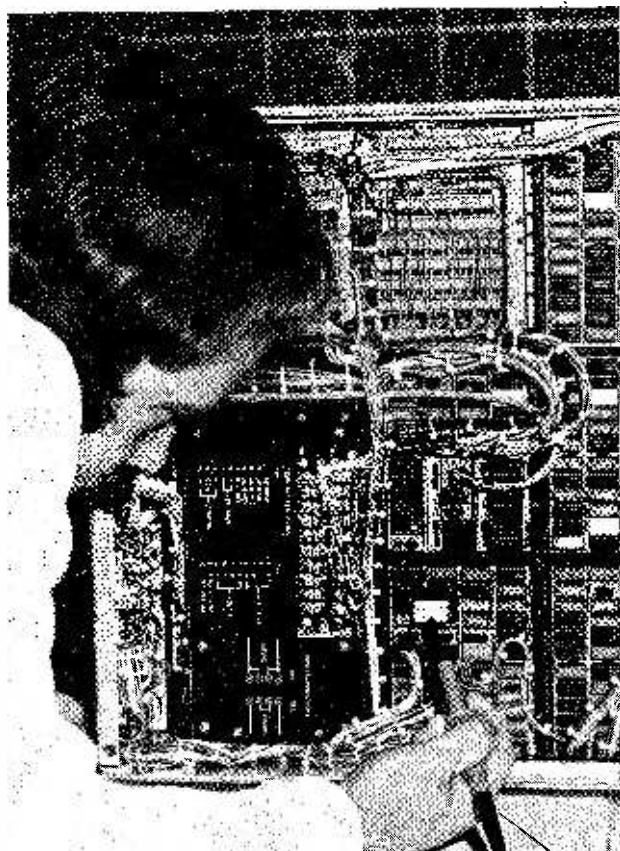
Easy to Build **E.E. DIGITAL CLOCK** (Jan. issue). Kit of all components, including case etc., for this attractive clock with 12mm green display. Full instructions. £16-20

50 Hz Xtal Timebase Kit for clocks (incl. advanced kit above). £8-28

CMOS ICs	CD4029 0-94	CD4059 10-64	CD4511 1-28	Displays
ICs NOT ONLY	CD4030 0-46	CD4080 0-82	CD4514 2-36	5LT-01 5-80
	CD4031 1-82	CD4081 16-43	CD4515 2-36	5LT704E 0-85
	CD4000 0-17	CD4032 0-88	CD4516 1-12	FND500 1-50
	CD4001 0-17	CD4033 1-14	CD4063 0-90	CD4518 1-03
	CD4002 0-17	CD4034 1-38	CD4066 0-58	CD4520 1-03
	CD4006 0-97	CD4035 0-97	CD4067 2-95	CD4527 1-30
	CD4007 0-17	CD4036 1-82	CD4068 0-18	CD4532 1-19
	CD4009 0-79	CD4037 0-78	CD4069 0-18	CD4555 0-74
	CD4009 0-46	CD4038 0-88	CD4070 0-18	CD4556 0-74
	CD4010 0-46	CD4039 2-86	CD4071 0-18	MC14508 2-37
	CD4011 0-17	CD4040 0-88	CD4072 0-18	MC14528 0-86
	CD4012 0-17	CD4041 0-69	CD4073 0-18	MC14534 6-04
	CD4013 0-46	CD4042 0-69	CD4075 0-18	MC14553 4-07
	CD4014 0-83	CD4043 0-83	CD4076 1-27	MC14586 1-21
	CD4015 0-83	CD4044 0-77	CD4077 0-18	MC14587 0-84
	CD4016 0-46	CD4045 1-15	CD4078 0-18	8-05
	CD4017 0-83	CD4046 1-10	CD4081 0-18	Clock Chips
	CD4018 0-83	CD4047 0-74	CD4082 0-18	MK50253 5-60
	CD4019 0-46	CD4048 0-46	CD4085 0-59	MM5314 4-44
	CD4020 0-92	CD4049 0-46	CD4086 0-59	AY5122 3-68
	CD4021 0-83	CD4050 0-46	CD4089 1-27	AY51202 4-76
	CD4022 0-79	CD4051 0-77	CD4093 0-66	
	CD4023 0-17	CD4052 0-77	CD4094 1-53	CMOS
	CD4024 0-64	CD4053 0-77	CD4095 0-88	Books
	CD4025 0-17	CD4054 0-83	CD4096 0-88	NO VAT or
	CD4026 1-42	CD4055 1-08	CD4099 1-50	P.P.
	CD4027 0-46	CD4056 1-08	CD4502 0-98	RCA1575 2-67
	CD4028 0-74	CD4057 20-35	CD4510 1-12	CMOS 2-77

ADD VAT at 8% (Higher rate does not apply to any of above).
 15p P & P on orders under £3—Despatch is by 1st Class Post.
 Price list and data sent FREE with an order, or on request (an SAE helps).
 Official orders welcomed (written or phoned)—Univs, Polys, Govt, Cos. etc.
 Export orders: no VAT, add 35p (Europe) £1 (overseas) for Airmail p & p.

SINTEL, 53n Aston Street, Oxford. Tel: 0865 49791



This hobby brings big rewards.

A soldering iron and a screwdriver. If you know how to use them, or at least know one end from the other, you know enough to enrol in our unique home electronics course.

This new style course will enable anyone to have a real understanding of electronics by a modern, practical and visual method. No previous knowledge is required, no maths, and an absolute minimum of theory.

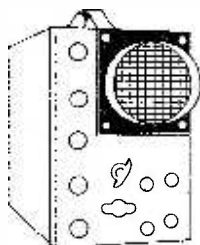
You build, see and learn as, step by step, we take you through all the fundamentals of electronics and show you how easily the subject can be mastered and add a new dimension not only to your hobby but also to your earning capacity.

All the training can be carried out in the comfort of your own home and at your own pace. A tutor is available to whom you can write, at any time, for advice or help during your work. A certificate is given at the end of every course.

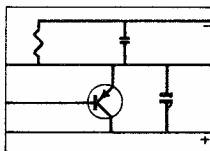
1

Build an oscilloscope.

As the first stage of your training, you actually build your own Cathode ray oscilloscope! This is no toy, but a test instrument that you will need not only for the course's practical experiments, but also later if you decide to develop your knowledge and enter the profession. It remains your property and represents a very large saving over buying a similar piece of essential equipment.



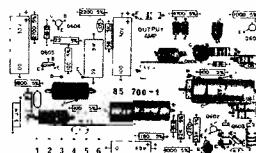
2



Read, draw and understand circuit diagrams.

In a short time you will be able to read and draw circuit diagrams, understand the very fundamentals of television, radio, computers and countless other electronic devices and their servicing procedures.

3



Carry out over 40 experiments on basic circuits.

We show you how to conduct experiments on a wide variety of different circuits and turn the information gained into a working knowledge of testing, servicing and maintaining all types of electronic equipment, radio, t.v. etc.

To find out more about how to learn electronics in a new, exciting and absorbing way, just clip the coupon for a free colour brochure and full details of enrolment.

PLUS FREE GIFT!



ALL STUDENTS ENROLLING IN OUR COURSES RECEIVE A FREE CIRCUIT BOARD ORIGINATING FROM A COMPUTER AND CONTAINING MANY DIFFERENT COMPONENTS THAT CAN BE USED IN EXPERIMENTS AND PROVIDE AN EXCELLENT EXAMPLE OF CURRENT ELECTRONIC PRACTICE

Brochure without obligation to:

**BRITISH NATIONAL RADIO
& ELECTRONICS SCHOOL, Dept WL36
P.O. Box 156, Jersey, Channel Islands.**

NAME _____

ADDRESS _____

(Block caps please)

SENSATIONAL—WORLD BEATING DIGITAL ALARM KIT

- Built in Alarm
- Photocell controlled Brightness
- AM/PM Indicator
- Giant 0.63" Led Display
- "Snooze" operated by tilt



£16

ONLY

INC. VAT & P & P etc.

N.B. Standard Non-Alarm
Still only £14 in kit form.

Ready built.....£22.50

BARGIN BIT2

ALL ITEMS CARRY FULL MFG. GUARANTEE. VAT INCLUSIVE.
ORDERS UNDER £2 ADD £0.25 FOR HANDLING CHARGE.

MM5314 Clock Chip 4-6 Digit	£2.95	12V Relays min. 1 PC/O 330Ω	£1.80	CAPACITORS
Gl. AY51202 Clock Chip 4 Digit	£4.76	LM3900 Quad OP Amp	£0.60	Pack of 5
NSN61L 0.63" LED. Price each	£1.65	LM309H 200mA 5V Reg.	£1.15	001, 400V 20p
DS885N Seg Drive Chip	£0.50	LM78L05 100 mA 5V Reg.	£0.58	01, 400V 20p
Futaba 4 Digit display + AM/PM 5LT01	£6.36	741 Mini Dip 8 pin	£0.31	022, 100V 20p
Resistors 1/2 Watt 5% carbon film most values.		IN4001 50V 1 Amp diode	£0.04	033, 100V 20p
Packs of 10 only per pack	£0.10	IN4148 Small signal diode	£0.03	022, 250V 35p
Resistors 1/2 Watt 5% carbon film most values.		Fuse Holders 20 x 5mm	£0.20	01, 630V 25p
Packs of 10 only per pack	£0.10	Slideswitch 4 pos	£0.20	1, 250V 30p
Resistors 1 Watt 5% carbon film most values.		Mains Transformer 110/240V	£2.00	22, 250V £1.10
Packs of 5 only per pack	£0.15	0-16.5v @ 100mA output		1μF 250AC Mains 41p each
Triac 400V 15 amp isolated tab	£1.98	Slide Pot 5K ohm Lin.	£0.55	
Transistors plastic BC183/213/307	£0.10	5 Pin Din Plug	£0.14	
		5 Pin Din Socket chassis mounted	£0.08	



CWO, Pulse Electronics, Dept. P10, 202 Shefford Rd., Clifton, Shefford, Beds. Hitchin (0462) 814477

FEBRUARY ISSUE
INCLUDES

FREE

WALL CHART - DESIGN DATA TABLES

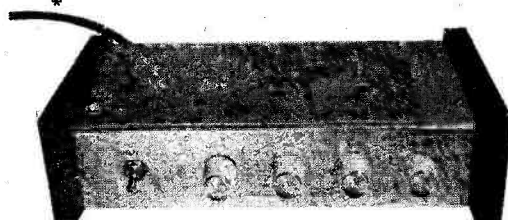
RADIO & ELECTRONICS CONSTRUCTOR

SAVE TIRESOME CALCULATIONS—The Design Data Tables list both capacitive and inductive reactances at radio and audio frequencies. Also given are the resistance and capacitor values required in symmetric multivibrators running at audio frequencies, sinusoidal a.c. peak, average and r.m.s. values, decibel ratios up to 100dB, maximum potentiometer currents and information on copper wire gauges.

SPECIAL FEATURE

4 CHANNEL STEREO MIXER

A comprehensive design which allows four separate stereo signals to be combined at any required mixing level.



MANY OTHER ARTICLES ON SALE NOW PRICE 35p

DORAM

A PROFESSIONAL DEAL FOR AMATEURS

*ORDERS BY RETURN OF POST *NO QUIBBLE REPLACEMENT PART SERVICE
*QUALITY BRANDED PRODUCTS *FREE UP DATE INFORMATION SERVICE

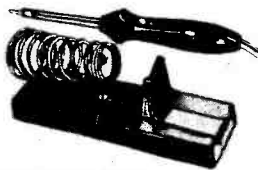
TOOLS

The handy EXPO 12V d.c. drill is supplied complete with drill kit containing 4 small drills, two spare collets, two cutters, wire brush, soft buffer, grindstone and 9 various milling and reaming tools.

Drill & kit £9.50 + s
Kit only £4.75 + s



ORYX 50W SOLDERING IRON



Temperature can be altered between 200-400°C.

Iron 240V £6.00 + s
Stand £2.20 + s

ISO-TIP CORDLESS IRON

Mains and 12V d.c. versions available
£11.50 + s



DE-SOLDER TOOLS

Three high-suction models available

SR2 £6.20 + s
SR3 £5.20 + s
SR3AS £4.80 + s
Spare nozzle 60p ea. + s
Please state type



NICKEL - CADMIUM RECHARGEABLE CELLS

	Sim. to dry cell	nom. capacity	charge cur. (mA)	
HP7	0-5Ah	50	£1.10 s	
HP7	1-2Ah	100	£1.24 s	
HP11	2-0Ah	200	£1.80 s	
HP2	4-0Ah	400	£2.70 s	

ELECTRONIC IGNITION UNIT

- * High performance
- * For 2 & 4 stroke engines
- * Improved start/running
- * 'Crisper' throttle response
- * Reduce battery drain

Neg. earth or pos. earth

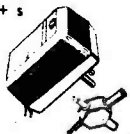
£15.00 + s

Please state type required



BATTERY ELIMINATOR

Switched output 6, 7.5 or 9V at 250mA.
D.C. pos. or neg. earth
£3.15 + s



SEMI-CONDUCTOR DEVICES

RECTIFIERS

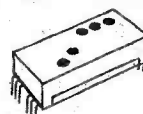
IN 4001 - 8p ea.)
IN 4002 - 9p ea.) + s
IN 4003 - 9p ea.)



1-0A bridge (400V) - 36p + H
1-6A " (200V) - 48p + H
1-6A " (800V) - 70p + H
2-0A " (200V) - 72p + H
2-0A " (600V) - 90p + H

MULLARD MODULES

LP 1173 - £6.75 + H
LP 1184/2 - £7.20 + H
LP 1185 - £5.60 + H
LP 1186 - £6.90 + H
LP 1400 - £7.25 + H



TRANSISTORS

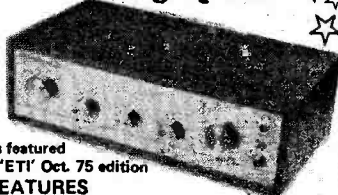
BC 107 - 18p s
BC 108 - 17p s
BC 109 - 18p s
BFY 50 - 24p s
BFY 51 - 24p s
BFY 52 - 24p s
2N 3055 - 80p s
2N 2646 - 94p s
TIP 2955 £1.14 s
TIP 3055 - 61p s
BC 237B - 13p H
BC 238C - 12p H
BC 239C - 14p H
ZTX 107 - 12p H
ZTX 108 - 11p H
ZTX 109 - 13p H
ZTX 300 - 15p H
ZTX 600 - 16p H
MJE 310 - 62p H
TIP 31A - 36p H
TIP 32A - 40p H
2N 3819 - 32p H
3N 141 - 65p s
CS 715 - 18p H
(Similar to 2N 3819)

I.C.'s

T05 Reg - £1.10 s
MVR 5 - £1.55 s
MVR 12 - £1.55 s
MVR 15 - £1.55 s
LM 309K - £2.12 s
7805 - £1.50 s
7812 - £1.50 s
7815 - £1.50 s
7824 - £1.50 s
±15V D.I.L. - £2.82 s
TBA 231 - £1.75 H
TBA 800 - £1.60 H
TBA 810S - £1.80 H
TBA 820 - £1.20 H
ZN 414 - £1.30 H
ZN 424 - £1.25 H
741 Op-amp - 54p s
747 Op-amp (Dual 741) - 85p s
748 Op-amp - 48p s
555 TIMER - 84p s
556 (dual 555) - £1.44 s
HA 1156 (similar to MC1310P) - 72p s
ORP12 - £1.18 s
8A Triac - £4.70 s
ZN 1034E

'INTERNATIONAL 25'

Build yourself a
BIG SOUND amp
at a budget price



As featured in 'ETI' Oct. 75 edition

FEATURES

- * Triple Op-amp pre-amplifier
- * Power 'Darlington's'
- * Modern styling
- * 25W per channel into 8 ohms.

Complete kit with assembly instructions
Overseas orders £34.50
S.A.E. for full spec.

£29-95
+£4-05 VAT

BOOKS (2)

Hi-fi hints and tips 38p ea.
Towers international transistor selector £2.95 ea.
Electronic circuit design handbook - a must for electronic enthusiasts £4.50 ea.

CONDITIONS OF SALE

All prices are ex-VAT
If affixed with s add 8%
If affixed with H add 25%
Z = Zero rated
Package & posting free for orders over £3.00
Overseas orders add 15%
Cash with order. Cheques/Postal Order to Doram Electronics Limited, P.O. Box TR8, Leeds, LS12 2UF
Small order handling charge of 40p for orders under £3.00

DORAM'S NEW CATALOGUE - THE AMATEURS GOOD COMPANION

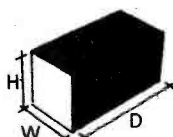


ONLY 60p

inc. post & packing.
Free up-date service until Aug. 1976.

'SAMOS' CASES

Low-cost blue cover and white base PVC steel cases



S1 50W x 50H x 100D £1.03 + s
S2 100W x 50H x 100D £1.17 + s
S3 150W x 50H x 100D £1.31 + s
S4 50W x 75H x 125D £1.47 + s
S5 100W x 75H x 125D £1.68 + s
S6 150W x 75H x 125D £1.97 + s
S7 200W x 75H x 125D £2.19 + s

SPECIAL OFFER!!

If catalogue ordered simultaneously with order for SAMOS cases - case price less 25%

DORAM
An Electrocomponents Group Company

"The Doorway to Amateur Electronics"

NAME

ADDRESS

POST CODE

I enclose 60p. Please send me by return my Doram Catalogue.
(Overseas orders except B.F.P.O. please add 30p for post and packing surface only).

PW3/76

Sparkrite mk2

The tried, tested, proven, reliable, complete, professional, capacitive discharge,

Electronic Ignition Kit

Sparkrite™ was voted best of 8 systems tested by Popular Motoring Magazine

ORDER NOW

PW3.

To ELECTRONICS DESIGN ASSOCIATES
82 Bath Street, Walsall, WS1 3DE
Phone 33652.

From Name

Address

Qty.

Sparkrite Mk 2 DIY Ass. kits @ £10-93

Sparkrite Mk 2 Ready Built Negative earth @ £13-86

Sparkrite Mk 2 Ready Built Positive earth @ £13-86

Ignition changeover switches @ £2-98

R.P.M. Limit systems in the above units @ £2-42

I enclose cheque/P.O.s for £.....

Cheque No.

(Send SAE if brochure only required)

Sparkrite MK2 is a high performance, high quality, capacitive discharge, electronic ignition system.

Because of the superb design of the Sparkrite circuit it completely eliminates problems of the contact breaker. There is no misfire because the contact breaker bounce is eliminated electronically by a pulse suppression circuit which prevents the unit firing if the points bounce open at high R.P.M. Contact breaker burn is eliminated by reducing the current to about 1/50th of the norm. It will perform equally well with new, old, or even badly pitted points and is not dependent upon the dwell time of the contact breakers for recharging the system. Sparkrite incorporates a short circuit protected inverter which eliminates the problems of SCR lock on and therefore eliminates the possibility of blowing the transistors or the SCR. (Many capacitive discharge ignitions are not completely foolproof in this respect.) Sparkrite can therefore give you:—up to 20% better fuel consumption, instant all weather starting, cleaner plugs—they last up to 5 times longer without attention, faster acceleration, higher top speeds, longer coil and battery life, efficient fuel burning and less air pollution, smoother running, continual peak performance. THE KIT COMPRISES EVERYTHING NEEDED Ready drilled pressed steel case coated in matt black epoxy resin, ready drilled base and heat-

sink, top quality 5 year guaranteed transformer and components, cables, coil connectors, printed circuit board, nuts, bolts, silicon grease, full instructions to make the kit negative or positive earth, and 10 page installation instructions.

OPTIONAL EXTRAS

Electronic R.P.M. limitation. This can be included in the unit to prevent over revving, an advantage to most companies, hire firms, high performance drivers etc.

Electronic/conventional ignition switch. Gives instant changeover from "Sparkrite" Ignition to conventional ignition for performance comparisons, static timing etc., and will also switch the Ignition off completely as a security device. Includes: switch, connectors, mounting bracket and instructions. Cables excluded.

PRICES

D.J.Y. assembly kit £10-93 incl. V.A.T. post and packing. Ready built unit £13-86 incl. V.A.T. post and packing. (Both to fit all vehicles with coil/distributor ignition up to 8 cylinders.) Switch for instant changeover from "Sparkrite" Ignition to conventional Ignition £2-98 incl. V.A.T. post and packing. R.P.M. limiting control £2-42 incl. V.A.T. post and packing. (Fitted in case on ready built unit, dashboard mounting on kit.)

CALLERS WELCOME

print-a-kit now bring you

PAK STRIP

(Pat. applied for)

The easiest way yet to mount D.I.L. IC's etc.

PAK STRIP is a thin, flexible fibre glass board with a self-adhesive backing.

You can bend it, drill it, cut it with scissors prick holes in it, solder to it, stick it to anything.

It is so versatile its many applications are limited only by the ingenuity of the user.

Star points of PAK STRIP

- ★ Will cut with scissors
- ★ Has a self-adhesive backing
- ★ Can be used to surface solder D.I.L. IC's, light displays, etc.
- ★ Miniature and standard potentiometers can be mounted on the take-off pads
- ★ Type B can be used for grouping cables, mounting diodes, resistors etc.
- ★ No need to drill holes for nuts and bolts... just stick down...

REMEMBER! a surface soldered D.I.L. IC will remove easily.

Type A
1 pitch for
D.I.L. IC's etc.

Type B
General purpose
group board

One Type A PAK STRIP will mount 11 8-pin D.I.L. IC's

Sample PAK STRIP 35p plus a SAE VAT incl.

8" x 5" board with 6 strips £1-00 VAT & Postage inc.

8" x 10" board with 12 strips £3-00 VAT & Postage inc.

Please state Type A or B when ordering: S.A.E. for details.

TERMS: Cash with Order or pro-forma invoice: Trade enquiries for quantity prices invited. Overseas add 25p per sheet.

print-a-kit
REGISTERED

Electronic Supplies, 408 Sharrowvale Road, Sheffield S11 8ZP ENGLAND

A hobby that pays big salaries.

Enrol in the BNR & E School and you'll have an entertaining and fascinating hobby. Stick with it and the opportunities and the big money await you, if qualified, in every field of Electronics today. We offer the finest home study training for all subjects in radio; television, etc., especially for the CITY AND 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.

BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, Dept WC 36

P.O. Box 156, Jersey, Channel Islands.

NAME

ADDRESS

(Block caps please)

NEW MULLARD & MAZDA VALVES

All individually boxed and guaranteed. Full trade discounts to bona fide companies. Price and availability lists on application.

EXPRESS POSTAGE

12p for 1 Valve.
Each additional Valve add 2p in UK

DM70	0-69	ECL86	0-73	PC94	0-68	PL504	1-02	30CL5/	
DY86/7	0-53	EF80	0-53	PC85	0-80	PL508	1-30	PCF800	1-22
DY802	0-53	EF83	1-10	PC88	0-88	PL509	1-77	30C17	1-29
EAB80	1-16	EF85	0-53	PC89	0-73	PL502	2-00	30C18/	
EB91	0-73	EF86	1-30	PC189	0-81	PL533	0-73	PCF805	1-29
EB91	0-89	EF89	1-30	PCF80	0-63	PL581/800	0-56	30FL/	1-35
EBF80	0-63	EF91	1-35	PCF82	1-37	PL582	0-76	30FL12	1-02
EBF83	0-66	EF92	1-51	PCF86	0-73	PL583	0-63	30FL12	1-44
EBF89	0-50	EF93	1-51	PCF900	1-13	PL584	0-68	30FL14	1-20
EC86	0-82	EF183	0-69	PCF201	1-13	PL585	0-68	30L1/PC84	0-63
EC88	0-86	EF184	0-69	PCF801	0-73	PL586	0-72	30L15/	
EC90	0-94	EF190	0-91	PCF802	0-78	PL587	0-56	30L15/	
EC97	0-69	EL34	1-08	PCF806	0-73	PL588	0-56	30L15/	
EC98	0-54	EL36	1-15	PCF800	1-30	PL589	0-56	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL590	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL591	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL592	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL593	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL594	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL595	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL596	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL597	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL598	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL599	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL600	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL601	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL602	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL603	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL604	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL605	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL606	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL607	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL608	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL609	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL610	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL611	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL612	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL613	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL614	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL615	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL616	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL617	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL618	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL619	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL620	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL621	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL622	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL623	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL624	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL625	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL626	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL627	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL628	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL629	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL630	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL631	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL632	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL633	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL634	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL635	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL636	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL637	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL638	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL639	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL640	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL641	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL642	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL643	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL644	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL645	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL646	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL647	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL648	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL649	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL650	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL651	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL652	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL653	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL654	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL655	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL656	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL657	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL658	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL659	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL660	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL661	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL662	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL663	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL664	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL665	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL666	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL667	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL668	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL669	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL670	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL671	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL672	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL673	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL674	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL675	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL676	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL677	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL678	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL679	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL680	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL681	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL682	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL683	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL684	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL685	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL686	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL687	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL688	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL689	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL690	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL691	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL692	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL693	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL694	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL695	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL696	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL697	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL698	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL699	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL700	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL701	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL702	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL703	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL704	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL705	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL706	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL707	0-80	30L15/	
EC98	0-53	EL38	0-53	PCF82	0-83	PL708	0-80	30L15/	

SEMI-CONDUCTORS

TRANSISTORS

BRAND NEW FULLY GUARANTEED

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
AC107	*0.20	AF114	*0.25	BC152	0.18	BC304	*0.37	BF115	*0.25	BFY50	*0.20	OC71	*0.15	2N706A	*0.12
AC133	*0.19	AF115	*0.25	BC153	0.29	BC440	*0.31	BF117	*0.46	BFY51	*0.20	OC72	*0.15	2N708	*0.14
AC135	*0.20	AF116	*0.25	BC154	0.29	BC460	*0.37	BF118	*0.71	BFY52	*0.20	OC74	*0.15	2N914	*0.14
AC137K	*0.30	AF117	*0.25	BC157	0.19	BD115	*0.63	BF119	*0.71	BFY53	*0.18	OC75	*0.16	2N918	*0.31
AC122	*0.12	AF118	*0.36	BC158	0.12	BD116	*0.61	BF121	0.46	BSX19	*0.16	OC76	*0.16	2N1131	*0.20
AC126	*0.18	AF124	*0.31	BC159	0.12	BD121	*0.61	BF123	*0.51	BSX20	*0.16	OC77	*0.28	2N1132	*0.22
AC128	*0.18	AF125	*0.31	BC160	*0.46	BD123	*0.67	BF125	0.46	BSY25	*0.16	OC81	*0.16	2N1302	*0.15
AC127	*0.19	AF126	*0.29	BC161	*0.51	BD124	*0.70	BF127	*0.51	BSY26	*0.16	OC81D	*0.16	2N1303	*0.15
AC128	*0.19	AF127	*0.29	BC167	0.12	BD131	*0.51	BF128	0.56	BSY27	*0.16	OC82	*0.16	2N1304	*0.18
AC132	*0.15	AF139	*0.31	BC168	0.12	BD132	*0.61	BF133	0.46	BSY28	*0.16	OC82D	*0.16	2N1305	*0.18
AC134	*0.15	AF178	*0.51	BC169	0.12	BD133	*0.67	BF154	0.46	BSY29	*0.16	OC83	*0.20	2N1306	*0.21
AC137	*0.15	AF179	*0.51	BC170	0.10	BD135	0.41	BF155	*0.71	BSY38	*0.19	OC139	*0.50	2N1307	*0.21
AC141	*0.19	AF180	*0.51	BC171	0.10	BD136	0.41	BF156	*0.49	BSY39	*0.19	OC140	*0.20	2N1308	*0.24
AC141K	*0.30	AF181	*0.51	BC172	0.10	BD137	0.46	BF157	*0.56	BSY40	*0.29	OC169	*0.26	2N1309	*0.26
AC142	*0.19	AF186	*0.51	BC173	0.15	BD138	0.51	BF158	0.56	BSY41	*0.29	OC170	*0.26	2N1613	*0.20
AC142K	*0.26	AF239	*0.38	BC174	0.15	BD139	0.56	BF159	0.61	BSY95	*0.13	OC171	*0.26	2N1711	*0.20
AC176	*0.20	AL100	*0.68	BC175	*0.35	BD140	*0.61	BF173	*0.62	BSY55A	*0.13	OC200	*0.26	2N2147	*0.73
AC180	*0.20	AL103	*0.68	BC177	*0.35	BD145	*0.81	BF176	0.66	BT105	*0.04	OC201	*0.26	2N2148	*0.58
AC180K	*0.30	BC107	*0.08	BC178	*0.19	BD175	*0.61	BF179	*0.31	MJ.E521	*0.56	OC202	*0.26	2N2218	*0.20
AC181	*0.20	BC108	*0.08	BC179	*0.19	BD176	*0.61	BF180	*0.31	MJ.E2955	*0.88	OC203	*0.26	2N2219	*0.20
AC181K	*0.30	BC109	*0.08	BC180	*0.25	BD177	*0.67	BF181	*0.31	MJ.E3055	*0.57	OC204	*0.26	2N2220	*0.22
AC187	*0.22	BC113	0.10	BC181	0.25	BD178	*0.67	BF184	0.12	MJ.E3440	*0.51	OC205	*0.26	2N2221	*0.22
AC187K	*0.28	BC114	0.16	BC182	0.15	BD179	*0.71	BF185	0.12	MPF102	*0.43	OC309	*0.41	2N2222	*0.20
AC188	*0.23	BC115	0.16	BC182L	0.15	BD180	*0.71	BF186	0.15	MPF104	*0.38	OC371	*0.44	2N2368	*0.18
AC188K	*0.23	BC116	0.16	BC183	0.15	BD185	*0.67	BF197	0.15	MPF105	*0.38	ORP12	*0.60	2N2369	*0.15
AC171	*0.26	BC117	0.19	BC183L	0.15	BD186	*0.67	BF257	*0.46	OC19	*0.36	ORP60	*0.60	2N2369A	*0.15
AC178	*0.24	BC118	0.10	BC184	0.20	BD187	*0.71	BF258	*0.61	OC20	*0.65	ORP61	*0.60	2N2646	*0.48
AC179	*0.24	BC119	*0.21	BC184L	0.20	BD188	*0.71	BF269	*0.67	OC22	*0.47	TIP29	*0.44	2N2904	*0.18
AC190	*0.24	BC120	*0.21	BC186	*0.29	BD189	*0.71	BF262	0.56	OC23	*0.48	TIP30	*0.52	2N2904A	*0.21
AC191	*0.24	BC137	0.16	BC187	*0.29	BD190	*0.77	BF263	0.56	OC24	*0.57	TIP31A	*0.56	2N2904A	*0.18
AC192	*0.24	BC139	*0.41	BC207	0.11	BD195	*0.87	BF270	*0.36	OC28	*0.39	TIP32A	*0.68		
AD140	*0.49	BC140	*0.31	BC208	0.11	BD196	*0.87	BF271	*0.31	OC28	*0.39	TIP32A	*0.68		
AD142	*0.49	BC141	*0.31	BC209	0.12	BD197	*0.92	BF272	*0.81	OC28	*0.51	TIP42A	*0.81		
AD143	*0.39	BC142	*0.31	BC212L	0.13	BD198	*0.92	BF273	0.36	OC29	*0.51	TIS43	*0.31		
AD149	*0.51	BC143	*0.31	BC213L	0.13	BD199	*0.98	BF274	0.36	OC35	*0.43	UT46	*0.28		
AD161	*0.36	BC145	0.46	BC214L	0.17	BD200	*0.98	BF299	*0.68	OC36	*0.61	ZX41A	*1.11		
AD162	*0.36	BC147	0.10	BC225	0.28	BD205	*0.81	BFX84	*0.22	OC41	*0.20	2N696	*0.13		
AD161 & AD162(MP)	*0.69	BC148	0.10	BC226	0.38	BD206	*0.81	BFX85	*0.31	OC42	*0.25	2N697	*0.14		
ADT140	*0.51	BC149	0.12	BC231	*0.28	BD207	*0.98	BFX86	*0.22	OC44	*0.16	2N698	*0.25		
		BC150	0.19	BC302	*0.25	BD208	*0.98	BFX87	*0.25	OC45	*0.13	2N699	*0.36		
		BC151	0.20	BC303	*0.31	BDY26	*1.02	BFX88	*0.22	OC70	*0.15	2N706	*0.11		

VAT CHAT

Please add 8% to prices marked *. Remainder add 25%. Do not add V.A.T. to prices marked †.

SUPER UNTESTED PAKS

Pak No.	Description	Price
U 1	120 Class Sub-min. General Purpose Germ. diodes	0.60
U 4	30 Germanium transistors like OC81, AC128	*0.60
U 5	60 200mA sub-min. silicon diodes	*0.60
U11	20 PNP Sil. planar trans. TO-5 like 2N1132, 2N2904	*0.60
U15	20 PNP Sil. planar trans. TO-5 like 2N696, 2M697	*0.60
U19	20 Silicon NPN transistors like BC107	*0.60
U28	30 Fast switching silicon diodes like IN914 Micro-Min.	*0.60
U29	10 1 Amp SCR's TO-5 case up to 600 CRS/25-600	*1.20
U32	25 Zener diodes 400mW DO-7 case 3-18 volts mixed	0.60
U36	20 Silicon planar NPN transistors TO-5 BFY50/51/52	*0.60
U45	7 3A SCR. TO66 up to 600 PIV	*1.20
U46	20 Unijunction transistors similar to T1843	*0.60
U48	9 NPN Sil. power transistors like 2N3055	*1.20

Note: No's mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked.

DIODES

Type	Price	Type	Price	Type	Price	Type	Price
BA100	*0.10	BB104	*0.15	OA10	*0.14	OA91	*0.07
BA115	*0.21	BY100	*0.16	OA47	*0.07	OA95	*0.07
BA128	*0.22	BY125	*0.15	OA70	*0.07	OA200	*0.07
BA148	*0.15	BY127	*0.16	OA79	*0.07	OA202	*0.07
BA164	*0.12	BY128	*0.16	OA81	*0.07	IN914	*0.06
BA166	*0.14	BY164	*0.51	OA85	*0.09	IN916	*0.06
BA173	*0.15	BYX38/30	*0.43	OA90	*0.07	IN4148	*0.06

THYRISTORS

PIV	0-4A	0-8A	1A	3A	5A	5A	7A	10A	16A	30A
	TO18	TO22	TO5	TO66	TO68	TO64	TO48	TO48	TO48	TO48
10	*0.15	*0.15	—	—	—	—	—	—	—	—
20	*0.15	*0.18	—	—	—	—	—	—	—	—
30	*0.19	*0.22	—	—	—	—	—	—	—	—
50	*0.22	*0.28	*0.20	*0.25	*0.36	*0.36	*0.48	*0.51	*0.54	*1.18
100	*0.25	*0.30	*0.25	*0.25	*0.48	*0.48	*0.51	*0.57	*0.58	*1.43
150	*0.31	*0.38	—	—	—	—	—	—	—	—
200	*0.38	*0.44	*0.25	*0.30	*0.50	*0.50	*0.57	*0.62	*0.68	*1.63
400	—	—	*0.30	*0.39	*0.55	*0.57	*0.62	*0.71	*0.77	*1.79
600	—	—	*0.39	*0.48	*0.69	*0.69	*0.78	*0.99	*0.99	—
800	—	—	*0.58	*0.65	*0.81	*0.81	*0.92	*1.22	*1.39	*4.07

SILICON RECTIFIERS

PIV	300mA (DO 7)	750mA (SO 16)	1 Amp Plastic	1.5 Amp 3 (SO 16)	3 Amp 3 (SO 10)	10 Amp 3 (SO 10)	30 Amp 3 (TO 43)
50	0.05	0.06	IN4001	0.05	0.07	0.18	0.58
100	0.05	0.07	IN4002	0.06	0.09	0.18	0.58
200	0.06	0.09	IN4003	0.07	0.12	0.20	0.58
400	0.07	0.14	IN4004	0.08	0.14	0.28	0.58
600	0.08	0.18	IN4005	0.09	0.18	0.33	0.42
800	0.11	0.18	IN4006	0.10	0.18	0.35	0.51
1000	0.13	0.28	IN4007	0.11	0.23	0.44	0.60
1200	—	0.32	—	—	0.28	0.54	0.68

SIL. G.P. DIODES

300mW 40 PIV (min) SUB-MIN FULLY TESTED
Ideal for Organ builders
30 for 50p, 100 for £1.50, 500 for £5, 1000 for £9.

TRIACS

	Case	100V	200V	400V
2 Amp	TO5	*0.31	*0.51	*0.71
6 Amp	TO66	*0.51	*0.61	*0.77
10 Amp	TO48	*0.77	*0.92	*£1.12

GP300

115 WATT SILICON TO3 METAL CASE
Vbeo 100V. Vceo 80V. IC 15A. Hfe. 20-100 suitable replacement for 2N3055, BDY11 or BDY20.
1-24 25-99 100+
*50p *48p *46p

GP Switching Trans

TO18 MIN. TO 2N706/8 BSY7/25/93A
All usable devices. No open and shorts.
ALSO AVAILABLE IN PNP similar to 2N2906, BCY70
20 for *50p, 50 for *£1, 100 for *£1.80, 500 for *£8, 1000 for *£14.
When ordering please state NPN or PNP.

WORLD SCOOP!!

JUMBO SEMICONDUCTOR PAK
Transistors-Germ. and Silicon. Rectifiers-Diodes
Triacs-Thyristors-I.C.'s and Zeners. ALL NEW
AND CODED. APPROX. 100 PIECES ONLY *£1.85

ZENER DIODES

FULL RANGE IN STOCK 2-33 Volts
400 mw 8p. 1.5 w 17p. 10 w *30p.

HANDBOOKS

TRANSISTOR DATA BOOK
DTE 1227 Pages packed with information on European Transistors. Full specification including outlines.

Price £12.95 each
TRANSISTOR EQUIVALENT BOOK
BPE 75 256 Pages of cross references and equivalents for European, American and Japanese Transistors. This is the most comprehensive equivalents book on the market today and has an introduction in 13 languages.

Price £12.68 each
DIODE EQUIVALENT BOOK
DE 74 144 Pages of cross references and equivalents for European, American and Japanese diodes, Zeners, Thyristors, Triacs, Diacs and L.E.D.'s.

Price £11.98 each
THE WORLD'S BROADCASTING STATIONS
WB5 75 An up to the minute guide for those interested in DX-ing. Contains all the world's broadcasters on SW, MW and LW, as well as European FM/TV stations.

Price £13.56 each
TTL DATA BOOK
DIC 75 Now complete Data book of 74 series TTL (7400-74132). Covering 13 main manufacturers in the U.S.A. and Europe, this book gives full data as well as equivalents. Price £13.74 each
A full range of technical books available on request.

P&P

Postage and Packing add 25p unless otherwise shown. Add extra for airmail. Minimum order £1.00.

BI-PAK

P.O. BOX 6, WARE, HERTS

Practical Wireless, March 1976

COMPONENTS

ALUMINIUM BOXES

No.	Length	Width	Height	Price
BA1	5 1/2"	2 1/2"	1 1/2"	*0.45
BA2	4 1/2"	2 1/2"	1 1/2"	*0.45
BA3	4 1/2"	2 1/2"	1 1/2"	*0.45
BA4	4 1/2"	2 1/2"	1 1/2"	*0.45
BA5	4 1/2"	2 1/2"	1 1/2"	*0.45
BA6	3 1/2"	2 1/2"	1 1/2"	*0.39
BA7	7 1/2"	5 1/2"	2 1/2"	*0.79
BA8	8 1/2"	5 1/2"	2 1/2"	*1.02
BA9	6 1/2"	4 1/2"	2 1/2"	*0.65

(Each complete with 1" deep lid and screws). PLEASE ADD 20p POSTAGE AND PACKING FOR EACH BOX.

COMPONENTS

CARBON RESISTOR PAKS

These Paks contain a range of Carbon Resistors, assorted into the following groups:

R1	50 Mixed 100 ohms-820 ohms	0.60
R2	50 Mixed 1K ohms-8.2K ohms	0.60
R3	50 Mixed 10K ohms-82K ohms	0.60
R4	50 Mixed 100K ohms-820K ohms	0.60
R5	50 Mixed 100 ohms-820 ohms	0.60
R6	50 Mixed 1K ohms-8.2K ohms	0.60
R7	50 Mixed 10K ohms-82K ohms	0.60
R8	50 Mixed 100K ohms-820K ohms	0.60

THESE ARE UNREPEATABLE PRICES

REPANCO CHOKES & COILS

RF Chokes	CH1 2.5mH	0.27
	CH2 7.5mH	0.29
	CH3 1.5mH	0.28
	CH4 5.0mH	0.28
	CH4 10mH	0.31

COILS	DRX1 Crystal set 0.29	0.42
	Dual range	0.42

CARBON POTENTIOMETERS

Log and Lin	4.7K, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M	0.20
VC1	Single Less Switch	0.20
VC2	Single D.P. Switch	0.20
VC3	Tandem Less Switch	0.20
VC4	1K Less Switch	0.20
VC5	100K Log anti-Log	0.20

HORIZONTAL CARBON PRESETS

0.1 Watt	100, 220, 470, 1K, 2.2K, 4.7K, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M	0.09 each
----------	--	-----------

REPANCO TRANSFORMERS

240V. Primary. Secondary voltages available from selected tappings 4V, 7V, 8V, 10V, 40V, 50V and 25V-0-25V.		
Type	Amps	Price p & p
MT/50/1	1	*1.79
MT/50/2	2	*2.24
MT/50/2	2	*3.06

COIL FORMERS & CORES

NORMAN 1/2" Cores & Formers	0.07
1" Cores & Formers	0.09

VEROBOARDS

V81 containing approx. 50 sq. ins. various sizes all 0.1 matrix	*0.60
V82 containing approx. 50 sq. ins. various sizes all 0.15 matrix	*0.60

CABLES

CP1	Single lapped screen	Per Metre
CP2	Twin Common Screen	*0.08
CP3	Stereo Screened	*0.11
CP4	Four Core Common Screen	*0.12
CP5	Four Core Individually screened	*0.21
CP6	Microphone Fully Braided Cable	*0.28
CP7	Three Core Mains Cable	*0.11
CP8	Twin Oval Mains Cable	*0.08
CP9	Speaker Cable	*0.06
CP10	Low Loss Co-Axial	*0.14

C280

CAPACITOR PAK

Containing 75 of the C280 range of capacitors assorted in values ranging from 0.1uF to 2.2uF. Complete with identification chart.

FANTASTIC VALUE
ONLY £1.20

Add 8% VAT to all prices marked *.

Remainder add 25%.

PLEASE NOTE THE ABOVE DIRECTIONS

VAT

COMPONENT PAKS

Pak No.	Qty.	Description	Price
C1	200	Resistors, mixed values approx. count by weight	0.60
C2	150	Capacitors, mixed values approx. count by weight	0.60
C4	75	1/8th. width Resistors, mixed preferred values	0.60
C5	5	Pieces assorted Ferrite Rods	0.60
C7	1	Pak Wire 50 metres assorted colours	0.60
C8	10	Reed Switches	0.60
C9	3	Micro Switches	0.60
C10	15	Assorted Pots & Pre-Sets	0.60
C12	30	Paper Condensers preferred types, mixed values	0.60
C13	20	Electrolytics Trans. types	0.60
C14	1	Pack assorted Hardware—Nuts, Bolts, Grommets, etc.	0.60
C16	20	Assorted Tag Strips and Panels	0.60
C19	2	Relays 6-24V Operating	0.60
C20	2	Sheets Copper Laminate approx. 200 sq. ins.	0.60

Please add 20p post and packing on all component packs, plus a further 10p on pack nos. C1, C2, C19 and C20.

AVDEL BOND

SOLVE THOSE STICKY PROBLEMS

with CYANOACRYLATE C2 ADHESIVE

The wonder bond which works in seconds bond plastic, rubber, transistors, components permanently, immediately!

OUR PRICE ONLY 69p for 2gm phial

AUDIO LEADS

S221	5 pin DIN plug to 4 phono plugs length 1.5m	£1.08
S222	5 pin DIN plug to 5 pin DIN socket length 1.5m	68p
S237	5 pin DIN plug to 5 pin DIN plug mirror image length 1.5m	£1.20
S238	2 pin DIN plug to 2 pin DIN socket length 5m	68p
S270	2 pin DIN plug to 2 pin DIN socket length 10m	80p
S271	5 pin DIN plug to 2 phono plugs connected to pins 3 & 5 length 1.5m	70p
S275	5 pin DIN plug to 2 phono sockets connected to pins 3 & 5 length 23cm	68p
S318	5 pin DIN plug to 2 phono plugs connected to pins 3 & 5 length 23cm	68p
S404	Coiled stereo headphones extension cord extends to 7m	£1.40
S217	3 pin DIN plug to 3 pin DIN plug length 1.5m	80p
S219	5 pin DIN plug to 5 pin DIN plug length 1.5m	80p
S474	3.5mm Jack to 3.5mm Jack length 1.5m	68p
S600	5 pin DIN plug to 3.5mm Jack connected to pins 3 & 5 length 1.5m	80p
S700	5 pin DIN plug to 3.5 Jack connected to pins 1 & 4 length 1.5m	80p

SWITCHES
DP/DT Toggle 0.28
SP/ST Toggle 0.22

P&P

Postage and Packing add 25p unless otherwise shown. Add extra for airmail. Minimum order £1.00.

BIB ACCESSORIES

REF 'D'	2 Hi-Fi Cable & Flex Tidy	*34p
REF 'I'	Tape Head Cleaning Kit	72p
REF 'P'	Hi-Fi Cleaner	*30p
Model 9	Wire Stripper	*£1.00
REF 23	Tape Editing Kit	*£1.80
REF 24	Cassette Ed'ng Kit	*£1.84
REF 25A	Salvage Cassette	*44p
REF 32A	Stylus Balance	£1.28
REF 33	Splicing Tape	*38p
REF 36A	Record & Stylus Cleaning Kit	*32p
REF 41	8 Track Cartridge Head Cleaner	88p
Model 42	Groov-Kleen	*£1.84
REF 42/S	Roller & Brush for REF 42 & 2000	*24p
REF 43	Record Care Kit	*£2.76
REF 45	Auto Changer Groov-Kleen	*98p
REF 46	Spirit Level	*72p
REF 48	Record Dust-Off	*26p
REF 52A	Cassette Tray	54p
REF 53	Hi-Fi Stereo Test Cassette	*£2.40
REF 56	Hi-Fi Hints & Tips Book	*48p
Model 60	Groov-Kleen	*£1.72
REF 60/S	Replacement Brush Velvet Pad and Base Sticker for Model 60	*24p
REF 62	Cassette Head Cleaner (Liquid)	*48p
REF 71	Record 'Dust Off' (Displays of ten)	*68p
REF 71A	Record 'Dust Off' (Bubble Pack)	*70p
REF 75	Index Record	*£1.50
REF 76	Stylus Cleaner	*36p
REF 78	Cassette Fast Hand Winder	*98p
REF 83	Cassette Title & Container Labels (20 & 10)	*36p

DYNAMIC MIKES

TYPE B1223. 200 ohms impedance. Complete with stand, on/off switch and 2.5mm and 3.5mm plugs. Suitable for cassette tape recorders. PRICE £1.67

ANTEX Equipment

SOLDERING IRONS

X25. 25 watt	*£2.45
Model G. 18 watt	*£2.70
CCN 240. 15 watt	*£2.90
SK2. Soldering Kit	*£3.90

BITS

102 for model CN240	*42p
104 for model CN240 8/16"	*42p
106 for model CN240 3/32"	*42p
1100 for model CCN240	*42p
1101 for model CCN240 8/16"	*42p
1102 for model CCN240 3/32"	*42p
1020 for model G240	*42p
1021 for model G240 3/16"	*42p
1022 for model G240 3/16"	*42p
50 for model X25	*44p
51 for model X25	*44p
52 for model X25 3/16"	*44p

ELEMENTS

Model ECN 240	*£1.10
Model EG 240	*£1.35
Model ECCN 240	*£1.55
Model EX25	*£1.20

SOLDERING IRON STAND

ST3 Suitable for all models	*£1.10
Antex heat shunt	*10p

PLUGS & SOCKETS

PLUGS	D.I.N.	Price
PS1	D.I.N. 2 Pin (Speaker)	£1.10
PS2	D.I.N. 3 Pin	0.10
PS3	D.I.N. 4 Pin	0.14
PS4	D.I.N. 5 Pin 180°	0.15
PS5	D.I.N. 5 Pin 240°	0.15
PS6	D.I.N. 6 Pin	0.16
PS7	D.I.N. 7 Pin	0.23
PS8	Jack 2.5mm Screened	0.17
PS9	Jack 3.5mm Plastic	0.11
PS10	Jack 3.5mm Screened	0.17
PS11	Jack 1/4" Plastic	0.14
PS12	Jack 1/4" Screened	0.20
PS13	Jack Stereo Screened	0.23
PS14	Phono	0.09
PS15	Car Aerial	0.14
PS16	Co-Axial	0.14

INLINE SOCKETS

PS21	D.I.N. 2 Pin (Speaker)	0.13
PS22	D.I.N. 3 Pin	0.19
PS23	D.I.N. 5 Pin 180°	0.19
PS24	D.I.N. 5 Pin 240°	0.19
PS25	Jack 2.5mm Plastic	0.15
PS26	Jack 3.5mm Plastic	0.13
PS27	Jack 1/4" Plastic	0.22
PS28	Jack 1/4" Screened	0.32
PS29	Jack Stereo Plastic	0.25
PS30	Jack Stereo Screened	0.35
PS31	Phono Screened	0.17
PS32	Car Aerial	0.20
PS33	Co-Axial	0.20

SOCKETS

PS35	D.I.N. 2 Pin (Speaker)	0.07
PS36	D.I.N. 3 Pin	0.09
PS37	D.I.N. 5 Pin 180°	0.09
PS38	D.I.N. 5 Pin 240°	0.10
PS39	Jack 2.5mm Switched	0.11
PS40	Jack 3.5mm Switched	0.19
PS41	Jack 1/4" Switched	0.11
PS42	Jack Stereo Switched	0.28
PS43	Phono Single	0.07
PS44	Phono Double	0.09
PS46	Co-Axial Surface	0.09
PS47	Co-Axial Flush	0.19

INSTRUMENT CASES

(In 2 sections. Black Vinyl covered top and sides and bezel)
No. Length Width Height Price
BV1 8" x 5 1/2" x 2" *£1.25
BV2 11" x 6" x 3" *£1.62
BV3 6" x 4 1/2" x 1 1/2" 0.92
BV4 9" x 5 1/2" x 2 1/2" £1.39
20p P & P Per Box.

RECORD CASES

7 in. E.P. 18 1/2" x 7" x 8"	*£2.48
(50 records)	
12 in. L.P. 13 1/2" x 7 1/2" x 12 1/2"	*£3.30
(50 records)	

CASSETTE CASES

Holds 15. 10" x 3 1/2" x 5". Lock and handle	*£1.50
--	--------

8-Track CARTRIDGE CASES

Holds 14. 13 1/2" x 5" x 6". Lock and handle	*£2.20
Holds 24. 12 1/2" x 8" x 5 1/2". Lock and handle	*£3.20

BI-PAK

P.O. BOX 6, WARE, HERTS

POWER UNIT Type A126

Supplying 6, 7.5 or 9 Volt DC at 200 mA. In moulded case forming a 2 pin 5A main plug. 2 metre output lead with 4-way multiplex giving 2.1 and 2.5 mm sockets and 3.5 mm plugs.

Price £2.40. Post 15p. plus 8% VAT



2" and 4" PANEL METERS

SIZE: 60mm Wide x 45mm High x 40mm Deep.	SIZE: 110mm Wide x 82mm High x 43mm Deep.
Movement	I.R. Movement
0-50 micro A. 1250	0-50 micro A. 1400
0-100 micro A. 580	0-100 micro A. 730
0-500 micro A. 170	0-500 micro A. 200
0-1 mA 170	0-1 mA 200
0-5 mA 170	0-5 mA 200
0-10 mA 6	0-10 mA 6
0-50 mA 0.5	0-50 mA 0.5
0-100 mA 0.5	0-100 mA 0.5
0-500 mA 0.5	0-500 mA 0.5
0-1 AMP 0.5	0-1 AMP 0.5
0-2 AMP 0.5	0-2 AMP 0.5
0-25 Volt 15K	0-25 Volt 15K
0-50 Volt 50K	0-50 Volt 50K
0-500 Volt 300K	0-500 Volt 300K
"G" Meter 170	"G" Meter 200
VU Meter 5250	VU Meter 5250

VU Meters are complete with detectors. Modern wide view. Price 2" £3.20 Post 10p. Price 4" £4.00 Post 10p. Lamps 60p per set. plus 8% VAT

1 watt CARBON FILM RESISTORS
1 watt at 70°C E 12 range 10Ω-1MΩ 5% tol above 470 KΩ 10% tol at 95p per 100, plus 28% VAT

C1000 MULTIMETER

Special Offer
Compact General Purpose Mini Multimeter. Input Resistance 1000 ohms per volt. Ranges: AC Volts 0-15, 50, 250, 1000 V. DC Volts 0-10, 50, 250, 1000 V. DC Current 0-1 mA. Resistance 0-100K ohms. Size 60 x 24 x 90 mm. Complete with Batteries, Test Prods, Instructions. Special price £3.95 Post 30p. plus 8% VAT



C1001 MULTIMETER

Input Resistance 20,000 ohms per volt. Overload protection 150 μA movement, clear scale. Ranges—AC Volts 0-10, 50, 250, 1000V. DC Volts 0-5, 25, 125, 500, 2500V. DC Current 0-50 mA. Resistance 0-60 Kohms, 0-6 Mohms. Decibels -20 to +22 dB. Carrying Case, Test Prods and Batteries included. Size: 11.5 x 8.3 x 2.7 cm. Price £9.95. Post 20p. plus 8% VAT

TRANSFORMERS

ADD 8% VAT ON ALL TRANSFORMER PRICES

CASED TRANSFORMERS

Housed in smart resin-coated steel cases, with 3-core power cable and outlet socket, fused primary winding. Isolation types are fitted with 3-pin outlet sockets, and are available with 110 volt or 240 volt output. (Please state). Auto types are fitted with 2-pin flat style sockets up to 500 VA. 3-pin sockets from 750 to 3000 VA. See Auto and Isolation sections for prices.

SAFETY ISOLATING

Prim. 120/240V. Sec. 120/240V. Centre Tap with Screen.

VA	Ref. No.	Price Cased	Price Plugs 2 Pin + 1 Earth	Price Open	Post
20	148	5.25	0.98	3.75	0.72
80	149	9.08	0.98	4.70	0.72
100	150	9.87	0.98	5.35	0.85
200	151	13.29	0.98	8.61	0.97
250	152	13.81	0.98	10.31	1.18
350	153	16.54	0.98	12.50	1.28
500	154	18.38	0.98	14.21	1.44
750	155	23.72	1.25	22.12	O.A.
1000	156	27.44	1.25	30.87	O.A.
1500	157	44.37	1.25	34.98	O.A.
2000	158	52.45	2.25	38.91	O.A.
3000	159	77.13	2.95	61.61	O.A.

12 & 24 Volts Prim. 200-240V.

VA	Ref. No.	Price	Post
12V 0-5	0-15	2.42	1.68
0-5	0-25	1.11	1.80
0-5	0-5	2.13	0.61
2	1	7.71	2.47
4	2	18	3.07
6	3	70	4.50
8	4	108	5.11
10	5	72	5.83
12	6	116	6.85
16	8	17	7.28
20	10	115	10.98
30	15	187	14.06
40	20	232	15.63
60	30	226	17.70

30 Volts

VA	Ref. No.	Price	Post
0-5	112	2.04	0.61
0-5	79	2.57	0.66
2	3	3.91	0.72
3	20	4.80	0.85
4	21	5.58	0.85
5	61	6.75	0.96
6	117	7.52	0.97
8	88	9.93	1.18
10	89	10.27	1.18

AUTO TRANSFORMERS

VA	Ref. No.	Price Cased	Price Plugs 2 & 3 pin	Price Open	Post
Watts Tapped at 115, 220, 240 Volts	113	4.31	0.25	1.88	0.61
Tapped at 115, 200, 220, 240 Volts	150	4	6.99	4.28	0.72
200	65	7.67	0.25	5.21	0.78
300	66	8.67	0.25	6.11	0.85
500	67	11.82	0.25	9.48	1.18
750	83	14.31	0.25	11.30	1.28
1000	84	18.38	0.25	14.35	1.44
1500	93	23.26	0.25	19.22	O.A.
2000	95	35.07	1.80	25.49	O.A.
3000	73	50.61	2.35	34.87	O.A.

50 Volts

Prim. 200-240V. Sec. 19, 25, 35, 40, 50V.

Amps	Ref. No.	Price	Post
0-5	102	2.71	0.61
1	103	3.58	0.76
2	104	5.30	0.85
3	105	6.10	0.85
4	106	7.97	1.08
6	107	12.93	1.18
8	118	13.75	1.44
10	119	17.79	1.86

60 Volts

Prim. 230-240V. Sec. 24, 30, 40, 43, 60V.

Amps	Ref. No.	Price	Post
0-5	124	2.51	0.72
1	126	3.75	0.72
2	127	5.36	0.85
3	125	7.91	0.97
4	128	9.20	1.18
5	40	10.82	1.18
6	120	12.10	1.36
8	121	15.74	O.A.
10	122	20.10	O.A.
12	189	18.87	O.A.

MINIATURE AND EQUIPMENT

Prim. 240V with screen.

Sec. 1 Volts	Sec. 2 Milliamperes	Ref. No.	Price	Post
3-0-3	200	238	1.58	0.34
0-6	500	234	1.58	0.34
0-6	1000	212	2.12	0.46
0-0-9	100	13	1.60	0.34
0-9	330	235	1.62	0.34
0-8-9	500	207	1.69	0.46
0-8-9	1000	208	2.79	0.46
15-0-15	40	240	1.55	0.34
0-15	200	236	1.58	0.34
20-0-20	30	241	1.55	0.34
0-20	150	237	1.58	0.34
0-15-20	500	205	2.88	0.58
0-20	300	214	2.03	0.61
0-20	350 (D/C)	116	2.50	0.61
20-12-0-12-20	1000	206	2.85	0.72
0-15-20	500	203	3.18	0.58
0-15-27	1000	204	4.55	0.72

PLASTIC CASED SILICON BRIDGE RECTIFIERS

One Amp	Two Amp	Four Amp	Six Amp
50 P.I.V. 20p	50 P.I.V. 35p	100 P.I.V. 55p	50 P.I.V. 65p
100 P.I.V. 25p	100 P.I.V. 40p	200 P.I.V. 59p	100 P.I.V. 70p
200 P.I.V. 28p	200 P.I.V. 45p	400 P.I.V. 65p	200 P.I.V. 80p
500 P.I.V. 30p	400 P.I.V. 50p	600 P.I.V. 75p	400 P.I.V. 90p

ADD 10p P & P PER ORDER plus 25% VAT

PLEASE
ADD
VAT
AS SHOWN

POWER UNIT Type CC 12-05

Output switched 3, 4.5, 6, 7.5, 9 and 12 volts at 500 mA D.C. Operates from 240 V mains, suitable for Radios, Tape Recorders, Record Players etc. Size 7.5 x 5.0 x 14.0 cm. Price £4.15. Post 30p. + 8% VAT



MINIATURE NEONS

6mm dia., 12mm length leads length approx. 20mm. Recommended ballast resistor 150K ohms for 240 Volt operation. Price: Packet of 10 for 60p. Postage 15p. plus 8% VAT

A.S.P. LTD.

DEPT PW9, SIMMONDS ROAD, WINCHEAP, CANTERBURY, KENT. Tel: (0227) 52436

Send 25p for Catalogue

PRACTICAL WIRELESS T.V. SOUND TUNER

IF Sub-Assembly (G8) £6.80. P & P 55p.
Mullard ELC1043 Varicap UHF Tuner £4.20. P & P 30p.
3-way Station Control Unit £1.20. P & P 25p.
6-way Station Control Unit (Special Offer) £1.00.
Resistors, Caps, Semiconds etc. £5.22. P & P 55p.
Printed Circuit Board £1.00. P & P 25p.

Add 25% VAT to price of goods. P & P all items 65p.

Callers welcome at shop premises.

MANOR SUPPLIES

172 WEST END LANE, LONDON NW6

(Near W. Hampstead Tube Stn.) Tel. 01-794 8751



CJL LTD. P.O. BOX 34, CANTERBURY, CT1 1YT
ALL PRICES INCLUDE P&P AND V.A.T.

ANTEX SOLDERING IRONS

(with slide on & off bits)

15W 'C' miniature irons	£2.30
3/32" 1/8" 3/16" bits-each	£0.45
'C' Elements	£1.10
18W 'G' miniature irons	£2.50
3/32" 1/8" 3/16" bits-each	£0.45
'G' Elements	£1.35
15W 'CCN' Low leakage irons	£2.70
3/32" 1/8" 3/16" bits-each	£0.45
'CCN' Elements	£1.50
25W 'X2S' Low leakage irons	£2.30
3/32" 1/8" 3/16" bits-each	£0.47
'X2S' Elements	£1.15
'SK1', 'SK2' Soldering Kits	£3.85
ST3 Stands-for all models	£1.10
SOLDER in Bib dispenser	£0.45

WIRE STRIPPER & CUTTER £0.85

HAND DRILLS Laytool precision,

compact, 5/16" chuck £3.99

AERIALS Extend 15-120cm £1.50

CASSETTE 'Head Demagnetisers'

Shaped pole-saves time £3.65

EARPHONES Stethoscope £1.25

Crystal earphone, lead & plug £0.65

Headphone, 2,000 Ω £3.20

INTERCOMS 2-station £6.35

MICROPHONES Dynamic £2.15

PRINTED CIRCUIT KITS -All

items for producing p.c.'s £3.99

SIGNAL INJECTOR -Audio through

video signals, self contained £4.25

STEREO HEADPHONES 8Ω £4.85

SPEAKERS -75mm dia. 8Ω £1.00

RETURN OF POST MAIL-ORDER SERVICE

JUST RELEASED

R.C.S. 100 watt VALVE AMPLIFIER



Four inputs. Four way mixing. master volume. treble and bass controls. Suits all speakers. This professional quality amplifier chassis is suitable for all groups, disco, P.A., where high quality power is required. 5 speaker outputs. A/C mains operated. Slave output. Produced by demand for a quality valve amplifier.
Suitable carrying cabinet £14. Price **£85** carr. £2-50

ANOTHER R.S.C. BARGAIN!

ELAC 9 + 5in. HI-FI SPEAKER TYPE 59RM
This famous unit now available. 10 watts. 8 ohm.

Price **£3-45** Post 40p



8" or 10" x 6" ELAC HI-FI SPEAKER

Dual cone plasticised roll surround. Large ceramic magnet. 50-16,000 cps. Bass resonance 55 cps. 8 ohm impedance. 10 watts.

£4-35

TEAK VENEER HI-FI SPEAKER CABINETS Fluted Wood Fronts

MODEL "A". 20 x 13 x 12in.
For 12 in. dia. or **£12-50** Post 85p

MODEL "B". 16 x 10 x 9in.
For 13 x 8in. or **£6-95** Post 75p

MODEL "C". 30 x 20 x 12in.
Reflex cabinet will accept 1-12in. bass unit, 1-5in. mid range, 1-3in. tweeter. Teak finish. Grooved front
£21-50 Carr. £3

LOUDSPEAKER CABINET
WADDING 18in. wide, 20p ft.

GOODMANS CONE TWEETER

3in. diam. 18,000 C.P.S. 25 WATTS 8Ω **£3-60**

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER. Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt **£5-20** battery operated.

STEREO VERSION OF ABOVE £8-85.

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built with volume, treble and bass controls. 18 volt battery operated. Mains Supply **£4-50** £2-45.

THE "INSTANT" BULK TAPE ERASER & HEAD DEMAGNETISER. Suitable for cassettes, and all sizes of tape reels. A.C. mains 200/240V. Leaflet S.A.E. **£4.35** Post 40p

WAFER THIN HEATING ELEMENTS

OFFERING 1001 USES for every type of heating and drying applications in the home, garage, greenhouse, factory (available in manufacturing quantities). Approx. size 10 1/2 x 8 1/2 x 1/16in. Operating voltage 200/250V. a.c. 250 watts approx. Printed circuit element enclosed in asbestos fitted with connecting wires. Completely flexible providing safe Black heat. British-made for use in photocopyers and print drying equipment.

Ideal for home handymen and experimenters. Suitable for Heating Pads, Food Warmers, Convector Heaters, etc. Must be clamped between two sheets of metal or asbestos, etc. to make efficient clothes dryers, towel rails—ideal for airing cupboards. Ideal for anti-frost device for the garage—preventing frozen radiators or acting as oil pump heater. Use in greenhouse for seed raising and plant protection. Invaluable aid for bird houses, incubators, etc., etc. Can be used in series for lower heat. Or in parallel for higher heat applications.

ONLY 40p EACH (FOUR FOR £1-50)

ALL POST PAID—Discounts for quantity.

BAKER MAJOR 12" £11-50

Post 60p



30-14,500 c/s. 12in. double cone, woofer and tweeter cone together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwells. Bass resonance 40 c/s rated 25 watts. NOTE: 3 or 8 or 15 ohms must be stated.

Module kit. 30-17,000 c/s with tweeter, crossover, baffle and instructions. **£14-50**

Please state 3 or 8 or 15 ohms. Post 50p

BAKER SPEAKERS "BIG SOUND"

Robustly constructed to stand up to long periods of electronic power. As used by leading groups. Useful response 30-13,000 cps. Bass resonance 55 cps.

GROUP "25"

12in 30 watt
3, 8 or 15 ohms.

£8-95

Post 50p

GROUP "35"

12in 40 watt
3, 8 or 15 ohms.

£10-50

Post 50p

GROUP "50/12"

12in 60 watt professional model. 8 ohms or 15 ohms.

£14-50

Post 80p

GROUP "50"

15in 75 watt
8 or 15 ohms.

£19-50

post 90p

MAJOR 50 WATT ALL PURPOSE TRANSISTOR AMPLIFIER

All purpose transistorised. Ideal for Groups, Disco and P.A. 4 inputs speech and music. 2-way mixing. Output 8/15 ohm A.C. mains. Separate treble and bass controls. Guaranteed. Details S.A.E.

£49 Carr. £1-00

Latest 100 watt Model as illustrated **£65**

Deluxe Model 100 watt in Wood Case
Covered Black Rexine with Handle **£75**

QUALITY LOUDSPEAKER ENCLOSURE

Teak veneered 1in thick wood cabinet. Size 18 1/2in x 14 1/2in x 8 1/2in. Weight 23lb. This cabinet features a wide mesh Silver Grill covering a separate compartment for mounting Tweeters or Mid-Range Horn. The fully sealed bass compartment is cut out for 6in Woofer. £7-50. Carr. 85p. Rosewood Version £8-50. Carr. 85p. Baffle could be cut for larger speaker.

P.W. SOUND TO LIGHT DISPLAY

Complete kit of parts with R.C.S. printed circuit. Three channels. 800 to 1,000 watt each. As featured in December Practical Wireless. Price **£12-50**
Cabinet extra £5.

R.C.S. STEREO DECODER

British made. Ready aligned and tested. Complete with instructions. Size 3in x 2in. **£4-95**

WEYRAD TYPE COILS

P50/20C	40p	RA2W	85p
P50/1AC	60p	OPT1	65p
P50/30C	40p	LFDT4	65p
PCA1	85p	Twin gang	£1-20

E.M.I. TAPE MOTOR

4 pole. 240 v. Size 3 1/2 x 2 1/2in. 1200 rpm. Spindle 1/16in. diameter. 120v version 75p.

£1-85 Post 45p

E.M.I. GRAM MOTOR

120V or 240V a.c. 2,400 rpm 2-pole. Size 2 1/2 x 2 1/2in.

£1-25 Post 35p

BAKER DISCO SPEAKERS HIGH QUALITY—BRITISH MADE

2 x 12" CABINETS

for Disco or P.A. all fitted with carrying handles and corners Black finish.



R.M.S. RATINGS

50 Watt—**£43** ea.

70 Watt—**£46** ea.

SUPERB HI-FI

12in 25 watts

A high quality loudspeaker. Its remarkable low cone resonance ensures clear reproduction of the deepest bass. Fitted with a special copper drive and concentric tweeter cone resulting in full range reproduction with remarkable efficiency in the upper register. Bass Resonance 25cps Flux Density 16,500 gauss Useful response 20-17,000cps 8 or 15 ohms models.

£17 Post 80p

AUDITORIUM

12in. 35 watts

A full range reproducer for high power. Electric Guitars. Public address, multi-speaker systems, electric organs. Ideal for Hi-Fi and Disco-theques. Bass Resonance 35cps Flux Density 15,000 gauss Useful response 25-16,000cps 8 or 15 ohms models.

£15-50 Post 80p

AUDITORIUM

15in. 45 watts

A high wattage loudspeaker of exceptional quality with a level response to above 8,000 cps. Ideal for Public Address, Discotheques, Electronic instruments and the home Hi-Fi. Bass Resonance 25cps Flux Density 15,000 gauss Useful response 20-14,000cps 8 or 15 ohms models.

£19-50 Post 90p

Hi-Fi Enclosure Manual containing plans, designs, crossover data and cubic tables. 68p

RADIO COMPONENT SPECIALISTS

337 WHITEHORSE ROAD, CROYDON

Open 9-6 Wed. 9-1 Sat. 9-5 (Closed for lunch 1.15-2.30)

Cash price includes VAT Rail Selhurst Tel. 01-684 1663

Minimum post 30p. Illustrated Radio Books & Components Lists 10p.



Stirling Sound Products

FROM BI-PRE-PAK

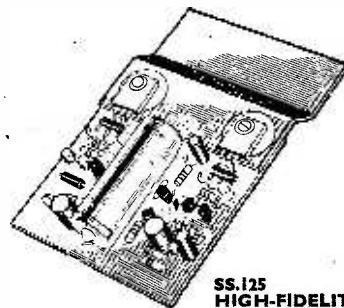
**BRAND NEW MODULES FROM A FOREMOST BRITISH
MODULE DESIGNER AND EXCLUSIVE TO B-P-P**

NEW FOR HI-FI ENTHUSIASTS

THE SS.125 HIGH-FIDELITY POWER AMPLIFIER

Not only is this Stirling Sound's best audio amplifier yet; it rightfully qualifies as one of the best of its kind yet made available to constructors. Intended above all for high-fidelity, the characteristics of the SS.125 are such that it can be used in many other applications where dependability is the prime consideration. The SS.125 integrates well with other S.S. units as well as those of other manufacturers. Incorporates new circuitry using a complementary long-tailed pair input and full complementary output circuits to give lab standards of performance.

OUTPUT	25 watts R.M.S. into 8 Ω using 50V 22 watts R.M.S. into 4 Ω using 33V (Low imp. not less than 4 Ω)
DISTORTION	Less than 0.05% at all power levels (From 10Hz to 10KHz)
FREQUENCY RESPONSE	± 1 dB 15 Hz to 30 KHz (4 Ω) ± 1 dB 10 Hz to 30 KHz (8 Ω)
HIGH Z INPUT	100 Kohms (40dB gain/100x)
INPUT SENSITIVITY	150mV for 25W. R.M.D. out
SIZE	(Inc. 40w. built on heat sink) 4 $\frac{1}{2}$ " x 3" x $\frac{3}{4}$ " high



**SS.125
HIGH-FIDELITY
Power Amp.
£7.50**

More Stirling Sound Modules

With easy to follow instructions

F.M. TUNER UNITS

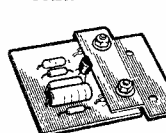
- SS.201** Tuner front end. Ganged, geared variable tuning. 88-108MHz. A.F.C. facility **£5.00**
- SS.202** I.F. amp. A metre and/or A.F.C. can be connected (size 3" x 2") **£2.65**
- SS.203** Stereo decoder for use with SS.201 and 202 or any good F.M. tuner. A LED beacon may be attached (3" x 2") **£3.85**



SS.201



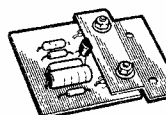
SS.202



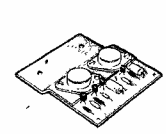
SS.203

AUDIO MODULES

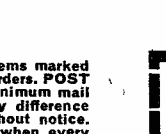
- SS.105** 5 watt amplifier to run from 12V. (3 $\frac{1}{2}$ " x 2" x $\frac{3}{4}$ ") **£2.25**
- SS.110** Similar to SS.105 but more powerful giving 10W. into 4ohms **£2.75**
- SS.120** 20 watt module when used with 34 volts into 4 **£3.00**
- SS.140** Delivers 40 watts R.M.S. into 4 ohms using a 45V/2A supply such as our SS.345 the power and quality of this unit are superb—two in bridge formation will give 80 watts R.M.S. into 8ohms. size 4" x 3" x $\frac{3}{4}$ ". **£3.75**
- SS.100** Active tone control stereo. ± 15 dB lift-cut bass/treble **£1.60**
- SS.102** Pre-amp for ceramic **£1.60**
- SS.103** Active pre-amp (stereo) inc. R.I.A.A. and line feed back **£2.25**



SS.105



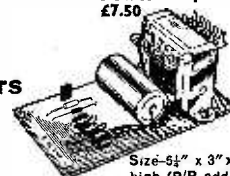
SS.100



SS.140

... And 5 NEW Stirling Sounds POWER SUPPLY UNITS

Robustly designed units in each of which is a stabilised take-off point to provide for tuner, pre-amp and control stages.



Size 6 $\frac{1}{2}$ " x 3" x 2 $\frac{1}{4}$ "
high (P/P add 50p
any model)

SS. 312	12V/1A	£3.75	SS. 334	34V/2A	£5.20
SS. 318	18V/1A	£4.15	SS. 345	45V/4A	£6.25
SS. 324	24V/1A	£4.60	(all above are at 8% V.A.T.)		

A new Stirling Sound Capacity Discharge Ignition Unit for your car.

Even better than the original B-P-P version, thousands of which are in use saving motorists appreciable time and money for petrol. Very easy to install. The Stirling Sound model incorporates switch for instant change to conventional Ignition; immediate adaption to pos. or neg. earth return; anti-burglar immobilising switch, pre-set control for rev. limitation. There are no exposed parts, the unit, on p.c.b. being housed in strong enclosed metal box. With instructions and leads. Size 7 $\frac{1}{2}$ " x 4 $\frac{1}{2}$ " x 2 $\frac{1}{4}$ " ex. switches.

KIT £7.95 BUILT & TESTED £10.50

A USEFUL CATALOGUE—FREE

Send us a large S.A.E. with 10p stamp and we will send you the latest Bi-Pre-Pak catalogue free by return. Packed with useful lines, it's a real money saver.

TERMS OF BUSINESS:

VAT at 25% must be added to total value of order except for items marked * or (8%) when VAT is to be added at 8%. No VAT on overseas orders. **POST & PACKING** add 30p for UK orders unless marked otherwise. Minimum mail order acceptable—£1 Overseas orders, add £1 for postage. Any difference will be credited or charged. **PRICES** subject to alteration without notice. **AVAILABILITY** All items available at time of going to press when every effort is made to ensure correctness of information.

Order your Stirling Sound products from

BI-PRE-PAK LTD

Co Reg No 320919

222 224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SSO 9DF.
TELEPHONE: SOUTHELD (0792) 46344

CHEQUES/MONEY ORDERS PAYABLE TO BI-PRE-PAK LTD

TO STIRLING SOUND (BI-PRE-PAK LTD) 220/222 WEST ROAD,
WESTCLIFF-ON-SEA, ESSEX SSO 9DF

Please send

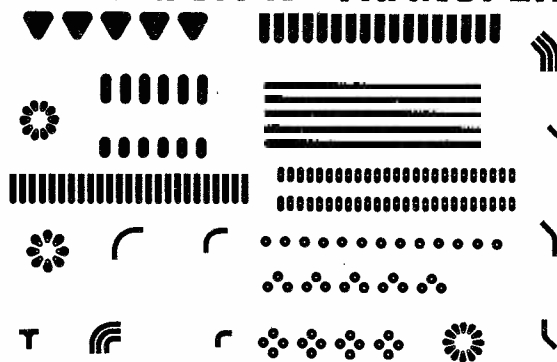
..... for which I enclose £

Inc. V.A.T.

NAME

ADDRESS

PRINTED CIRCUIT BOARD TRANSFER SYSTEMS



Acid resistant transfers for direct application to P.C. Board. This is a new approach to printed circuit board manufacture, giving a professional finish with all details that an electronics engineer would require, including all drilling positions automatically marked.

Ideal for single unit boards or small quantities. All at a very low cost—for example an average 6" x 4" layout would cost less than 30p, and the time taken under one hour, including etching to complete.

The system is simple, briefly it consists of 10 sheets of self adhesive acid resistant transfers made in required shapes—i.e. edge connectors, lines, pads, dual in line I.C.'s, 8-10-12. T.O.5 Cans, 3-4 lead transistors, etc., etc., which only require pressing into the required positions on the printed circuit board before etching.

The printed circuit transfer system is a genuine offer to the public and industry. A full money back guarantee is sent with each order, trade prices on application.

List of Prices

Complete system including post and VAT	£2.95
Individual sheets	30p
Sample sheet	30p
Ex U.K. Post Extra	£1.00

Printed circuit board PCB transfer systems patent applied for.

E. R. NICHOLLS, 46 LOWFIELD ROAD, STOCKPORT, CHESHIRE

TELEPHONE NUMBER: 061-480 2179

ESSENTIAL BOOKS FOR RADIO AMATEURS

1976 Edition

RSGB AMATEUR RADIO CALL BOOK

Incorporates all new call signs and amendments notified between August 1974 and August 1975.

Also includes valuable operating data such as band plans, beacons, prefix list, ITU zone list, beam headings and QSL Bureau sub-managers, and lists of clubs and groups.

168 pages

Price £1.47 post paid

AMATEUR RADIO TECHNIQUES

(5th edition)

by Pat Hawker, G3VA

Basically an ideas and source book, this ever-popular work brings together a large selection of new circuits and devices and many constructional and fault-finding hints.

In this latest edition some 50 pages of new material have been included and other sections have been revised and expanded.

304 pages Price £2.52 inc. p. & p. Over 700 diagrams

RADIO DATA REFERENCE BOOK

by G. R. Jessop, CEng, MIERE, G6JP

An invaluable source of essential radio data conveniently gathered into one hard-bound volume measuring 5½in by 9in.

150 pages

Price £1.32 post paid

RSGB LOG BOOKS

TRANSMITTING: Standard, 96p; de luxe, £2.44; minilog (for mobile and portable), 80p. All post paid.

RECEIVING: £1.20, post paid.

The **Receiving Log Book**, similar in format to the transmitting log books, is designed specially for the short-wave listener who wishes to make a proper record of amateur stations heard.

These are just a few of a complete range of technical publications, log books and maps for the radio amateur. Send a large stamped self-addressed envelope for the complete list.

The **RSGB** is the national society representing all **UK** radio amateurs. Membership is open to all interested in the hobby: write to the membership section and ask for full details.

RADIO SOCIETY OF GREAT BRITAIN

35 DOUGHTY STREET, LONDON, WC1N 2AE TEL: 01-837 8688



Marshall's

A. Marshall (London) Ltd Dept: PW
42 Cricklewood Broadway London NW2 3ET Tel: 01-452 0161/2
Telex: 21492
& 85 West Regent St Glasgow G2 2QD Tel: 041-332 4133
& 1 Straits Parade Fishponds Bristol BS16 2LX
Tel: 0272 654201/2
& 27 Rue Danton Issy Les Moulineaux Paris 92 Tel: 644 2356
Catalogue price 25p Trade and export enquiries welcome

Our range covers over 7,000 items. The largest selection in Britain

Top 200 IC's TTL, CMOS & Linears

CA3020A £1.80	CD4050 66p	NE555V 70p	SN7442 65p	SN74151 85p
CA3028A 79p	CD3130 88p	NE555 1.30	SN7446 95p	SN74153 85p
CA3035 £1.37	CD4510 £1.25	NE560 £4.48	SN7447 95p	SN74157 95p
CA3046 70p	CD4511 £1.94	NE565 £4.48	SN7448 90p	SN74160 £1.10
CA3048 £2.11	CD4516 £1.25	SL414 £1.80	SN7450 16p	SN74161 £1.10
CA3052 £1.62	CD4518 £1.87	SL610C £1.70	SN7451 16p	SN74162 £1.10
CA3089E £1.96	CD4520 £1.87	SL611C £1.70	SN7453 16p	SN74163 £1.10
CA3090Q £4.23	LM301A 48p	SL612C £1.70	SN7454 16p	SN74164 £2.01
CD4000 36p	LM308 £2.30	SL620C £2.60	SN7460 16p	SN74165 £2.01
CD4001 36p	LM308 £1.50	SL621C £2.60	SN7470 33p	SN74167 £4.10
CD4002 36p	LM380 36p	SL623C £4.59	SN7472 26p	SN74174 £1.25
CD4006 £1.58	LM381 £2.20	SL640C £3.10	SN7473 36p	SN74175 90p
CD4007 36p	LM702C 75p	SN7400 16p	SN7474 36p	SN74176 £1.44
CD4008 £1.63	LM709 38p	SN7401 16p	SN7475 30p	SN74180 £1.40
CD4009 £1.18	TO99 38p	SN7401 AN38p	SN7476 35p	SN74181 £1.95
CD4010 £1.18	8DIL 45p	SN7402 16p	SN7480 50p	SN74190 £2.30
CD4011 36p	8DIL 38p	SN7403 16p	SN7481 £1.25	SN74195 £2.30
CD4012 36p	LM710 47p	SN7404 19p	SN7482 75p	SN74192 £1.15
CD4013 66p	LM723C 90p	SN7405 19p	SN7483 95p	SN74193 £1.15
CD4014 £1.72	LM741C 40p	SN7406 45p	SN7484 95p	SN74196 £1.60
CD4015 £1.72	TO99 40p	SN7407 45p	SN7485 £1.25	SN74197 £1.58
CD4016 66p	8DIL 40p	SN7408 19p	SN7486 32p	SN74198 £2.25
CD4017 £1.72	LM741C 38p	SN7409 22p	SN7490 45p	SN74199 £2.25
CD4018 £2.55	LM747 £1.05	SN7410 16p	SN7491 85p	SN76003N £2.12
CD4019 86p	LM748 60p	SN7411 25p	SN7492 45p	SN76013N £1.95
CD4020 £1.91	8DIL 60p	SN7412 25p	SN7493 45p	SN76023N £1.60
CD4021 £1.72	LM741C 73p	SN7413 35p	SN7494 82p	SN76033N £2.92
CD4022 £1.66	LM3900 70p	SN7416 35p	SN7495 75p	TAA263 £1.10
CD4023 36p	LM3308 £2.00	SN7417 35p	SN7496 75p	TAA360 £1.80
CD4024 £1.24	LM7812 £2.30	SN7420 16p	SN74100 £1.25	TAA35A £2.00
CD4025 32p	LM7815 £2.30	SN7423 29p	SN74107 36p	TAA550 60p
CD4027 43p	LM7824 £2.50	SN7425 29p	SN74118 £1.00	TAA611C £2.18
CD4028 £1.50	MCI303L £1.50	SN7427 29p	SN74119 £1.92	TAA621 £2.03
CD4029 £3.50	MCI310P £2.50	SN7430 16p	SN74121 37p	TAA661B £1.32
CD4030 36p	MCI3308 90p	SN7432 25p	SN74122 50p	BA641B £2.25
CD4031 £5.19	MCI351P 80p	SN7437 35p	SN74123 60p	TAA651 £1.69
CD4037 £1.93	MCI4553 £4.07	SN7438 35p	SN74141 85p	TBA800 £1.40
CD4041 £1.86	MCI4661 £3.50	SN7440 16p	SN74145 90p	TBA810 £1.40
CD4049 81p	MCI469R £2.75	SN7441 AN85p	SN74150 £1.50	TBA820 £1.15

London, Glasgow, Paris and now **BRISTOL** It's our service that makes us grow

POPULAR SEMICONDUCTORS

2N696 22p	2N3906 27p	AF139 65p	BD139 71p	MPSA56 31p
2N697 16p	2N4037 42p	AF239 65p	BD140 87p	OC28 76p
2N698 82p	2N4036 37p	AF240 90p	BF115 36p	OC35 60p
2N699 59p	2N4058 18p	AF278 70p	BF117 55p	OC42 50p
2N706 14p	2N4061 18p	AF154 20p	BF154 20p	OC45A 60p
2N708 17p	2N4289 34p	AL102 £1.00	BF159 27p	TIP29A 49p
2N916 28p	2N4920 £1.10	BC107 14p	BF180 35p	TIP29C 58p
2N918 32p	2N4921 83p	BC108 14p	BF181 36p	TIP31A 62p
2N1302 18p	2N4923 £1.00	BC109 14p	BF184 30p	TIP32A 74p
2N1304 12p	2N5294 47p	BC178 14p	BF194 12p	TIP35A £1.01
2N1306 31p	2N5294 48p	BC148B 15p	BF195 12p	TIP34A £1.31
2N1308 47p	2N5296 48p	BC149B 15p	BF196 13p	TIP35A £2.90
2N1711 45p	2N5457 49p	BC157A 16p	BF197 15p	TIP36A £3.70
2N2102 18p	2N5458 49p	BC158A 16p	BF198 18p	TIP41A 74p
2N2147 78p	2N5459 49p	BC167B 15p	BF244 21p	TIP42A £0.90
2N2148 94p	2N6027 45p	BC168B 15p	BF257 47p	TIP2951 30p
2N2218A 22p	2N128 73p	BC169B 15p	BF258 53p	TIP3055 50p
2N2219A 26p	2N140 £1.00	BC182 12p	BF259 55p	TIS43 28p
2N2220 25p	2N141 81p	BC182L 12p	BF561 27p	ZTX300 13p
2N2221 18p	2N200 £2.49	BC183 12p	BF598 25p	ZTX301 13p
2N2222 20p	40361 40p	BC183L 12p	BF839 24p	ZTX500 13p
2N2269 20p	40362 45p	BC184 13p	BF879 24p	ZTX501 13p
2N2646 55p	40406 44p	BC184L 13p	BF879 24p	ZTX502 13p
2N2904 22p	40407 35p	BC212A 16p	BF879 24p	IN914 7p
2N2905 25p	40408 50p	BC212LA 16p	BF879 24p	IN375A 15p
2N2906 19p	40409 52p	BC213LA 15p	BF879 24p	IN4007 10p
2N2907 22p	40410 52p	BC214LB 15p	BF879 24p	IN4148 7p
2N2924 20p	40411 £2.00	BC237B 16p	BFY50 23p	IN5404 30p
2N2926G 12p	40594 74p	BC238C 15p	BFY51 15p	IN5408 30p
2N3053 25p	40595 84p	BC239C 15p	BFY52 20p	AA119 8p
2N3054 60p	40636 £1.10	BC257A 16p	BFY39 48p	BA102 25p
2N3055 75p	40673 73p	BC258B 16p	ME0402 20p	BA145 18p
2N3391 28p	AC162 20p	BC259B 17p	ME0412 18p	BA154 12p
2N3392 18p	AC127 20p	BC301 34p	ME4102 11p	BA185 15p
2N3393 15p	AC128 20p	BC301B 17p	ME480 95p	BB103B 23p
2N3440 59p	AC151 27p	BC308A 15p	MJ481 £1.20	BB104B 45p
2N3442 £1.40	AC152 49p	BC309C 20p	MJ490 £1.05	BY126 12p
2N3638 15p	AC153 35p	BC327 23p	MJ491 1.45	BY127 15p
2N3702 12p	AC176 30p	BC328 22p	MJ2955 £1.00	BY121 51p
2N3703 13p	AC187K 30p	BCY70 17p	ME340 48p	BY121 51p
2N3704 15p	AC188K 40p	BCY71 22p	ME370 45p	OA47 10p
2N3706 15p	AD143 68p	BCY72 15p	MJE371 75p	OA81 18p
2N3708 14p	AD161 50p	BD121 £1.00	MJE520 60p	OA90 6p
2N3714 £1.38	AD162 50p	BD123 82p	MJE521 70p	OA91 6p
2N3716 £1.80	AF106 40p	BD124 67p	MJE2955 £1.20	OA200 8p
2N3771 £2.20	AF109 40p	BD131 40p	MJE3055 75p	BY164 37p
2N3773 £2.68	AF115 35p	BD132 50p	MPB113 47p	ST2diac 30p
2N3789 £2.06	AF116 35p	BD135 40p	MPF102 39p	4062 £1.00
2N3819 37p	AF117 35p	BD136 47p	MPSA05 25p	TIC44 29p
2N3820 64p	AF118 35p	BD137 55p	MPSA06 31p	CI06D 65p
2N3904 27p	AF124 30p	BD138 63p	MPSA55 31p	ORP12 60p

Prices correct at February, 1976, but all exclusive of VAT. P.&P. 25p

Technical Training in Radio, Television and Electronics

ICS have helped thousands of ambitious people to move up into higher paid, more secure jobs in the field of electronics - now it can be your turn. Whether you are a newcomer to the field or are already working in the industry, ICS can provide you with the specialised training so essential to success.

Personal Tuition and Guaranteed Success

The expert and personal guidance by fully qualified tutors, backed by the ICS guarantee of tuition until successful is the key to our outstanding record in the technical training field. You study at the time and pace that suits you best and in your own home. In the words of one of our many successful students: "Since starting my course, my salary has trebled and I am expecting a further increase when my course is completed."

City and Guilds Certificates

Excellent job prospects await those who hold one of these recognised certificates. ICS can coach you for:

- Telecommunications Technicians
- Radio, TV Electronics Technicians
- Technical Communications
- Radio Servicing Theory
- Radio Amateurs
- Electrical Installation Work
- Also MPT Radio Communications Certificate

Diploma Courses

- Colour TV Servicing
- Electronic Engineering and Maintenance
- Computer Engineering and Programming
- Radio, TV and Audio, Engineering and Servicing
- Electrical Engineering, Installations and Contracting

Qualify for a New Career

Home study courses for leading professional examinations and diploma courses for business and technical subjects:-

- | | | |
|--------------|-------------|--------------|
| G.C.E. | Engineering | Purchasing |
| 60 subjects | Farming | Sales |
| at "O" & | Heating | Storekeeping |
| "A" levels | Industrial | Work Study |
| Accountancy | Management | |
| Air | Mechanical | |
| Conditioning | | |
| Building | | |

POST OR PHONE TODAY FOR FREE BOOKLET.

ICS

To: International Correspondence Schools

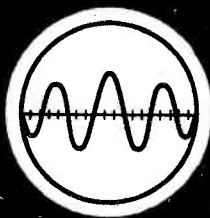
Dept. 777Q Intertext House, London
SW8 4UJ or telephone 622 9911

Subject of Interest.....

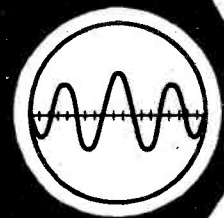
Name.....

Address.....

Telephone Number.....

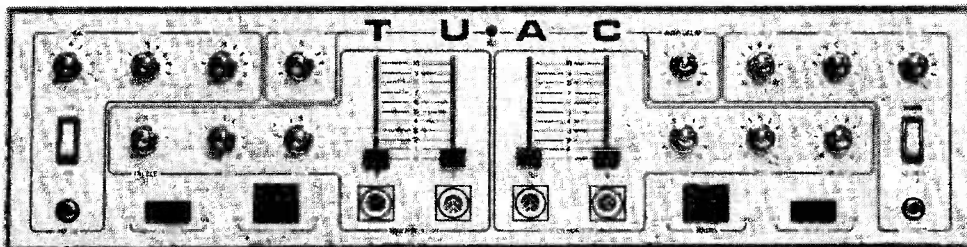


TUAC



TRANSISTOR UNIVERSAL AMPLIFICATION CO. LTD.
163 MITCHAM RD. LONDON SW17 9PG 01-672 3137/9080

TUAC STEREO DISCO MIXER



£75.00

Size 25" long
6" high
5" deep.

INPUTS

4 identical stereo inputs available with any equalisation. 2 magnetic and 2 flat supplied as standard. High quality slider control on each channel. Volume treble, and bass controls for each pair of sliders. Sensitivity mag., 3mV (R.I.A.A. comp). Flat 50mV at 1KHz. Bass controls $\pm 18\text{dB}$ @ 60Hz. Treble controls $\pm 18\text{dB}$ @ 15KHz.

OUTPUTS

Up to 3 volts (+12dB) available. Attenuated output for TUAC Power Modules. Rotary Master and Balance controls. Band width 15Hz-25KHz $\pm 1\text{dB}$.

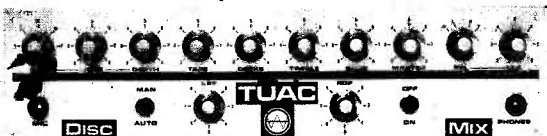
P.F.L.

Output 250mW into 8 ohms. Rotary Volume Control. Monitoring facility for all 4 channels. Selection via touch sensitive illuminated switches. Switched visual cue indicator.

MISCELLANEOUS FACILITIES

2 illuminated deck on/off switches. Mains illuminated on/off switch. Auto fade illuminated on/off switch. Mains powered with integral screen and back cover. Complete with full instructions.

MONO DISCOTHEQUE MIXER WITH AUTO FADE



Designed for the discerning D.J. of professional standard. Offering a vast variety of functions. Controls: Mic Vol; Tone, over-ride depth; auto/Manual Sw; Tape Vol; L & R Deck Faders; Deck Volume, Treble and Bass; H. Phon Vol Selector; Master Vol On/Off Sw. Max output 1 V RMS. Specifications: Deck inputs—50mV into 1M Ω ; Deck Tone Controls—treble ± 20 —10dB at 12KHz. Bass ± 22 —15dB at 40Hz; Mic input—200 ohms upwards. 2mV into 10k Ω ; Mic Tone Control—Total Variation Treble 15dB. Total Variation Bass 10dB; Tape Input—30mV into 47k Ω . Power Requirements—30-50 volts at 50mA.

PANEL SIZE 18 x 4 $\frac{1}{2}$ in DEPTH 3in

£31.50

PROFESSIONAL AMPLIFIERS

(black rexine covered cases)

LO-LINE 60 (single pre-amp version)

£65.00

LO-LINE 125 (single pre-amp version)

£81.00

LO-LINE 125 SLAVE

£70.00

LO-LINE TWIN 60 (2 pre-amp)

£80.00

LO-LINE TWIN 125 (2 pre-amp)

£98.00

LO-LINE STEREO 250 (125w per channel)

£130.00

(All LO-LINE AMPS 25 $\frac{1}{2}$ " long x 11 $\frac{1}{2}$ " high x 6 $\frac{1}{2}$ " deep)

AMPLIFIER MODULES

T.P. 125 (125 watts *) £19.50

T.L. 100 (100 watts *) £16.25

T.L. 60 (60 watts *) £13.50

T.L. 30 (30 watts *) £9.75

(* Watts R.M.S. continuous sine wave output)

POWER SUPPLIES

P.S. 250 for supplying 2 TP 125's

£22.00

P.S. 60/60 for supplying 2 TL 60's

£19.50

P.S. 125 ± 45 volts for TP 125

£13.75

P.S. 100 ± 43 volts for TL 100

£12.00

P.S. 60 ± 38 volts for TS 60

£11.50

P.S. 30 ± 25 volts for TL 30

£7.50

PSU 2 for supplying disco mixer

£5.50

LIGHTING EFFECT MODULES

4 Channel sound to light sequence

chaser 1000 watt per channel £17.25

3 Channel light modulator 1000 watt

per channel £15.50

1 Channel light modulator 1500 watt

per channel £7.25

Add sequence chasing and dimming

effects to TUAC 3 channel

L/Modulator £11.75

PRE AMPLIFIERS

Designed for use with TUAC power amplifier modules. Extensive research has gone into various wide range tone control circuits to produce superb sound quality. Thousands are already in use in high quality professional amplification systems.

VAOS Vol. Treb. Mid and Bass controls. Hi. IMP. FET. I/P suitable Mid. Guitar. Radio. Crystal/Ceramic P.U. Sensitivity 4mV. Treble $\pm 35\text{dB}$ at 16KHz. Mid ± 20 —15dB at 1KHz Bass ± 20 —10dB at 40Hz. £8.50

VAOS Vol. Treb. and Bass controls. Sensitivity 8mV. Treb ± 28 —15dB at 12KHz. Bass $\pm 18\text{dB}$ at 40Hz. £5.50

SYAOS STEREO PRE AMP Vol. Treb. Mid and Bass controls, I/P suitable. Guitar. Radio. Crystal/Ceramic P.U. Sensitivity 4mV. Treble $\pm 35\text{dB}$ at 16KHz. Mid ± 20 —15dB at 4KHz. Bass ± 20 —10dB at 40Hz Plus Full Balance Control. Full I/C operation supply voltage $\pm 15\text{VDC}$ £12.50

HOW TO ORDER BY POST

Make cheques/P.O.s payable to
TUAC LTD (PW3)

or quote Access/Barclay Card No.
and post to TUAC LTD (PW3)

163 Mitcham Road, London, SW17 9PG

We accept phone orders against

Access/Barclay Card Holders

Phone: 01-672 3137/9080

PERSONAL SHOPPERS MON. TUES, THURS, FRI. & SAT
9 a.m. - 6 p.m. WED 9 a.m. - 1 p.m.

ALL PRICES INCLUDE V.A.T. (8%) AND POSTAGE AND PACKING

ACCESS & BARCLAY CARDS ACCEPTED JUST SEND OR PHONE US YOUR NUMBER. H.P. ENQUIRIES INVITED

SAXON

ENTERTAINMENTS LTD

SYSTEM 7000

professional standards · realistic prices

NEW! NEW! NEW!

120 WATT R.M.S. POWER AMPLIFIER MODULE

USES 150W 16A RCA DEVICES

Compare these features:

- 10 Transistors 4 Diodes—Fibre Glass P.C.B.
- Typical Distortion—0.4% : Noise—80dB
- Short, Open Circuit proof—Load line limiting
- Only FOUR Connections—Simplicity!
- High sensitivity (240mV) suits most mixers
- 30Hz—40KHz \pm 1dB Frequency response
- Single supply line—No output capacitor needed (95v)
- Standard 8 Ω output—will operate on other impedances
- Compact—6" \times 3" \times 1½" (15 \times 8 \times 4cm)

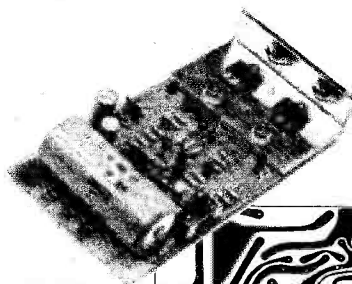
ALSO AVAILABLE—60W RMS & 30W RMS VERSIONS WITH ALL THE ABOVE FEATURES

SA608 60W RMS into 8 Ω (65v) **£12.50** **SA308** 30W (48V) RMS into 8 Ω **£9.50**

■ Power supplies with glass-fibre P.C.B., high grade transformer, fully fused and ready to wire:

PM120 1 FOR ONE SA1208 **£11.60** **PM1202** FOR TWO SA1208D **£15.30**

PM601/2 for one or two SA608 **£10.50** **PM301/2** for one or two SA308 **£8.80**



it's
the new
SA1208D
£19.50



SYSTEM 7000 DISCOTHEQUE CONTROL UNIT

Design and performance to professional standards

- Complete and ready to plug in
- Totally encased—no soldering at all
- Tough, bold, two tone stainless steel panel—for panel mounting or freestanding
- Mono or stereo versions
- Front and rear output terminations to suit style of usage
- Inputs for 2 ceramic cartridges/tape/microphone
- Autofade with depth and threshold controls
- Wide range treble and bass controls on both channels
- Individual deck controls AND left/right fader
- Low noise (—80dB) 20Hz—50KHz \pm 1dB
- Suits all Saxon amplifiers and most other makes
- 1 watt headphone monitor—five position switch with mute positions



- **CONTROLS**—L. to R.: Mic Vol/Treble Bass, Autofade depth, L/Deck Vol, R/Deck Volume, Tape Volume, Treble, Bass, Master, Monitor Volume, Monitor Selector-On-Off
- Variable autofade stainless steel panel

MONO £34.50

STEREO £49.50

MODULAR DISCO MIXERS MONO & STEREO

Printed circuit sub-assembly version of the above mixers—ideal for those wishing to incorporate Saxon's superb specifications into their own systems—all the electronics are provided. You require only plugs and sockets plus one switch to complete the wiring. All other controls are already mounted on the P.C.B. Comprehensive wiring instructions are supplied with circuit and very clear diagrams.

MONO £18.50

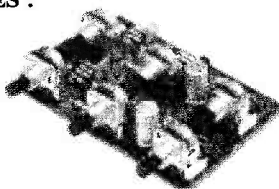
STEREO £27.50



MULTI-PURPOSE MODULAR MIXERS—A SYSTEM 7000 BREAKTHROUGH—UP TO 20 CHANNELS MONO/STEREO

■ P.C.B. MODULES :

- Ready assembled with all controls
- Simple terminations—solder or edge connector
- Consumption 10mA at 18v



INPUT MODULES Mono 1M7001M **£5.50**
(up to 20 may be used) Stereo 1M7001S **£9.00**
MIXING MODULE Mono 1M7002M **£5.50**
(only 1 required) Stereo 1M7002S **£9.00**

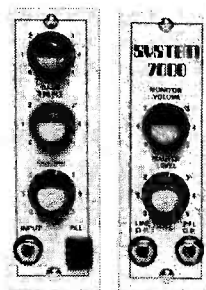
Provides headphone output & mixes all inputs to output level. Suits all mixing requirements for groups—clubs discos etc.

■ COMPLETELY WIRED WITH STAINLESS PANEL:

Both modular and complete types on offer:

- Inputs for all sources inc mag. cartridge
- Wide range bass and treble controls
- Only one mixing module required
- Up to twenty channels
- 1w monitor power
- Mono and stereo modules may be used together
- Feeds most amplifiers
- Modern low noise circuitry
- 20Hz—30KHz \pm 1dB
- Echo send/return facility
- Send for details
- Complete—ready to plug in or solder
- 5cm matrix—bold panel
- Individual monitor buttons

Mono input module **£8.50**
Stereo input module **£12.00**
Mono mixer module **£8.50**
Stereo mixer module **£12.00**



Power supply unit **£7.50**

it's the complete answer!

SEE SYSTEM 7000 AT OUR SHOWROOMS OR SEND FOR LOCAL STOCKIST LIST

New! TWO STROBES TO MEET ALL REQUIREMENTS

SUPERSTROBE

- Built in Saxon reliability
- 1 flash/2 secs.—up to 20/sec.
- Compact black Bondene case
- Appearance matches other Saxon units
- Ideal for the mobile disco or smaller club

PRO-STROBE

- Giant 80 watt tube
- Discharge energy up to 6 Joules
- External trigger—audio up to 240v
- May be used with Soundlite to obtain rainbow strobe
- Smart, tough Bondene case 8" x 8" x 5" approx (20cm x 20cm x 13cm)



SUPERSTROBE £24.75

PRO-STROBE £38.50

New! 150 WATT LIQUID WHEEL PROJECTOR

- Complete with wheel
- 150 watt tungsten lamp
- Wide range of extra effects may be attached
- Sturdy construction
- Adjustable feet



£29.20

Spare wheels £4.90

TOTAL CONTROL WITH SYSTEM 7000 LIGHTING CONTROL UNIT AND SUPERFECT MODULE

- Full control of 3KW of lights (1KW/channel)
- Audio control *plus* sequence *plus* override
- Variable speed sequence with slider function control
- Stainless steel two tone panel—matches mixer
- 13 transistors 8 diodes—advanced control circuitry
- High audio sensitivity—operates from any amplifier
- Attractive Bondene case—free standing or panel mounting
- Individual tone controls *plus* master audio control

This unit offers the performance of units offered at nearly twice the price.

£38.00

inc. case & plug—ready to use.



SUPERFECT MODULE

- All features as the System 7000 lighting control unit
- Requires only panel and plug socket, etc.
- Slider control supplied
- Glass fibre P.C.B.
- 8 amp RCA triacs
- Complete light show in one unit with instructions



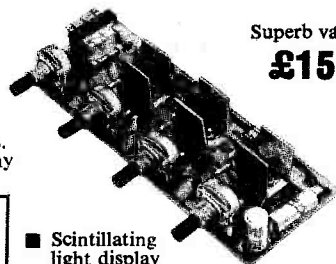
£27.75

This P.C.B. sub-assembly of the System 7000 lighting control unit is recommended for those wishing to incorporate Saxon's excellent specs. in their own systems.

SAXON SOUND-LITE

Our outstandingly successful 3kW converter in module form

- Up to 1kW/channel
- Individual tone controls
- Master control
- RCA 8A triacs
- Glass fibre P.C.B.
- Operates from any amplifier



Superb value at
£15.50

REFLECTORPOD

3 way light banks with twin plug socket complete with reflector lamps—attractive Bondene case with white front.

£15 each

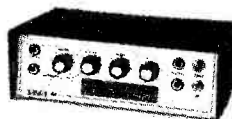
SPECIAL OFFER—
Reflector lamps (spots)
100W Red/Blue/Green
£1.40 ea. or 10 for £12

- Scintillating light display

SYSTEM 7000 MINOTAUR

THE LITTLE AMPLIFIER WITH THE BIG HEART

- 100W INTO 8 OHMS
- Twin mixed inputs
- Wide range bass and treble controls
- May be used as a slave amplifier
- Twin output sockets
- Two tone anodised front panel
- Fully protected against incorrect loads



With bondene cover £49.00

With Vynide covered wooden case £53.00

CHASSIS LOUDSPEAKERS
12" 50 WATT HIGH-GRADE
SAXON UNITS WITH 14,000
GAUSS MAGNET *PLUS*
PRESENCE DOME ONLY
£14.50 EACH FULL RANGE
PROFESSIONAL QUALITY

Ask for a quotation for a complete system to your specification—Systems from £280.00—consoles from £160

We have a fine selection of consoles, loudspeaker cabinets, etc.,



Buy it with Access



Access or Barclaycard? Send or telephone your number for prompt attention. After 5.0 p.m., ring our Answerphone service on 01-684 6385

PRICES include carr. and packing but VAT at 8% must be added to all orders. C.O.D. 65p extra—SAE all enquiries. CALLERS are welcome at our showrooms at 327-333 Whitehorse Road, Croydon, Surrey.

Orders by post to the same address—Please make cheques or crossed P.O.'s payable to

SAXON ENTERTAINMENTS LTD.

Telephone: 01-684 6385/0098

Shop Hours 9am-5pm Lunch 12.30-1.30 Sat. 9.30am-5pm. Mail Order desk 10am-4pm Mon.-Fri. Prices and specifications subject to alteration without notice

Bona-fide trade enquiries to NORMAN ROSE ELECTRICAL LTD., London (01) 837 9111 Manchester (061) 273 1498 Birmingham (021) 236 4710 Bradford 0274 26104

Fully guaranteed Individually packed VALVES

A1085	11.25	ECL80	55p	GZ37	11.00	PY82	40p
A83	55p	ECL82	35p	K766	22.50	PY83	40p
ATP4	50p	ECL83	70p	K788	23.85	PY88	45p
B12H	22.00	ECL86	50p	MH4	75p	PY600	11.00
CY31	50p	EF86	65p	ML6	65p	PY800	25p
D4F96	55p	EF37A	11.20	O82	45p	OAZ	30p
DF96	50p	EF40	75p	PABCS0	40p	AC 120	40p
DK35	70p	EF41	65p	PC97	50p	AC 175	40p
DL92	40p	EF80	30p	PC900	50p	AC 18	40p
DL96	40p	EF83	21.25	PC854	40p	AC 19	40p
DY86/87	40p	EF85	35p	PC858	40p	AC 20	40p
		EF86	35p	PC889	50p	AC 39	40p
DY802	40p	EF89	30p	PC189	60p	AC 40	40p
E89CC	11.20	EF92	30p	PCF80	40p	AD 140	40p
E180CC	70p	EF95	40p	PCF82	40p	AD 161	40p
E182CC	11.25	EF183	35p	PCF84	40p	AD 162	40p
		EF184	35p	PCF86	40p	ADZ 11	40p
EA50	40p	EF185	35p	PCF88	40p	ADZ 12	40p
EABCS0	40p	EF186	35p	PCF90	75p	AF 114	40p
EAF42	75p	EF187	35p	PCF91	55p	AF 115	40p
EB91	80p	EF188	35p	PCF92	55p	AF 116	40p
EB93	80p	EF189	35p	PCF93	55p	AF 117	40p
EB94	80p	EF190	35p	PCF94	55p	AF 118	40p
EB95	80p	EF191	35p	PCF95	55p	AF 119	40p
EB96	80p	EF192	35p	PCF96	55p	AF 120	40p
EB97	80p	EF193	35p	PCF97	55p	AF 121	40p
EB98	80p	EF194	35p	PCF98	55p	AF 122	40p
EB99	80p	EF195	35p	PCF99	55p	AF 123	40p
EC82	35p	EF196	35p	PCF100	55p	AF 124	40p
EC83	35p	EF197	35p	PCF101	55p	AF 125	40p
EC84	35p	EF198	35p	PCF102	55p	AF 126	40p
EC85	35p	EF199	35p	PCF103	55p	AF 127	40p
EC86	35p	EF200	35p	PCF104	55p	AF 128	40p
EC87	35p	EF201	35p	PCF105	55p	AF 129	40p
EC88	35p	EF202	35p	PCF106	55p	AF 130	40p
EC89	35p	EF203	35p	PCF107	55p		
EC90	35p	EF204	35p	PCF108	55p		
EC91	35p	EF205	35p	PCF109	55p		
EC92	35p	EF206	35p	PCF110	55p		
EC93	35p	EF207	35p	PCF111	55p		
EC94	35p	EF208	35p	PCF112	55p		
EC95	35p	EF209	35p	PCF113	55p		
EC96	35p	EF210	35p	PCF114	55p		
EC97	35p	EF211	35p	PCF115	55p		
EC98	35p	EF212	35p	PCF116	55p		
EC99	35p	EF213	35p	PCF117	55p		
EC100	35p	EF214	35p	PCF118	55p		
EC101	35p	EF215	35p	PCF119	55p		
EC102	35p	EF216	35p	PCF120	55p		
EC103	35p	EF217	35p	PCF121	55p		
EC104	35p	EF218	35p	PCF122	55p		
EC105	35p	EF219	35p	PCF123	55p		
EC106	35p	EF220	35p	PCF124	55p		
EC107	35p	EF221	35p	PCF125	55p		
EC108	35p	EF222	35p	PCF126	55p		
EC109	35p	EF223	35p	PCF127	55p		
EC110	35p	EF224	35p	PCF128	55p		
EC111	35p	EF225	35p	PCF129	55p		
EC112	35p	EF226	35p	PCF130	55p		
EC113	35p	EF227	35p	PCF131	55p		
EC114	35p	EF228	35p	PCF132	55p		
EC115	35p	EF229	35p	PCF133	55p		
EC116	35p	EF230	35p	PCF134	55p		
EC117	35p	EF231	35p	PCF135	55p		
EC118	35p	EF232	35p	PCF136	55p		
EC119	35p	EF233	35p	PCF137	55p		
EC120	35p	EF234	35p	PCF138	55p		
EC121	35p	EF235	35p	PCF139	55p		
EC122	35p	EF236	35p	PCF140	55p		
EC123	35p	EF237	35p	PCF141	55p		
EC124	35p	EF238	35p	PCF142	55p		
EC125	35p	EF239	35p	PCF143	55p		
EC126	35p	EF240	35p	PCF144	55p		
EC127	35p	EF241	35p	PCF145	55p		
EC128	35p	EF242	35p	PCF146	55p		
EC129	35p	EF243	35p	PCF147	55p		
EC130	35p	EF244	35p	PCF148	55p		
EC131	35p	EF245	35p	PCF149	55p		
EC132	35p	EF246	35p	PCF150	55p		
EC133	35p	EF247	35p	PCF151	55p		
EC134	35p	EF248	35p	PCF152	55p		
EC135	35p	EF249	35p	PCF153	55p		
EC136	35p	EF250	35p	PCF154	55p		
EC137	35p	EF251	35p	PCF155	55p		
EC138	35p	EF252	35p	PCF156	55p		
EC139	35p	EF253	35p	PCF157	55p		
EC140	35p	EF254	35p	PCF158	55p		
EC141	35p	EF255	35p	PCF159	55p		
EC142	35p	EF256	35p	PCF160	55p		
EC143	35p	EF257	35p	PCF161	55p		
EC144	35p	EF258	35p	PCF162	55p		
EC145	35p	EF259	35p	PCF163	55p		
EC146	35p	EF260	35p	PCF164	55p		
EC147	35p	EF261	35p	PCF165	55p		
EC148	35p	EF262	35p	PCF166	55p		
EC149	35p	EF263	35p	PCF167	55p		
EC150	35p	EF264	35p	PCF168	55p		
EC151	35p	EF265	35p	PCF169	55p		
EC152	35p	EF266	35p	PCF170	55p		
EC153	35p	EF267	35p	PCF171	55p		
EC154	35p	EF268	35p	PCF172	55p		
EC155	35p	EF269	35p	PCF173	55p		
EC156	35p	EF270	35p	PCF174	55p		
EC157	35p	EF271	35p	PCF175	55p		
EC158	35p	EF272	35p	PCF176	55p		
EC159	35p	EF273	35p	PCF177	55p		
EC160	35p	EF274	35p	PCF178	55p		
EC161	35p	EF275	35p	PCF179	55p		
EC162	35p	EF276	35p	PCF180	55p		
EC163	35p	EF277	35p	PCF181	55p		
EC164	35p	EF278	35p	PCF182	55p		
EC165	35p	EF279	35p	PCF183	55p		
EC166	35p	EF280	35p	PCF184	55p		
EC167	35p	EF281	35p	PCF185	55p		
EC168	35p	EF282	35p	PCF186	55p		
EC169	35p	EF283	35p	PCF187	55p		
EC170	35p	EF284	35p	PCF188	55p		
EC171	35p	EF285	35p	PCF189	55p		
EC172	35p	EF286	35p	PCF190	55p		
EC173	35p	EF287	35p	PCF191	55p		
EC174	35p	EF288	35p	PCF192	55p		
EC175	35p	EF289	35p	PCF193	55p		
EC176	35p	EF290	35p	PCF194	55p		
EC177	35p	EF291	35p	PCF195	55p		
EC178	35p	EF292	35p	PCF196	55p		
EC179	35p	EF293	35p	PCF197	55p		
EC180	35p	EF294	35p	PCF198	55p		
EC181	35p	EF295	35p	PCF199	55p		
EC182	35p	EF296	35p	PCF200	55p		
EC183	35p	EF297	35p	PCF201	55p		
EC184	35p	EF298	35p	PCF202	55p		
EC185	35p	EF299	35p	PCF203	55p		
EC186	35p	EF300	35p	PCF204	55p		
EC187	35p	EF301	35p	PCF205	55p		
EC188	35p	EF302	35p	PCF206	55p		
EC189	35p	EF303	35p	PCF207	55p		
EC190	35p	EF304	35p	PCF208	55p		
EC191	35p	EF305	35p	PCF209	55p		
EC192	35p	EF306	35p	PCF210	55p		
EC193	35p	EF307	35p	PCF211	55p		
EC194	35p	EF308	35p	PCF212	55p		
EC195	35p	EF309	35p	PCF213	55p		
EC196	35p	EF310	35p	PCF214	55p		
EC197	35p	EF311	35p	PCF215	55p		
EC198	35p	EF312	35p	PCF216	55p		
EC199	35p	EF313	35p	PCF217	55p		
EC200	35p	EF314	35p	PCF218	55p		
EC201	35p	EF315	35p	PCF219	55p		
EC202	35p	EF316	35p	PCF220	55p		
EC203	35p	EF317	35p	PCF221	55p		
EC204	35p	EF318	35p	PCF222	55p		
EC205	35p	EF319	35p	PCF223	55p		
EC206	35p	EF320	35p	PCF224	55p		
EC207	35p	EF321	35p	PCF225	55p		
EC208	35p	EF322	35p	PCF226	55p		
EC209	35p	EF323	35p	PCF227	55p		
EC210	35p	EF324	35p	PCF228	55p		
EC211	35p	EF325	35p	PCF229	55p		
EC212	35p	EF326	35p	PCF230	55p		
EC213	35p	EF327	35p	PCF231	55p		
EC214	35p	EF328	35p	PCF232	55p		
EC215	35p	EF329	35p	PCF233	55p		
EC216	35p	EF330	35p	PCF234	55p		
EC217	35p	EF331	35p	PCF235	55p		
EC218	35p	EF332	35p	PCF236	55p		
EC219	35p	EF333	35p	PCF237	55p		
EC220	35p	EF334	35p	PCF238	55p		
EC221	35p	EF335	35p	PCF239	55p		
EC222	35p	EF336	35p	PCF240	55p		
EC223	35p	EF337	35p	PCF241	55p		
EC224	35p	EF338	35p	PCF242	55p		
EC225	35p	EF339	35p	PCF243	55p		
EC226	35p	EF340	35p	PCF244	55p		
EC227	35p	EF341	35p	PCF245	55p		
EC228	35p	EF342	35p	PCF246	55p		
EC229	35p	EF343	35p	PCF247	55p		
EC230	35p	EF344	35p	PCF248	55p		
EC231	35p	EF345	35p	PCF249	55p		
EC232	35p	EF346	35p	PCF250	55p		
EC233	35p	EF347	35p	PCF251	55p		
EC234	35p	EF348	35p	PCF252	55p		
EC235	35p	EF349	35p	PCF253	55p		
EC236	35p	EF350	35p	PCF254	55p		
EC237	35p	EF351	35p	PCF255	55p		
EC238	35p	EF352	35p	PCF256	55p		
EC239	35p	EF353	35p				

MACK'S ELECTRONICS for

MOTOROLA McMos®

MC14001CP	Quad 2 Input NOR	18p
MC14002CP	Dual 4 Input NOR	20p
MC14011CP	Quad 2 Input NAND	18p
MC14015CP	Dual 4 Bit Static Shift Register	£1-26
MC14017CP	Decade Counter	£1-22
MC14021CP	8 Bit Static Shift Register	£1-25
MC14023CP	Triple 3 Input NAND	20p
MC14027CP	Dual J-K Flip-Flop	86p
MC14042CP	Quad Latch	£1-26
MC14046CP	Phase Locked Loop	£1-85
MC14049CP	Hex Inverter Buffer	61p
MC14510CP	BCD Up-Down Counter	£1-40
MC14511CP	BCD 7 Segment Latch Decoder Driver	£2-12
MC14528CP	Dual Monostable	96p



TEXAS TTL 74 SERIES

SN7400N	Quad 2 Input NAND	16p
SN7402N	Quad 2 Input NOR	16p
SN7404N	Hex Inverter	19p
SN7413N	Dual NAND Schmitt Triggers	32p
SN7447AN	BCD To 7 Segment Decoder Driver	95p
SN7472N	J-K Master-Slave Flip-Flop	26p
SN7473N	Dual J-K Master-Slave Flip-Flop	30p
SN7475N	8 Bit & 4 Bit Bistable Latches	50p
SN7490N	Decade Counter	50p
SN7493N	4 Bit Binary Counters	50p
SN7495N	4 Bit Right Shift Left Shift Registers	70p
SN74121N	Monostable Multivibrators	35p

MOTOROLA
MC 1310P
14 Pin DIL
Colours
Stereo
Decoder
£2-10

FAIRCHILD
723
14 Pin DIL
var. voltage
Regulator
55p

FAIRCHILD
741
8 Pin DIL
Op-amp
30p

NATIONAL SEMI-CONDUCTOR
LM 1303
14 Pin DIL
Stereo
Pre-Amp
£1-65

MOTOROLA
MFC 4080 B
1/2 Watt
Audio Amp
75p

SIGNETICS
NE 555v.
8 Pin DIL
Timer
60p

FERRANTI
ZN 414
Radio
Chip
£1-25

SPECIAL OFFER "ECONOMACK" 7 SEGMENT LED DISPLAYS

Common Anode	
707E 0-3"	75p each 4 for £2-75
727E 0-5" Dual	£1-65 each 4 for £6-00
747E Jumbo 6"	£1-95 each 4 for £7-00

MICROTEST 80
Measures only
90 x 70 x 18mm
Electronic
Zero Ω
Amazing value at
£12-90
8 fields of
measurement
and 40 ranges

PRINTED CIRCUIT BOARD IS
REMOVABLE WITHOUT
SOLDERING

Volts D.C. 6 ranges: 100mV - 2V.
- 10V. - 50V. - 200V. - 1000V.
(20k Ω/V) 2% precision on DC and AC
Volts A.C. 5 ranges: 1.5V. - 10V. -
50V. - 250V. - 1000V. (4k Ω/V)
Amp. D.C. 6 ranges: 50μA - 500μA -
5mA - 50mA - 500mA - 5A.
Amp. A.C. 5 ranges: 250μA - 2.5mA -
25mA - 250mA - 2.5A
Ohms 4 ranges: Low Ω - Ωx1 - Ωx10 -
Ω x 100 from 1/10 dl Ω until 5 Mega Ω
V Output 5 ranges: 1.5V. - 10V. - 50V.
- 250V. - 1000V
Decibels 5 ranges: +6dB, +22dB, +
36dB, +50dB, +62dB
Capacity 4 ranges: 25μF - 250μF -
2500μF - 25,000μF

NATIONAL SEMI-CONDUCTOR
LM 380 N
14 Pin DIL
2 watt
Audio Amp
£1-20

NATIONAL SEMI-CONDUCTOR
MM 5314
24 Pin DIL
Clock Chip
£4-35

NATIONAL SEMI-CONDUCTOR
LM 3900 N
14 Pin DIL
Quad Amp
69p

EUROSIL
E 1109
24 Pin DIL
Clockchip
£7-78

SUPERTESTER 680R ICE
10 Fields-80 Ranges: 20,000 Ohm per Volt/sensitivity
● Fully screened against external magnetic fields
● Scale width and small case dimensions (128 x 95 x 32mm)
● Accuracy and stability (1% in D.C., 2% in A.C.) of indicated reading
● Simplicity and ease of use and readability
● Full ranges of accessories
● 1000 times overload
● Printed circuit board is removable without desoldering
● More ranges
£19-95



SEMICONDUCTORS

AC128	16p	BC338	16p
AD161		BC347	13p
AD162	*£1-00	BC348	12p
AF114	25p	BC349	12p
AF116	25p	BC350	15p
AF239	45p	BC351	15p
BC107	12p	BC352	15p
BC108	12p	BCY71	21p
BC147	10p	BD131	40p
BC148	10p	BDV55	£1-85
BC149	10p	BF194	10p
BC157	10p	BF195	10p
BC158	8p	BF196	12p
BC159	9p	BF197	12p
BC172B	12p	BFY29	25p
BC237	15p	BFY51	20p
BC238	12p	BSX60	60p
BC239	15p	BU102	£1-85
BC261A	18p	BU104	95p
BC307	15p	MJE3055	70p
BC308	13p	OC28	60p
BC309	15p	OC71	15p
BC317A	18p	TIP29A	45p
BC318B	18p	TIP41A	97p
BC319C	20p	TIP42A	£1-05
BC320A	20p	2N1302	20p
BC321A	20p	2N1304	25p
BC322B	20p	2N2243	70p
BC327	18p	2N2369	12p
BC328	18p	2N3055	70p
BC337	18p	2N3553	£1-10

*matched pair

SPECIAL OFFER

PROFESSIONAL QUALITY LOW
NOISE CASSETTES (Screw case)

	Ten for £3-00	Ten for £4-00
C60	35p each	45p each
C90		



KITS

UK105/C	FM Microtransmitter	£8-07
UK220	Signal Injector	£3-53
UK230	AM/FM Antenna Amplifier	£4-16
UK285	UHF/VHF Antenna Amplifier	£8-87
UK302	4Ch. Radio Control Transmitter	£17-50
UK345/A	Superhet R/C Receiver	£8-81
UK325	GXC 2Ch. R/C Splitter 1000Hz. & 2000Hz.	£8-34
UK330	GXC 2Ch. R/C Splitter 1500Hz. & 2500Hz.	£8-34
UK555	Radio Control Strength Meter	£9-65
UK780	Electronic Metal Detector	£11-65
UK875	Capacitive Discharge Electronic Ignition Kit Neg. Earth	£17-33

MACK'S ELECTRONICS

283 Edgware Road, London W2.
Tel. 01-262 8614

Hours of business 9.30 - 6.00
Monday to Saturday Callers welcome
ALL PRICES INCLUDE VAT

Send SAE for
FREE LISTS

PLEASE ADD 20p P & P

EDITORIAL ANNOUNCEMENT

NEW!

PRACTICAL WIRELESS

PCB SERVICE FOR READERS

As a result of continued requests from readers we are happy to announce the start of a printed circuit board service for projects published in Practical Wireless. A list of PCBs now available, plus ordering coupon, will be found below. The list will be extended as new PCBs are made available. Generally the boards will be of epoxy glassfibre, drilled and roller-tinned. For the time being PCBs for projects published in PW before December 1975 are not available through this new service

To:- READERS PCB SERVICES LTD, PO BOX 11, WORKSOP, NOTTS

Please supply PCB/s as indicated by tick/s in box/es

Issue	Project	Ref	Price	
Dec 75	Radio-Pickup Link	DN0792	0.98 + 10 p/p	<input type="checkbox"/>
Dec 75	Random Number Selector	DN0793A	0.98 + 10	<input type="checkbox"/>
Dec 75	Sound-To-Light Display	DN0798	1.15 + 10	<input type="checkbox"/>
Dec 75	12V PA System	DN2/JM	0.98 + 10	<input type="checkbox"/>
Dec 75	Disco System, Amplifier (2 required)	SRBP each	AM0421 3.40 + 18	<input type="checkbox"/>
		glassfibre each	AM0421 4.10 + 18	<input type="checkbox"/>
Dec 75	Disco System, Light Modulator	AM0423	2.70 + 18	<input type="checkbox"/>
Jan 76	Music Box	SRBP	DN1/JM 2.25 + 18	<input type="checkbox"/>
		glassfibre	DN1/JM 3.00 + 18	<input type="checkbox"/>
Jan 76	Emergency Light Unit	AM0419	3.50 + 18	<input type="checkbox"/>
Mar 76	CMOS Crystal Calibrator	AM0438	1.19 + 10	<input type="checkbox"/>

Post and packing is for one board. For each additional board add 4p to the 10p or 18p rate as applicable. Prices include VAT.

Remittances with overseas orders must be sufficient to cover despatch by sea or air mail as required.

I enclose Postal Order/Cheque No..... for £..... made payable to READERS PCB SERVICES.

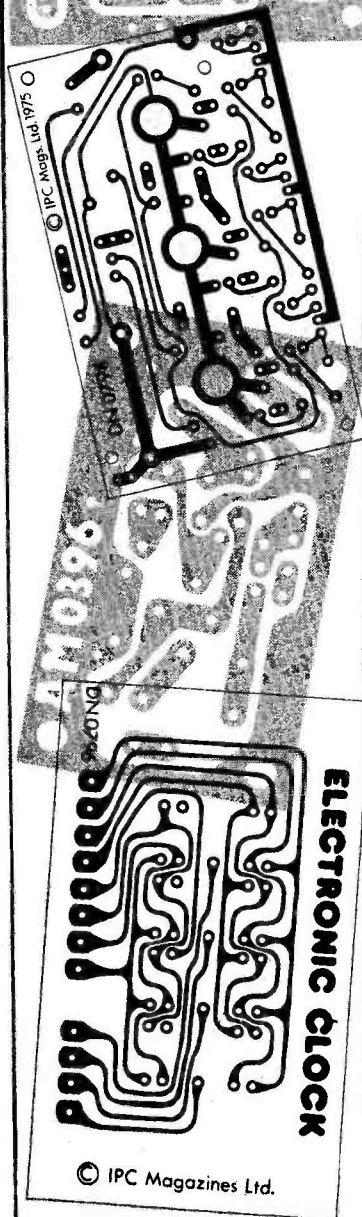
NAME.....

ADDRESS

.....

..... Post Code

Any correspondence concerning this service must be addressed to READERS PCB SERVICES and not to the Editorial offices.



Wild Life Contest

PRIZES worth more than £1,000 are to be awarded in the 1976 'Scotch' Wildlife Sound Recording Contest, organised for the eighth consecutive year by 3M United Kingdom Limited's Recording Materials Division.

Top Award for the overall winner of the contest, which is open only to British amateur tape recordists, is a Sennheiser MKH 815T transistorised condenser gun microphone, together with power pack and accessories, donated by Hayden Laboratories. New to the competition are special awards for cassette recordings and stereo entries: a Wollensak 4766E hi-fi cassette deck with Dolby noise reduction circuitry (recommended price £288) goes to the entrant submitting the best entry made on a cassette machine, and a pair of Monitor MA5 Series II speakers will go to the recordist entering the best stereophonic recording.

In addition, a Grampian parabolic reflector with DP6 microphone, and a pair of Rotel stereo headphones will be awarded for the most original recording, and specially commissioned watercolours featuring the subject of their recordings will go to the six class winners (three in the novices' section and three in the section for experienced entrants).

Subject categories are: birds, mammals and insects, and outdoor habitat. Scotch Classic recording tape or cassettes will be bonus prizes for all winners and runners-up, and all entrants will be invited to the prizegiving luncheon in London. The overall winner—3M Wildlife Sound Recordist of the Year—has a seat reserved on the judging panel for the following year's competition.

There is no entry fee, and copies of the rules and entry forms—together with hints on wildlife recording by lecturer, author and international recording contest winner Richard Margoschis—are available from Bill Bowles, Public Relations Executive, 3M United Kingdom Ltd., 380 Harrow Road, London W9 2HU. Closing date for receipt of entries is March 31, 1976.

Marshalls Ltd.

MARSHALLS of Cricklewood recently announced that they have been appointed as distributors for Mullard Ltd. and National Semiconductors Ltd.

Products covered by the new franchises will be available not only through their main branch at 42 Cricklewood Broadway, London N.W.2 but also at 1 Straits Parade, Fishponds, Bristol BS16 and at 85 West Regent Street, Glasgow G2 2QD.

Sutton & Cheam

THE 27th Annual Dinner & Ladies' Festival of the Sutton & Cheam Radio Society is being held on 6th March, 1976. Tickets are available from A. V. Tillin, G3MES, 11 Great Ellshams, Banstead, Surrey, SM7 2BA. Tickets are £4.50 for seniors and £3.50 for juniors. Time: 6 for 6.30 p.m.

Och Aye

THE Central Scotland Ham-Fest will be held at Wrangholme Hall Community Centre, Jerviston Road, New Stevenson, Motherwell, ML1 4UQ on March 14th. Doors open at 2 p.m. Many Amateur equipment distributors will have stands there and there will be a Home Built Equipment Contest with a difference—entries will be tested with professional test gear to make sure they work! In addition, there will be a sale of useful gear and components—not junk it is stressed—there will be a teach-in on the Central Scotland 2m Repeater at 3 p.m. and a talk-in station will be operating on 145.5MHz (GM3PXX). There will be a demonstration of slowscan TV and RTTY and refreshments will be available. Further gen from D. H. Plumridge, GM3KMG, Mid Lanark Amateur Radio Society, at the Wrangholme Hall address mentioned above.

VHF Convention

THE next National VHF Convention will be held at Brunel University, Uxbridge, Middx, on 8-9 May, 1976. The accommodation is vastly better than at previous venues and there is more exhibition space which will not need to be disturbed by the dinner. Residential accommodation is also available.

Radio Society of Great Britain, 35 Doughty Street, London, WC1N 2AE.

Heathkit Catalogue

THIS is the front cover of the new Heathkit catalogue which is available from Heath (Gloucester) Ltd., Bristol Road, Gloucester, GL2 6EE. Please enclose a 10p stamp for return postage.

The following new models are introduced. GB-1201E Digital Electronic Stop Watch Kit; BD-1157 Car Intrusion Alarm Kit; TD-1089 Electronic Doorbell Kit; CI-1079 Digital Rev. Counter Kit; CO-2500 Solid State Ignition Analyser Kit; HW-104 SSB Transceiver Kit; HS-1661 Station Speaker Kit; HWA-104-1 10 Metre Access Kit; HW-8 CW Transceiver Kit; HW-2026 Synthesised 2 metre FM Transceiver Kit; HW-2021 Hand Held 2 metre Transceiver Kit; IM-4100 30MHz Frequency Counter-Timer Kit.

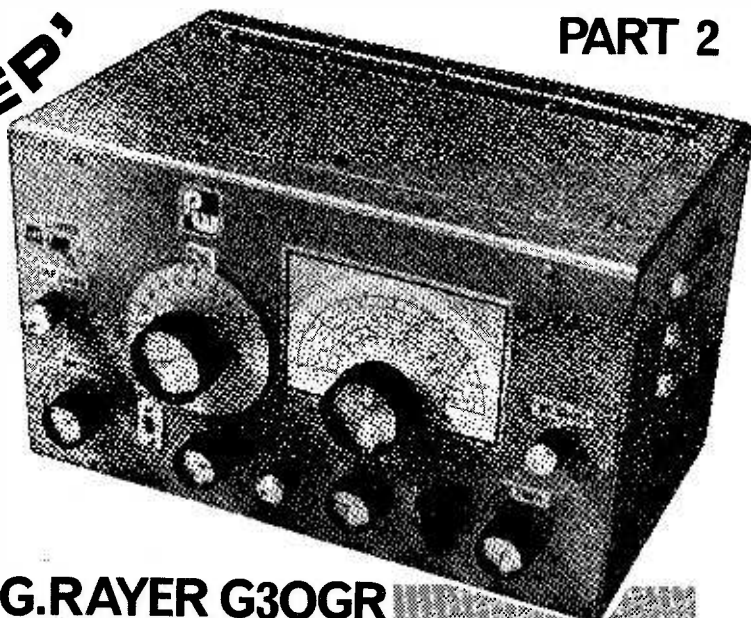


'STEP BY STEP'

PART 2

GENERAL COVERAGE RECEIVER

F.G. RAYER G3OGR



BEAT FREQUENCY OSCILLATOR

Fig. 10 shows the circuit of this unit. Its purpose is to provide a carrier at the detector diode, to heterodyne with incoming CW to produce an audio tone, or to replace the carrier removed during the generation of SSB signals. The BFO is wired upon a board as in Fig. 11. No particular difficulties are likely here. Fit pins so that leads may be taken to the BFO switch and a flexible lead to take to the positive point on the audio board. A wire is also necessary for capacitor VC9.

The coil is close wound using 32SWG enamelled wire. Begin at X, Fig. 11, wind 12 turns, form a tapping, and continue in the same direction with 50 further turns, ending at Y. The BFO unit is fixed under the chassis, near VC9. Earth VC9 to one of the tags in Fig. 11 or to an adjacent chassis tag. An insulated lead runs from VC9 to C29 and from C29 the lead passes up through the chassis to D1 positive/IFT3 pin 4. Take the switch leads to the BFO on/off switch S2, which is next to VC9.

It is necessary to tune the BFO coil to 1.6MHz, with VC9 half closed. To do this, tune in any steady

AM signal, with the BFO off. Switch on the BFO and rotate the core until a strong heterodyne appears with the transmission. Adjust the core for zero beat so that if VC9 is turned either way, an audio tone is heard, increasing in pitch. Check that this happens on all signals because, if the adjustment were made at a high frequency, harmonics of the BFO might be responsible.

The BFO is not used for AM reception. To receive CW, tune in the CW correctly, switch on the BFO and adjust VC9 for the desired pitch. Signals should not be too strong at the detector. This means that for CW reception, RF gain is usually turned back, while AF gain is turned well up. For SSB reception,

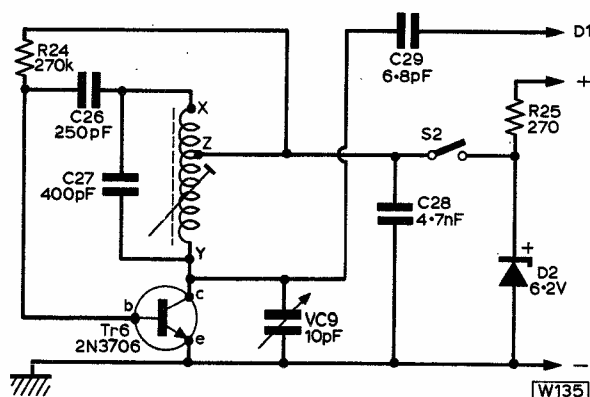


Fig. 10: Circuit of the optional BFO unit.

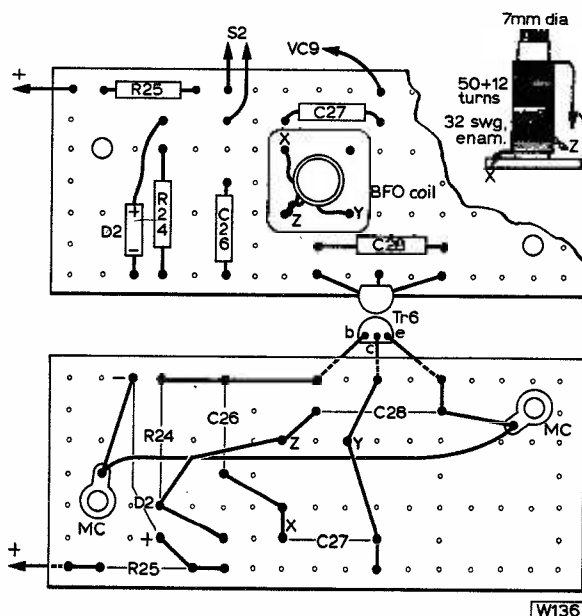


Fig. 11: Layout of the BFO on veroboard. The coil is home-made on a 7mm former with core.

the BFO is used in the same way, except that adjustment is much more critical. If the BFO is tuned to the wrong side the SSB speech is inverted and cannot be resolved. Amateur bands 14MHz and above use upper sideband, 7MHz and below use LSB. No difficulty should arise in receiving SSB, provided the level of the SSB signal at the detector is kept down, as described for CW reception. If a signal of reasonable strength is tuned in and the RF gain is turned up while AF gain is reduced, to maintain about the same volume level, a point is reached where SSB resolution becomes worse or even impossible. So all signals have to be kept below this level at the detector.

ADDITIONAL IF STAGE

The additional IF amplifier, placed between the mixer and existing IF section, will increase selectivity and sensitivity. It is quite feasible to use this as an extra IF stage of similar type, with a worthwhile improvement in reception. If so, the IF gain control described should be included, as it is often necessary to turn this back to avoid overloading of later stages, and to allow satisfactory CW and SSB reception. It is also possible to fit an improved type of IF stage here, and the circuit in Fig. 12 employs a single crystal, with adjustable phasing. An advantage with this circuit is that only a single crystal is needed, while varying degrees of selectivity can, in effect, be obtained by use of capacitor VC10.

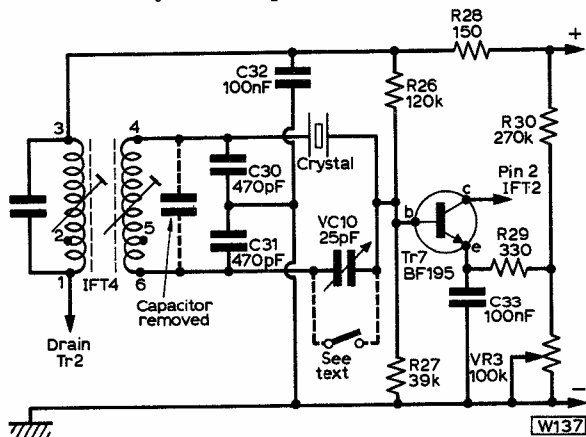
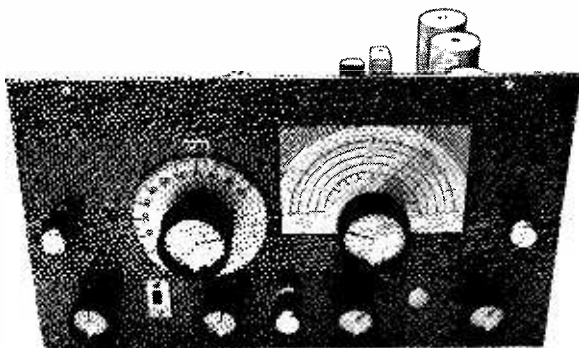


Fig. 12: The additional IF stage incorporates a crystal filter at the IF of 1.6MHz.

As no centre-tapped IFT is available, it is necessary to modify IFT4 by carefully removing it from its screening can and taking out the fixed capacitor which is between pins 4 and 6. It is then replaced. The two external capacitors C30 and C31 replace the internal capacitor and provide a centre-tap. When VC10 is adjusted so that it balances the stray capacitance of the crystal, selectivity is at maximum. This balancing will normally require only a few pF so that VC10 will be nearly fully open. VC10 is purposely made large, so that considerable unbalance is possible, to reduce selectivity. It is also necessary to render the crystal circuit inoperative, for "normal" selectivity. This can be arranged by turning the extreme corner of the rear moving plate of VC10 outwards, so that when VC10 is fully closed, it shorts, giving a circuit straight through from pin 6 to the base of Tr7. Note that C30 and C31 prevent shorting of Tr7 base bias.

Practical Wireless, March 1976



The front panel before the noise limiter and bandswitching were added.

An alternative method of cutting out the crystal is to fit a contact which is 'made' by rotating VC2, so that the crystal itself is shorted. This has the advantage that the crystal is completely inactive, and it avoids the "whoop" which can arise when tuning quickly and signals encounter the unbalanced crystal resonance.

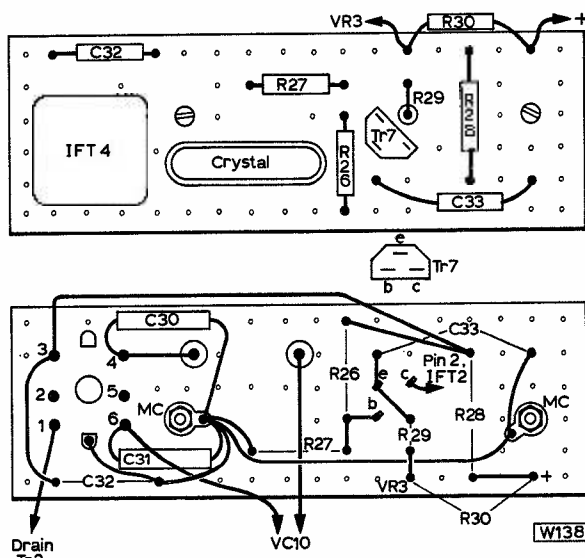


Fig. 13: Component layout for the crystal IF stage.

Fig. 13 shows the construction of the unit which is mounted behind the main tuning capacitor, see photographs. Long bolts are used to allow C30 and C31 to clear the chassis. A hole is required under the IFT for connections to VR3 and the phasing capacitor VC10. The capacitor must be completely isolated electrically from the chassis. It is mounted on a piece of paxolin or other insulating material about

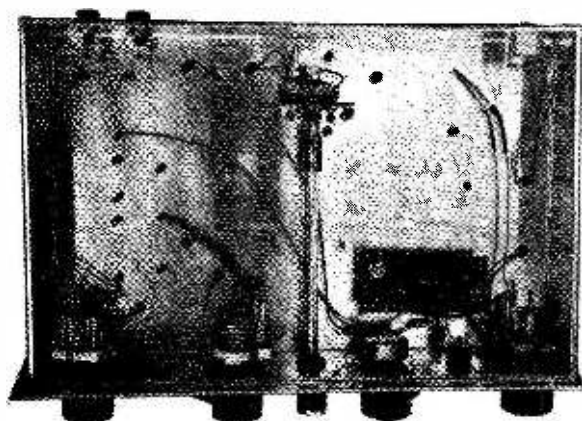
★ components list

NOISE LIMITER

R35 200kΩ C36/C37 100nF
D3/6 OA47 or similar germanium diode
S9 Switch, SP on-off

MAINS POWER UNIT

R36 2.7kΩ D7/8 1N4001 or similar
T1 Transformer, 240V/9-0-9V 100mA



Under the chassis before the bandswitch and associated coils had been incorporated.

$1\frac{3}{4} \times 1\frac{1}{2}$ in in size, which is bolted to a $1\frac{1}{2}$ in bracket, or two small brackets. It is positioned so that short leads can run to it down through the chassis. It is operated by an insulated $\frac{1}{4}$ in dia. rod about $4\frac{1}{2}$ in long passing through a bush in the panel.

ADJUSTING THE CRYSTAL FILTER

Fig. 14 should be of help in dealing with this aspect of the filter. For best possible adjustment a signal generator is necessary, but a very useful degree of selectivity should be obtainable without it. In Fig. 14, A is the response curve of the IF transformers alone. At resonance, response is maximum, falling away either side as the receiver is tuned a little one way or the other from that giving best reception. Curve B is the sharp peak obtained with the crystal when balanced by VC10. When the IFT's and crystal are on the same frequency, A and B will occur at the same tuning point, as in Fig. 14. But where the crystal and IFT's are on slightly different frequencies (as may be expected) curve A and curve B will occur at slightly different tuning points.

If a meter is connected, as described earlier, and the receiver is tuned across a steady AM signal, the flat peak A and sharp peak B may possibly be observed. If so, tune the signal to peak B and adjust all the IFT cores slightly to move peak A to peak B. This will give an improved signal strength reading on the meter. When this is reasonably correct, adjust

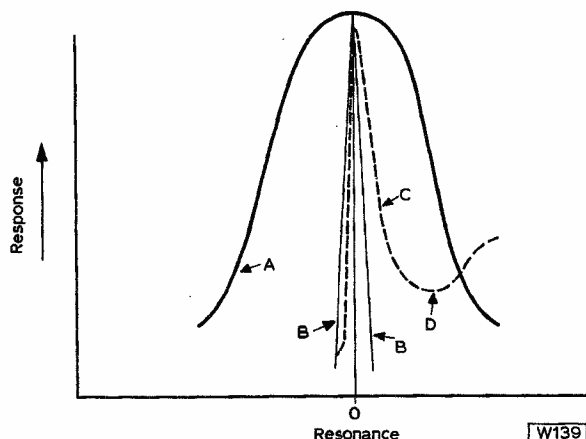


Fig. 14: The various IF bandwidths obtainable with the crystal filter are shown as B, C and D. The bandwidth with IFT's alone is shown by response curve A.

VC10 for the sharpest possible peak. If VC10 is set too high, in capacitance, the crystal curve resembles C, while too little capacitance causes the notch D to move to the other side of the pass-band. With a correctly adjusted filter, the rejection notch D can be moved across the pass-band by VC10, to eliminate or reduce an unwanted carrier. Deliberate unbalance is also obtained with VC10, to reduce selectivity.

Best possible adjustment requires an unmodulated signal from a generator as the sidebands caused by modulation will lie partly outside the pass-band. Otherwise find a setting which causes noticeable loss of upper frequencies with any AM signal, with a fall in background noise, and much sharper tuning. As such a filter is not normally kept in circuit all the time, it can be cut out by either of the methods already described.

BANDSWITCHING

Bandswitching obviates the need to change sets of coils by hand, but needs quite a lot of wiring, so whether or not it is provided must depend on personal choice. Fig. 15 gives details of the circuit used. For four bands, a 4-way 6-pole switch is used. It is necessary to use a switch with three separate wafers, each with two poles. The front wafer is S3 and S4, the middle wafer is S5 and S6, and the rear wafer is S7 and S8. A standard Maka-Switch was used as it is quite small. The wafers are actually 2-pole 6-way, but two ways are left unused.

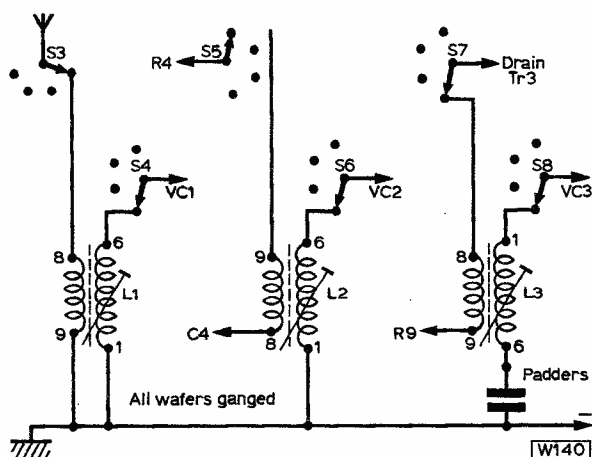
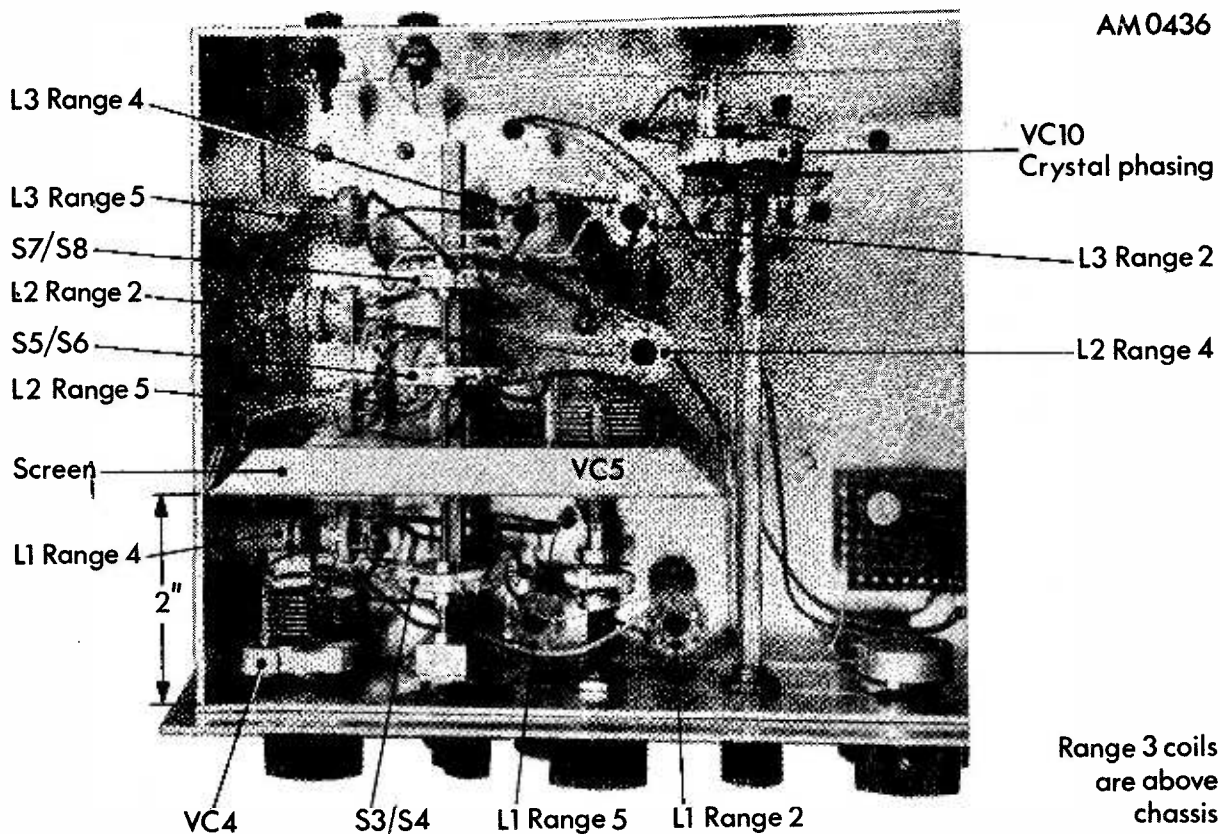


Fig. 15: Connections for one range of the bandswitch. Each range should be fitted and tested before adding the next.

Referring to Fig. 15, S3 switches the aerial to the primary of L1. The remaining three ways of S3, not connected in Fig. 15, are wired to the primaries of the other three aerial coils. S4 goes to VC1, bandspreading and trimmer capacitors as well as the RF gate circuit C1. Wafer S5 switches the RF stage drain circuit. All the four lower ends of the primaries of L2, pins 8, are connected together and to the positive circuit. Wafer S6 switches the variable capacitors and C5. All the windings return to chassis. S7 switches the oscillator drain to pin 8 of each coil, as necessary, and all these windings (pin 9) return to the positive supply circuit for this stage. S8 switches all the oscillator capacitors and gate circuit. The appropriate pin of L3 has its own padder, as already explained, returned to chassis.

It may be preferable to fit the coils for one range only, and to check that the receiver works correctly,



Close-up of the corner of the chassis to show placement of components when bandswitching is introduced.

before fitting the other coils. If any doubt is felt about the way in which the switch makes internal circuits, check it with a meter for each position. In this way errors can be avoided. It is not intended to give a wiring diagram for the switching and coils, as this is largely a matter of duplication. Some wiring points do, however, arise.

COIL WIRING AND LOCATION

Unscrew the RF/mixer/oscillator unit, so that connections can be reached. A number of holes should be drilled in the chassis below it, remembering that these should permit short through connections and keep aerial and RF circuits away from following circuits and components. The plug-in coil assembly can be retained for Range 2 or Range 3. Disconnect the leads to permit wiring as in Fig. 15 and take colour-coded wires down through the holes.

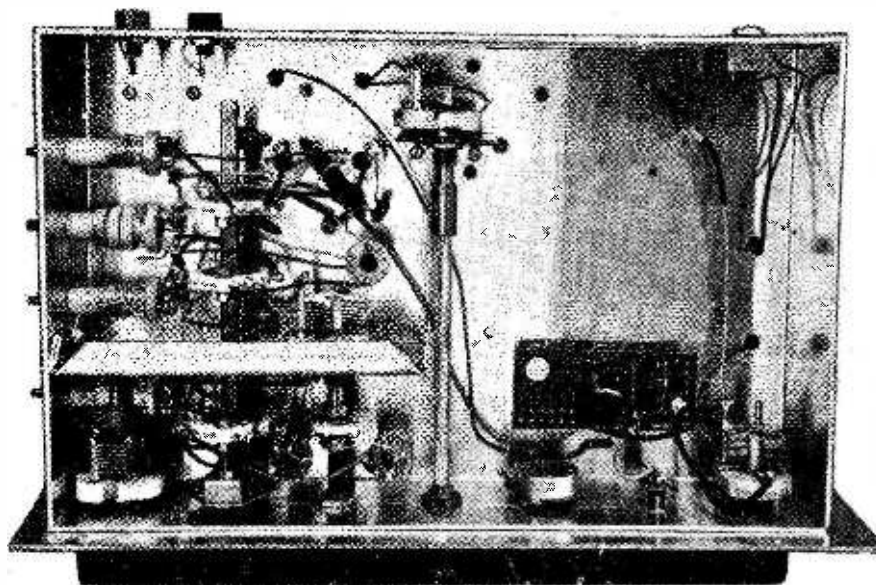
A 5 x 2in flanged universal chassis side is drilled so that holes line up with the bandswitch and mixer trimmer holes in the panel. The Maka-Switch is assembled with threaded rod and nuts so that this screen is 2in from the front panel, between the RF and mixer circuits, see photograph. Assemble with wafer S3/4 in front of this screen. To further segregate circuits, the mixer trimmer is now fitted to the screen and operated through an extension shaft and coupler. The shaft runs through a panel bush.

The lead from the aerial socket runs through the side of the chassis at the back, along the outside, and in opposite S1. A short length of coaxial cable,

kept inside, is preferable. Viewing the receiver from the front and below, fit L1, Range 7, immediately adjacent to S3/4. Fit Range 4 coil on the chassis side, behind the aerial panel trimmer. Range 3 coil occupies the plug-in holder above the chassis. Range 2 coil is between the extension shafts to mixer trimmer and phasing capacitor. The chassis returns for these coils are made to a tag secured by the bolt holding the front of the tuning capacitor to the chassis.

Range 5 Yellow coil is immediately behind the screen, on the chassis side, with pins near S5/S6. Range 4 coil is near the mixer trimmer. Range 3 coil is in the mixer assembly, and Range 2 coil is adjacent to Range 5, on the side of the chassis. Range 5 oscillator coil is on the chassis side, with pins near wafer S7/S8. Range 4 coil is also near this wafer, with Range 2 coil beside it, nearer the phasing capacitor. Range 3 occupies the top holder as before.

All coils are mounted so as to give reasonable clearance from each other and any metal surfaces. It will be found helpful to solder colour-coded leads to the switch contacts, such as blue for aerial, brown for VC1, pink for drain and so on, as before. The padders are returned to a tag held by the bolt securing the back of the ganged capacitor. All leads must be short and direct. Note that the type of switch which shorts all unused contacts together on any wafer may be used for S3/S4 and S7/S8, but cannot be used for S5/S6 as this will short-circuit the positive supply to chassis, via the secondaries of L2. Separate oscillator trimmers can now be used for each range, for individual adjustment of the HF ends of the bands.



View under the chassis with all optional stages fitted. The BFO board is on the lower right side, the crystal filter phasing capacitor at rear centre and the bandswitch with coils for three of the four ranges at the left.

TRANSISTOR GAIN

Wide spreads in gain can be expected in some of the transistor types. The resistor R13 is to stabilise the IF amplifier against oscillation from this cause. Stability also depends somewhat on individual wiring and alignment. In some cases R13 might be omitted, or reduced in value, without instability arising. Here, it would be shown by oscillation or even loss of signals, when the IF's are peaked, or oscillation on weak signals only.

In a similar way, should the additional IF stage tend to oscillate with VR3 at maximum gain, a resistor may be placed in the circuit at the base of Tr7. Use short leads, connecting it directly from Tr7 to the junction of R26/R27. A usual value would be 220Ω to 1kΩ or so. Unnecessarily high values may reduce gain.

AUDIO PRE-AMPLIFIER

The circuit is shown in Fig. 16 and the unit is placed between the diode D1 and audio IC via C16 and VR2. The few extra components can be mounted on the space left for this purpose on the audio board, adjacent to VR2, or may be assembled on a separate small circuit board. The negative line is taken to one of the tags on the chassis.

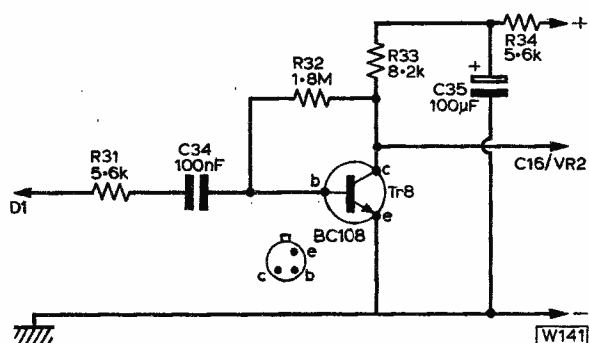


Fig. 16: If this additional audio stage is needed it can be added to the main audio board.

AUDIO LIMITER

The receiver sensitivity allows the copying of signals of under 1μV (measured at 29MHz) so sudden bursts of noise may arise when tuning across a band. These can be strong signals or static or other types of interference. The discomfort caused is particularly severe with headphones unless volume is kept well down at all times. These effects are practically eliminated by fitting the audio limiter circuit shown in Fig. 17.

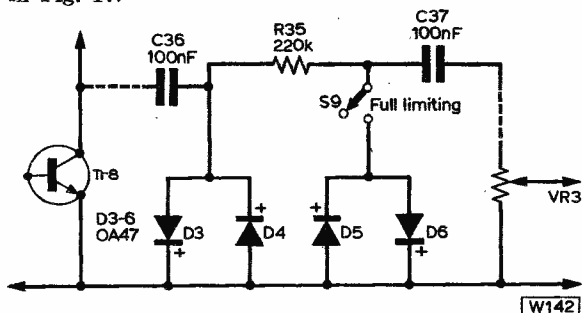


Fig. 17: Circuit of the switchable noise limiter providing partial or full limiting.

Tr8 with its associated components and gain control VR3 are already present. A small 2-way slide switch S9 is fitted to the panel above VR3. The resistor, capacitors and four diodes are supported by the switch tags. A tag on the switch mounting screw provides a chassis return for the diodes. Diodes D3 and D4 provide a permanent degree of limiting. With the switch closed for full limiting signals do not exceed a level set by VR3. As unnecessarily severe clipping of strong signals by the diodes causes a loss of audio quality, the switch allows the limiting to be reduced for general reception.

Headphones of 8 to 16Ω impedance may be plugged directly into the output jack. With higher impedance phones, a 15Ω ½W resistor can be connected across the jack socket. This can be permanently soldered in place as the reduction in signal strength with a speaker is not important. Its purpose is to provide

continued on page 964

HOTLINES

ON RECENT DEVELOPMENTS

DIAL A GAME

So you're one of the many electronics games lovers who has a 'teletennis.' But now you've got a problem—what do you go for next? A robot that lollops around the house after you pouring your Martini and lighting your cigar on command? Or should you go for something really practical like an electronic bank manager of your very own?

Stop worrying, your troubles are over; well, very nearly. An enterprising gentleman in the United States has come up with an idea which will appeal to all who love electronics games and conventional ones too. The idea is to programme a dirty great computer (he is buying it at this very moment according to reports) that can be accessed or talked to over the ordinary telephone lines. If this system gets off the ground, users will be able to dial the number and play the computer at chess, or golf, solitaire, football, chequers etc. plus word games or mathematical amusements.

The initial set-up is to be used in the New Jersey area because our entrepreneur believes that there are already a large number of people in that location who have the necessary terminal equipment to converse with the computer. Up to 32 users will be able to play their games simultaneously in the prototype arrangement.

Cost to the player/user is a suggested three dollars per hour of computer time, which is not too expensive. But before you get excited, you need the terminal equipment which, at the time of writing, sells for between £250 and £750 in the US. However, prices of this equipment are dropping all the time, so when the system—if the system—comes to England, the costs should be considerably lower by then. If you just happen to have a teletype terminal and a graphics display readout, then you won't need anything.

I can remember a senior person from the Italian company Olivetti saying (about 7 years ago) that the ultimate in home entertainment would not be a television receiver which merely allowed one to watch TV programmes. The ideal is that such a receiver shall be able to be connected to the telephone lines and

that a person would be able to study French (simply dial up the lesson required) or mathematics etc. besides being able to play games. Think I'll brush up on my boxing. I can hardly wait to ring up Mohamed Ali for a quick video punch up. (Ginsberg is the greatest!).

SPELLIN KOREKTLIE

Optical character readers have been in use for some time. The idea is that machine-printed characters of the alphabet can be read automatically by a photosensitive device and a printout obtained—or the information could be transmitted or stored etc. Japanese giant Hitachi has gone one step further with the idea. This company has produced a machine which can "read" automatically, hand-written English language and numbers. It can do this at 500 hand-written characters per second and twice as fast for machine written ones.

One of my computer orientated associates informs that a machine called the IBM 1287 (which incidentally, can only read machine-written characters) costs twice as much and operates at half the speed of the Hitachi unit.

If one links this piece of news with the last item on computer access via the telephone line, then fascinating ideas become a real possibility. Think of writing your letter and then feeding it into a machine. You dial a number and that's that; your letter is immediately printed out at its destination. Instant post and no paper involved. I wonder if the machine will curekt spellin errors?

HYPERCUBES

Say the word "microprocessor" and you're accepted as being one of the "in" crowd in electronics. These are the beasties which began rumours not so long ago about a complete computer on a single chip. The complexity of microcomputers seems to be increasing as these tiny ICs do more and more in organising the computer and its tasks. Very few chips are now required to make a computer and that number is shrinking all the time. Give the microprocessor a memory chip as a mate and you're really in business. Of

course, it wasn't long before some bright soul wondered about making up an array of microprocessor/memory modules. The latest reports indicate that someone, somewhere is quite definately building a Six Million Dollar Man—well, the head at least and certainly the brain.

The buzz word here is "Hypercube" Nope, not a gross of Oxo's, it consists of each microprocessor in the arrangement communicating with eight others. I am not joking when I say that one company has plans to interconnect 10,000 (ten thousand) microprocessor modules. Another system, currently in the pipeline has eight microcomputers in a system which should be able to handle well over half a million words of memory and can execute 3,000,000 instructions every second.

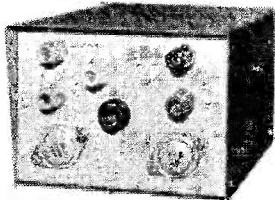
In case you're still unimpressed I'll say another secret word—Hypercube II. Correct; there's already a next generation version lurking. In Hypercube II we are talking about a system in which memory chats happily to memory, and in which the execution rate runs at around 16,000,000 instructions every second. I hear that Hypercube II is to be sold for about \$80,000. Even more impressive is Hypercube III—available for a mere \$400,000. I dare not mention the specifications of the latter. With simple pocket calculators taking the arithmetical thinking away from school children, think what Hypercube could do. Perhaps we humans will not have to think at all in the future—then we will all be politicians!

VIVE LA B.P.O.

Facts from a recent survey in the US should prove useful ammunition if you're at a party and the conversation lags a little. For example, there are more telephones than people in Washington D.C. The cost of having a telephone laid on in Japan is about £300! In France it costs around £110—and there's a 15 month wait. Vive la BPO.

Ginsberg

INVERTORS



240v-50Hz from your 12v car battery.

25 watt—£4.20 150 watt—£19.10
40 watt—£7.35 300 watt (12v)—£22.85
75 watt—£10.71 300 watt (24v)—£22.75

All above inverters are in kit form but may be purchased built up in metal case & ready for use. Price list sent on receipt of s.a.s. Prices include post & packing.

P.W. AUTOMATIC EMERGENCY SUPPLY

240v-50Hz-150 watt inverter with built in battery charger. In event of power failure switches over automatically from battery charging to inverter operation. Cct. as appeared in Dec. 72 P.W. Complete kit of parts (excluding meter) £22.90 + £1.10 p. & p.

FLUORESCENT LIGHT INVERTOR KIT
8 watt-12v-Fluorescent light, suitable for tents, caravans, houses, boats & secondary lighting for factories, hotels, etc.
12" 8 watt—£2.90 + 25p p. & p. Built up £4.4 + 25p.
21" 13 watt—£3.30 + 30p p. & p. Built up—£4.50 + 30p.

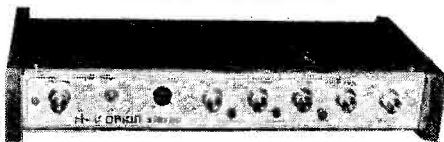
TRANSFORMERS & COILS

Both high volume & small order capacity available.

Special offer. Miniature mains transformer 12-0-12v-6V.A.—85p plus 10p p. & p.

TRADE & EXPORT ENQUIRIES WELCOMED

ORION STEREO AMPLIFIER



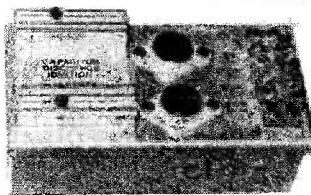
20 + 20 Watts r.m.s. into 8 ohm load. Distortion less than 0.01% 100Hz-10kHz. Frequency response ± 1 dB 20 Hz to 20 kHz. Hum level virtually nil with vol. full on.

This is a power amplifier of superb quality incorporating the very latest design features. Professional hi-fi enthusiasts have classed it as fantastic and real value for money. The CCT incorporates a low flux transformer and inputs for disc. tape, tuner etc.

Complete kit of parts including slim line bookend case, silk screened front panel & knobs. £43 incl. VAT & p. & p.

The bookend case, I.C.s & semiconductors, P.C. board, Transformer, etc. may be purchased separately if desired. Send S.A.E. for further information

ASTRO IGNITION



ASTRO IGNITION SYSTEM

Complete kit of parts for this proven and tested system £9.50 incl VAT. Ready built with only two connections to alter £12.50 incl. VAT.

Thousands have used this system both home and abroad. Consider these advantages more power, faster acceleration, fuel economy, excellent cold starting, smoother running, no contact breaker-burning. Also because of the high energy spark, the fuel mixture can be made weaker giving further economy and fewer plug problems. Fitting time when built 5 minutes approx. Please state whether positive or negative earth. Trade and export enquiries welcomed.

ASTRO ELECTRONICS,
Spring Bank Rd., West Park,
Chesterfield.



TRAMPUS
ELECTRONICS LTD. WINDSOR

58-60 GROVE RD.
WINDSOR, BERKS. SL4 1HS.
ADD 5% VAT TO PRICES MARKED *
ADD 25% VAT TO ALL OTHER PRICES
SEND C.W.O. (EXCEPT GOVT DEPTS)
POST & PACKING 20P FOR THE UK

NEW FAST SERVICE. LOW PRICES.
MONEY BACK IF NOT SATISFIED.
ALL BRAND NEW TOP GRADE FULL
SPEC. DEVICES. CALLERS WELCOME
NEW CATALOGUE LIST SHEET 52P.
BARCLAYCARD & ACCESS BY POST
SORRY NO SALES TELEPHONE.

FAST SERVICE



LEDs red 12P.

209 STYLE OR 0.2" NO CLIP 12p*
TIL209 OF 0.2" RED & CLIP 14p*
GREEN LARGE/SMALL & CLIP 19p*
ORANGE LARGE/SMALL & CLIP 19p*
ORP12 57p* 2N5777 33p* REC12 50p*
DIGITAL CLOCKS MM5316 £5*
MM5314 £3.30p MM5311 £5*
AT51224 £3.49p PCB £1*
CAPACITORS
CERAMIC 22pF-0.1uf 50v 5p.
ELECTROLYTIC 10/50/100 uf in
25V 7P. 50V 9P. 2uf/10V 6P.
1000uf 25V 18P. 200/500uf 9P.
POTENTIOMETERS LIN/LOG 14p.
PRESSETS 6P. RESISTORS 11P ea

HEATSINKS: T05 & T018 5p* TV4 15p*
TV3/T03 16p* EXTRUDED 4" 4Y1 29p*
SWITCHES: SPST 18p, DPDT 25p.
DIN PLUGS ALL 12p. SOCKETS ALL 9p
ALI CASES ABS/AB7 50p, AB13 65p*
TRANSFORMERS 1/1A 6 or 12V £1.50*

TRAMPUS FULL SPEC PAKS ALL £1 ea
PAK A 10 RED LEDs our choice £1*
PAK B 5 741C OP AMP 8 PIN £1*
PAK C 4 2N3055 £1*, D 12 BC108 £1*
PAK E 10 BC182 £1*, F 11 2N3704 £1*
PAK G 8 BFT51 £1*, H 9 2N3819 £1*
PAK J 9 2N3053 £1*, K 4 1N914 £1*
NEW PAK M 4 PLASTIC 3055 90W £1*

IC's

LOW PRICES

703 RF/IF 26p MC1303 £1.50
709 T099 22p* MC1310 £2.20
709 DIL 14 28p* MC1312 SQ £2.50
710 DIL 14 31p* MC1318 £2.50
723 Regul'r 45p* MC1330 75p
741 DIL 8 21p* MC1339 £1.40
741 DIL 14 31p* MC1350 1/2 75p
741 T099 31p* MC1406 /9 £3
747 2x741 67p* MC4000 IF 49p
748 DIL 8 27p* NE536 FETOPA £2*
7805 5V £1.25* NE540 £1.10*
7812 12V £1.25* NE550 2VR £1*
7815 15V £1.25* NE555 TIMER 42p*
7900 Series £2* NE556 2x £8p*
79013 6W AF 75p NE580 PLL £4.00
CA3046 54p NE581 PLL £4.00
CA3048 £2 NE562 PLL £4.00
CA3054 £1.50 NE563 £2.25
ICL8038 SGEN £3* NE566 £2.50
LM300 £1.50* NE568 £1.55
LM301 OPA 41p* NE567 £2.20
LM304 0-40V £3* SN72741 741 21p*
LM308 H1 Bo 95p* SN7660 IF 75p*
LM309K 5V £1.75* SN76811 IF £1
LM372 IF £2.00 TAD100 & IF £2
LM377 2x2W £3 TB800 89p
LM380 80745 89p TB810 7WAF 89p
LM381 £1.50 TB820 75p
LM3900 40PA 63p* ZN414 RX 99p



740 TTL

7400 11p* 7474 29p*
7401 13p* 7476 29p*
7402 13p* 7490 39p*
7403 13p* 7491 73p*
7404 15p* 7492 43p*
7410 13p* 7493 39p*
7413 29p* 7494 46p*
7420 13p* 7496 74p*
7430 13p* 74100 £1*
7440 13p* 74121 27p*
7441 64p* 74123 65p*
7447 69p* 74141 64p*
7470 26p* 74173 £2*
7472 24p* 74174 £1*
7473 29p* 74175 85p*

TRANSISTORS ALL FULL SPEC

PRICE EACH:-
AC127 & 128 11p*
AC176 9p*
AC187 & 188 11p*
AD149 45p*
AD161 & 162 33p*
BC107 8p*
BC107B 12p*
BC108 12p*
BC109 9p*
BC109C 12p*
BC147/8/9 9p*
BC157/8/9 12p*
BC167/8/9 12p*
BC177/8/9 18p*
BC182/3/4A & L10p
BC212/3/4A & L12p
BC270/1/2 10p*
BD131 & 132 39p*
BFR88 250V 35p
BFY50 14p*
BFY51 14p*
BFY52 & 53 14p*
BSX19/20/21 16p*
MJ2955 T03 75p*
MJ2955 99p*
MJ3055 67p*
*PU131 PUT 45p

DIODES

OAR1 & OA91 GERMANIUM 5p.
IN4001 1A50V & IN4002 5p*
IN4004 6p* IN4007 9p*
IN4148 & IN914 SILICON 4p.
ZENERS BZY78 400mV 9p.
ZENERS 11W 17P. 21J not sel
BRIDGE RECTIFIER 1A50 18p
1A400V 25p. 4A100V 45p

SCR's TRIACS

SCR's TAG1/400 1A400V 50p*
1A50V 39p* 1A 600V 70p*
C106D 4A400V SCR ONLY 47p*
TRIAC SC146D 10A400V £1*
TRIAC DISCO 16A400V £1.75*
DIACS: ST2 20p, BR100 25p

VERO

36PINS 28p* FACE CUTTER 49p*
COPPERCLAD 0.1 PITCH VERO
2 1/2"x5" 32p* 2 1/2"x3 1/2" 29p*
3 1/2"x5" 37p* 3 1/2"x3 1/2" 32p*
3 1/2"x17" 11.70p*
3 1/2"x17" PLAIN 0.1" £1.06*
DIL BREADBOARD 6x4" £2*

DALO 69P pen

DALO ETCH RESIST PEN 69p*
PEC ETCH PAK 500mg 89p*
6x4" COPPER BOARD 50p*
PCB KIT 3 ITEMS £2*
CASSETTE MECHANISM £9 & AS £12

TGS GAS DETECTORS 308et £2*

OIL sockets

TOP QUALITY NYLON
SOCKETS 6PIN 12p*
14PIN 13p, 16PIN 14p
SOLDERCON PINS:
100 65p, 1000 £3.50*

Complete the coupon and we'll send you our complete, new catalogue.



The new Heathkit catalogue is now out. Full as ever with exciting, new models. To make building a Heathkit even more interesting and satisfying.

And, naturally, being Heathkit, every kit is absolutely complete. Right down to the last nut and bolt. So you won't find yourself embarrassingly short of a vital component on a Saturday evening—when the shops are shut.

You'll also get a very easy to understand instruction manual that takes you step by step through the assembly.

Clip the coupon now (enclosing a 10p stamp for postage) and we'll send you your copy to browse through.

With the world's largest range of electronic kits to choose from, there really is something for everyone.

Including our full range of test equipment, amateur radio gear, hi-fi equipment and many general interest kits.

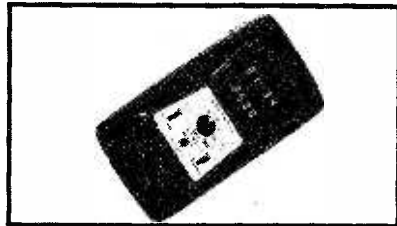
So, when you receive your catalogue you should have hours of pleasant reading.

And, if you happen to be in London or Gloucester, call in and see us. The London Heathkit Centre is at 233 Tottenham Court Road. The Gloucester showroom is next to our factory in Bristol Road.

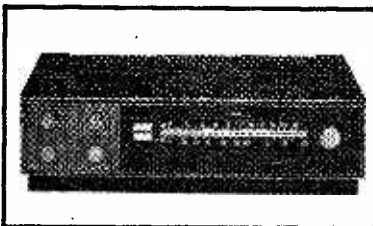
At either one you'll be able to see for yourself the one thing the catalogue can't show you.

Namely, how well a completed Heathkit performs. Heath (Gloucester) Limited, Dept. PW-36 Bristol Road, Gloucester, GL2 6EE. Tel: Gloucester (0452) 29451.

Digital electronic stop watch



AM/FM 60 watt r.m.s. stereo receiver



Digital rev counter



FREE

SOLDERING IRON

WORTH

£3.50

with all orders over £30

The new Heathkit catalogue. Out now. FREE.

To: Heath (Gloucester) Limited, Dept. PW-36, Gloucester, GL2 6EE.

Please send me my Heathkit catalogue. I enclose a 10p stamp for postage.

HEATH

Schlumberger

Name _____

Address _____

Postcode _____

Full details in the catalogue. Offer available for limited period only.

EASY TERMS AVAILABLE
WITH HEATHKIT CATALOGUE

Look AT THESE PRICES AND BUY QUALITY

VALVES

Type	Price (p)
DY87	30.0
DY802	30.0
ECC82	28.0
EF80	29.5
EF183	34.5
EF184	34.5
EH90	35.5
PC900	24.5
PC889	40.0
PC1889	41.0
PCF80	31.5
PCF86	39.0
PCF801	42.0
PCF802	40.0
PCL82	39.0
PCL84	39.0
PCL85	44.5
PCL86	41.0
PFL200	59.5
PL36	55.5
PL84	25.0
PL504	64.5
PL508	67.0
PV88	£1.20
PV159	35.5
PV800	33.0
PV500A	85.0

SEMI CONDUCTORS

Type	Price Each (p)
AC127	17
AC128	13
AC141K	25
AC142K	25
AC151	20
AC154	18
AC155	18
AC158	20
AC176	22
AC187	19
AC187K	24
AC188	17
AC188K	26
AD142	45
AD149	40
AD181	38
AD162	38
AF114	24
AF115	21
AF116	22
AF117	19
AF118	50
AF139	35
AF178	45
AF180	45
AF181	45
AF239	40
AF240	60
BC107	11
BC108	11
BC109	14
BC109C	13
BC113	14
BC116A	19
BC117	14

Type

Type	Price Each (p)
BC125B	15
BC132	25
BC135	15
BC137	19
BC138	26
BC142	23
BC143	25
BC147	11
BC147A	11
BC148	10
BC149	10
BC153	15
BC154	15
BC157	14
BC158	11
BC159	11
BC173	18
BC178B	20
BC182L	12
BC183L	12
BC187	25
BC214L	25
BC328	18
BC337	19
BD124	75
BD131	45
BD132	39
BD160	£1.39
BD235	49
BD237	52
BDX32	£2.40
BF115	20
BF160	15
BF167	20
BF173	20
BF178	35
BF179	40
BF180	31
BF181	32
BF184	25
BF185	25
BF194	9
BF195	8
BF196	10
BF197	12
BF198	23
BF200	26
BF218	30
BF224	23
BF258	34
BF336	28
BF337	35
BF355	54
BFX85	19
BFY50	20
BFY52	20
BSY52	35
BT106	£1.20
BU105/02	£1.95
BU108	£2.10
BU208	£2.35
E1222	30
MJE340	45
OC71	15
OC72	16

Type

Type	Price Each (p)
R2008B	£2.00
R2010B	£2.00
RCA16334	80
RCA16335	80
TIP31A	57
TIP32A	67
TIP41A	67
TIP42A	80
2N3055	55
DIODES	
BA115	7
BA145	14
BA148	19
BA154/201	11
BY115	11
BY127	12
BY199	27
BY205	21
BY238	25
OA90	6
OA202	7.5
IN60/OA91	5
IN914	6
IN4002	5
INTEGRATED CIRCUITS	
ETTR6016	£2.00
MC1351P	70
SN76003N	£2.35
SN76013N	£1.50
SN76013ND	£1.50
SN76023N	£1.50
SN76023ND	£1.50
SN76033N	£2.35
SN76227N	£1.45
SN76532N	£1.45
SN76660N	58
SN76666N	87
TAA550	49
TAA700	£2.95
TBA120AS	£1.00
TBA120S	£1.00
TBA480Q	£1.40
TBA520Q	£2.35
TBA530Q	£1.75
TBA540Q	£1.75
TBA650Q	£2.90
TBA660CQ	£2.40
TBA800	£1.50
TBA920Q	£2.90
TBA990Q	£2.90
TCA270Q	£2.90

EHT MULTIPLIERS COLOUR

Type	Price Each
11TAQ ITT CVC 1, 2 & 3	£4.50
11TN GEC Soheli	£4.50
11TAZ GEC 2110	£4.85
11TAM Philips G8	£4.50
11TBD Philips 550	£4.50
3TCW Pye 691/693	£3.50
11TH Decca 30 Series	£4.50
11TAQ Decca Bradford	£4.50
3TCU Thorn 3000/3500	£5.00
11HAA Thorn 8000	£1.90
11HAB Thorn 8500	£4.25

New TOSHIBA TUBES

Type	Price Each
19" A49-191X equivalent	
A49-192 and A49-120X	£48.95
20" 510DJB22 equivalent	
A51-110X	£50.75
22" A56/120X	£54.25

PRICES SUBJECT TO 25% V.A.T.

All goods subject to settlement discount of 5% 7 days and 2% monthly.
No postage charges or minimum order values.
Write or phone for full details now.



PRICE QUALITY SERVICE



COMBINED PRECISION COMPONENTS (PRESTON) LTD
Department P,
194-200 North Rd,
Preston PR1 1YP
Tel: 550334
Telex: 677122.

TRANSFORMERS

MAINS SAFETY ISOLATING Primary 240V, Sec. 120V or 240V.
Please state which type you require.
All types are screened and Centre tapped to earth.

V.A. (watts)	OPEN TYPE	P. & P.	CASED TYPE	SOCKETS 5 amp 15 amp	CARRIAGE	PLUGS FOR CASED TYPE complete set
£	£	p	£			
50	3-70	62				
100	4-15	70				
200	7-00	80				
250	8-35	1-10				
350	10-20	1-18				
500	11-75	1-34	21-25	1	O.A.	1-20
750	17-50	O.A.	28-00	1	O.A.	1-20
1000	25-77	O.A.	36-27	2	O.A.	2-40
1500	29-25	O.A.	40-75	3	O.A.	3-60
2000	34-50	O.A.	48-00	1	O.A.	2-70
3000	53-00	O.A.	68-50	3	O.A.	5-10

CASED TYPES These are of extremely high quality to British Standard Specification, with resettable fused primary winding, and are fitted with covered outlet sockets. Housed in steel cases with carrying handles and 3ft of 3 core cable.

12V or 24V				MINIATURE TRANSFORMERS			
Primary 240V				Primary voltage 240V			
Please state which voltage							
12V	24V	AMPS	p	Sec. volts	mA	PRICE	P & P
1	5	25	1-14	26	3-0-3	200	1-35
2	1	5	1-40	45	0-5 x 2	1A	1-60
4	2	2-45	1-95	45	0-9 x 2	330	1-35
6	3	3-50	2-45	52	0-9 x 2	500	1-63
8	4	4-55	3-90	52	0-9 x 2	1A	2-50
10	5	4-55	4-35	65	0-15 x 2	200	1-30
12	6	4-70	4-70	78	0-20 x 2	300	1-60
16	8	6-15	6-15	80	0-20 x 2	1A	3-00
20	10	8-85	8-85	1-00	0-15-27 x 2	1A	3-47

SPECIAL OFFER from export order. £4.00 p & p 87p + V A T
Primary 0-110-120V x 2 Sec 0-32V x 2 2 amp

We manufacture power Transformers to customers own special requirements, please send details of any Transformer you may require custom built.

PLEASE ADD 8% V.A.T. TO TOTAL PRICE

S. G. Wright's Ltd., Bishop House Works, Rylands St., BURNLEY, Lancs. BB10 1RG Tel. 26934

QUALITY STEREO SOUND

ALMOST **1/2 PRICE OFFER!** SOLENT AUDIO SYSTEM

MADE TO SELL AT DOUBLE THE PRICE IN CABINET FORM

OUR PRICE £59.95

£5.95 down

*Stereo Tuner Amplifier chassis with AM/FM radio covering long medium short and Stereo FM wavebands. Separate Base and Treble controls. 30 watts total power output (frequency response 25-20,000 Hz) AFC Switching, Tape record and playback facilities. Dimensions 18 1/2" x 9" x 3 1/2". The very latest BSR automatic record deck with cue and pause control. Two matching elliptical speaker units.

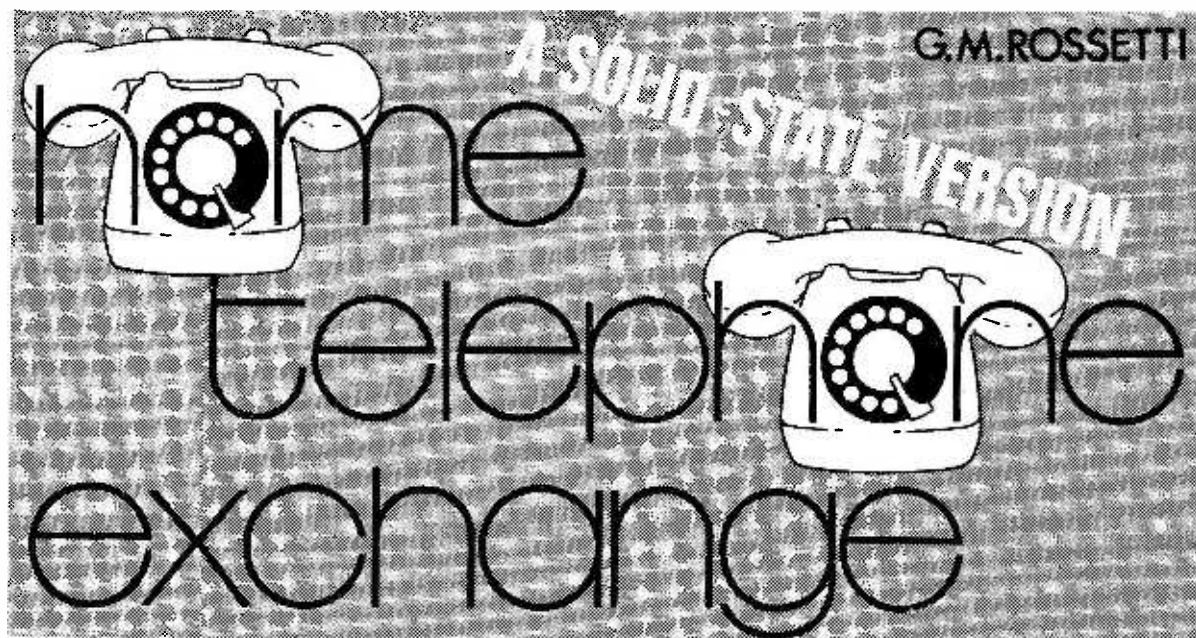
Order early limited stocks available cash price £59.95. Credit Sale £5.95 deposit 9 monthly payments of £7.00 (Total Credit price £68.95). P. & P. £3.00. Send £8.95 today.

Chassis only available for cash at £42.00.

Full 12 months Guarantee.
CALLERS WELCOME.
Access and Barclaycard
telephone orders accepted

Stereo headphones supplied with every complete order.

LEWIS radio PW/3/76 100 CHASE SIDE SOUTHGATE LONDON N14 5PL Telephone: 01-882-1644



THIS article has been written to supplement the Home Telephone Exchange published in February 1975. For a home telephone exchange however, cheapness and size are major considerations, and it is for these reasons that the circuitry described here is entirely solid state. Cost has been cut by about £6.00 by leaving out ten reed relays, shunt diodes and several other components. However two more low cost IC's are needed, a 7413 and a 7408. Also a 74141 decoder has been used instead of the 74145.

In the power supply section the 7V supply is not required, and a 60V supply has to be found. This is simply achieved, because the ringing supply is no longer required and the same transformer can be used to produce this 60V supply.

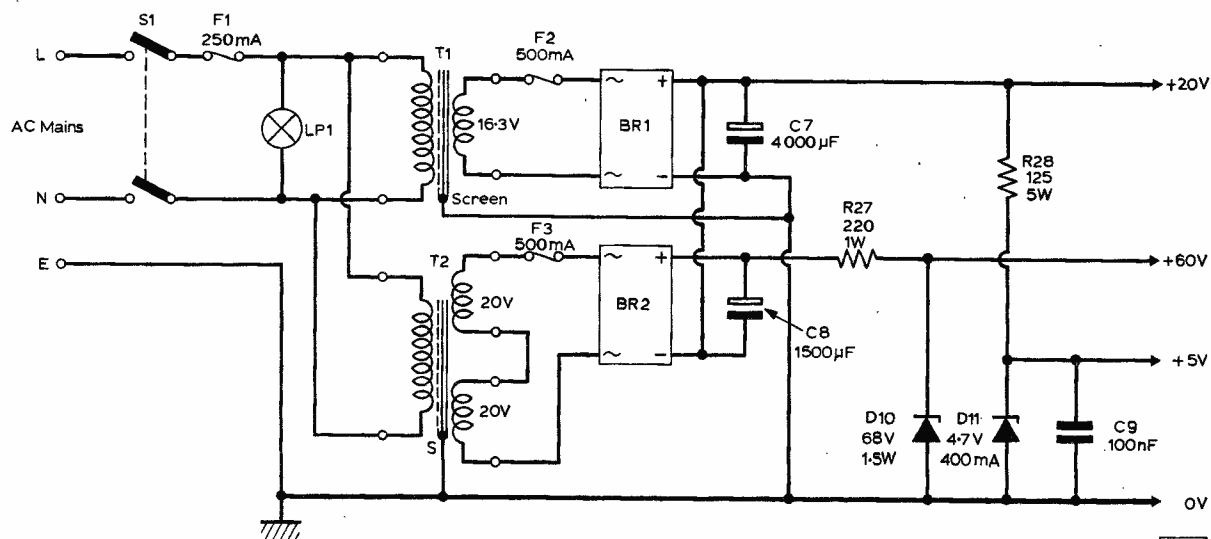
Circuit operation is identical so far as counting and generating the ring pulse is concerned. How-

ever a transistor, Tr1 is used to detect the dial pulse instead of RLA.

Circuit description

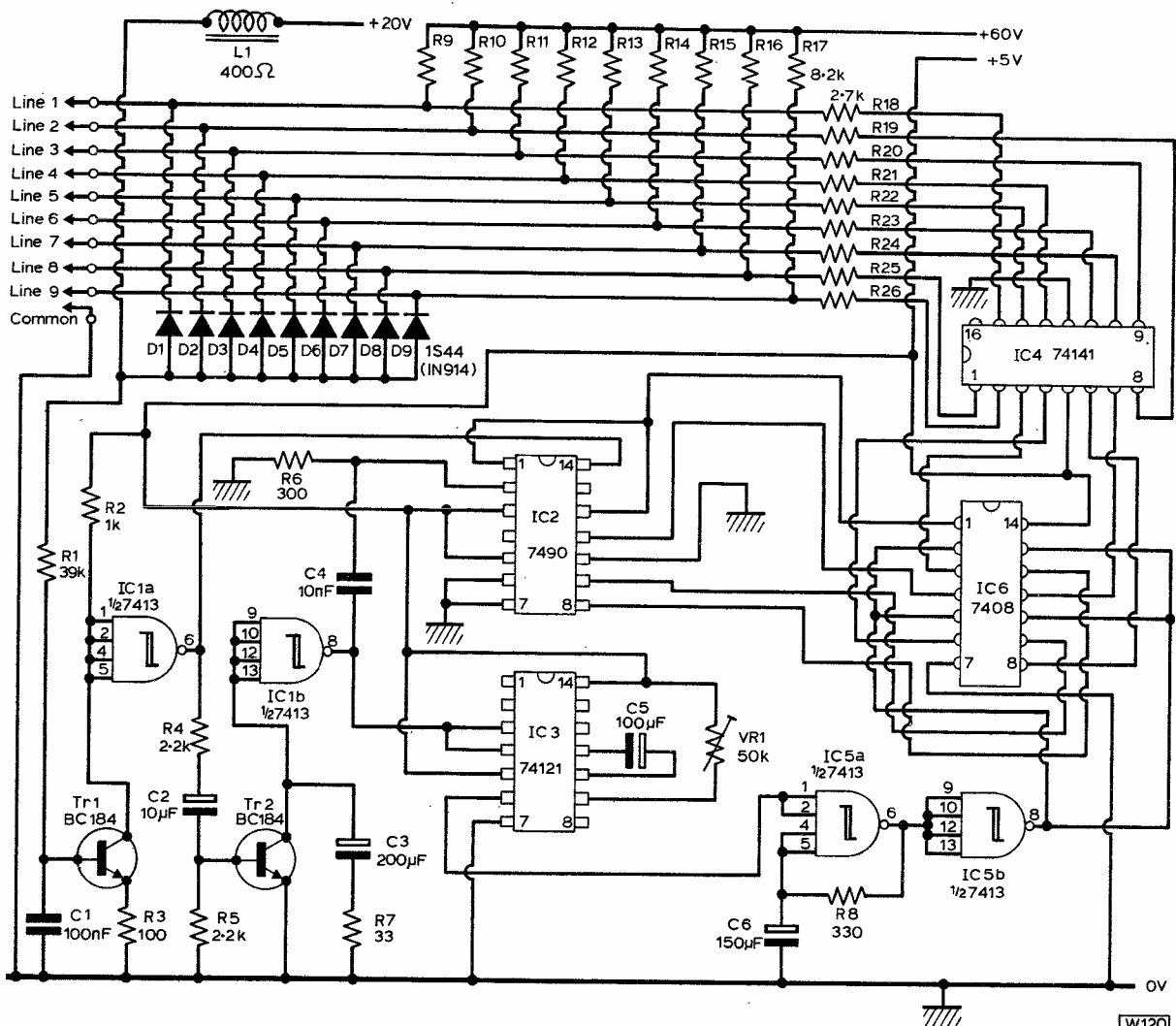
The major difference to the circuitry is in the way the selected line is rung. The binary output of IC2 is fed to the decoder, IC4, through AND gates. IC5b is normally low and until it goes high the decoder will not operate. At the end of the dial period the monostable IC3 goes high for the duration of the ring pulse. IC5a is enabled and produces a pulse train with a frequency of 16Hz. This is now inverted by IC5b and the pulses enable the AND gates of IC6. The decoder is thus pulsed on and off at 16Hz.

When IC4 is in the ON mode, it decodes the binary



[W121]

Modified power supply using both secondary windings of T2 linked in series to give a +60V output. This is at the expense of the 'Ringing' supply.
Practical Wireless, March 1976



Complete circuit diagram of the modified home telephone exchange. Notice the absence of reed relays and shunt diodes and the introduction of two new IC's which carry out the same tasks.

output from IC2 and the selected decimal output goes low. This output is now connected to the called telephone line through 2.7kΩ resistors. Normally the line is at a potential of 60V, but when the decoder operates to the ring pulse, this drops to about 15V. The result is that a 45V AC voltage at 16Hz is superimposed on the called telephone line and this rings the magneto bell.

There are however two disadvantages, neither of which is of much significance in a home telephone

system. Firstly the transmission efficiency is slightly lowered by the shunting effect of the 2.2kΩ resistors. Secondly the bell ringing is not as loud nor as shrill as with a 60V pp voltage at 50Hz. In normal home circumstances, however, this can be an advantage! Moreover there is no possibility of the called subscriber getting an acoustic shock if the receiver is put to the ear before the ringing has stopped. In such circumstances, the AC voltage across the receiver is barely audible.

Resistors

R1 39kΩ
R2 1kΩ
R3 100Ω
R4 2.2kΩ
R5 2.2kΩ
R6 330Ω
All ½W 5%

R7 33Ω
R8 330Ω
R9-R17 8.2kΩ
R18-R26 2.7kΩ
R27 220Ω 1W
R28 125Ω 5W
VR1 50kΩ min. preset

Capacitors

C1 100nF 6V
C2 10μF 6V
C3 200μF 6V
C4 10nF 6V
C5 100μF 6V

C6 150μF 6V
C7 4000μF 40V
C8 1500μF
C9 100nF

Semiconductors

Tr1 BC184
Tr2 BC184
IC1 SN7413
IC2 SN7490
IC3 SN74121
IC4 SN74141
IC5 SN7413

IC6 SN7408
D1-D9 1S44 or 1N914
D10 BZX61 68V 1.3W zener
D11 BZY88 4.7V 400mW zener
Br1/2 1A bridge rectifiers

Miscellaneous

F1, 250mA anti-surge. F2, 500mA. F3, 500mA.
L1, 400Ω choke. LP1, mains neon indicator. T1, mains transformer/16.3V. T2, mains transformer/20+20V. S1, DPST toggle switch.

Henry's Radio

LARGEST SELECTION OF ELECTRONIC COMPONENTS AND EQUIPMENT.
LOW PRICES— MEAN LESS VAT.

Have you seen this years most important component catalogue yet?

HENRY'S CATALOGUE IS NOW AVAILABLE



ONLY 50p

+20p p & p

Get your copy NOW send remittance of 70p (cheque or P.O.)

Don't buy another electronic component until you've consulted the Henry's catalogue. It's packed with more items than ever before—over 5000 in all, making the Henry's range of electronic components the largest in the UK for the home constructor.

There are literally dozens of new lines and new ranges to get excited about! And many components are selling at reduced prices. Get your copy soon, and start reading these 200 pages of vital statistics about electronic components.

Complete with
FREE 50p
Discount Voucher

FREE to Educational
Establishments when
ordered on official
headed note-paper

ELECTRONIC COMPONENTS AND EQUIPMENT

More selection - Bigger Stocks for every purpose. Let us quote for your requirements. (Please enclose SAE with all enquiries).

ALL HENRY'S PRICES ARE NOW INCLUSIVE OF VAT

TAPE HEADS P.P. 15p

Marriot XRSP/17½ Track High £3.15
Marriot XRSP/36½ Track Med. £6.75
Marriot XRSP/63½ Track High £2.20
Marriot Erase Heads for XRSP 17/18/36 (XES11) 95p
Marriot BX12E34 ½ track erase 95p
R/RP Record/Play ½ Track 55p
H/RP Single Track Rec/Play 45p
Miniature Stereo Cassette Rec/Play £2.70

UHF TUNERS

625 line receiver UHF transistorised tuners UK operation. Brand new. (Pst/packing 25p each).
TYPE A variable tuning. Slow motion drive £3.50
TYPE B 4-button push-button (adjustable) £4.60
TYPE C variable tuning £2.90
TYPE D 6-button UHF/VHF £5.25

EMI SPEAKERS SPECIAL PURCHASE

13in x 8 in chassis speakers. (carr./packing 30p each or 50p pr.)
350 20 watt 8-15 ohm with tweeter £10.05 each
*Polished wood cabinet £6.00 carr., etc. 35p each or 50p pair.

New from Henry's Radio!

HENELEC RADIO CONTROL SYSTEM

Proportionally Controlled switch to minimise power consumption and extend battery life. Specially designed to provide aircraft and boat modelmakers with a low-cost, easy-to-use radio control, the Henelec System gives you everything from single channel, up to sophisticated 7 - channel Digital Proportional System! Buy the components you want. Ideal for any radio control application. Use with servos, or with our P.C. Switches for relay outputs. Or both.

Simple transmitter £11.75
PC board for above 75p
Case for transmitter £1.25
7-channel add-on kit £9.95
Basic receiver £6.95
Single-ch. add-on for above £2.95
7-channel decoder for receiver £4.25
Proportionally controlled switch £3.50

ELECTRONIC FOOTBALL & TENNIS WITH THE FABULOUS VIDEO SPORT ON YOUR OWN TV

Play three exciting electronic ball games. FOOTBALL, TENNIS, HOLE IN THE WALL on your own TV! Just plug Video Sport into the aerial socket of your TV and away you go. Completely safe for you, your children and your TV. Mains operated.



OUR INCREDIBLE PRICE £29.50
Carriage & Packing 50p. inc. VAT
DEMONSTRATIONS NOW IN ALL CENTRES

8 DIGIT POCKET ELECTRONIC CALCULATOR

SINCLAIR

Cambridge Kit £9.50
Cambridge Built £10.65
Scientific Kit £13.50
Scientific Built £14.45
Cambridge Memory £14.45
Oxford 100 £11.85
Oxford Mains Adaptor £3.15



SPECIAL PURCHASE MULLARD TYPE LP1179 AND LP1171 AM/FM TUNER MODULES

These two modules together form a high quality AM/FM tuner covering the long medium and VHF broadcast bands. Requires only 16 resistors and capacitors and a switch to complete. Supplied with circuits and spec. data.

LP1179

FM Coverage 87-108 MHz
Bandwidth 300KHz
Selectivity 35dB
Signal to noise at limiting threshold 40dB
Audio output 75mV



LP1171

AM Bandwidth 6-5KHz
Sensitivity 1mV
Built-in AGC
Supply 6V negative earth
LP1179 and LP1171 £4.80 each or £8.63 pair.
C & P 30p. Suitable Ferrite Aerial 83p.



MULLARD MODULES

LP1157 AM/TYPE £2.84
LP1185 10-7 I.F. Unit £6.81
LP1186 10-7 F/M Tuner £7.31
Gorlier Perm. F/M Tuner £5.03

TEXAN-BEST-SELLING IC amp of the '70s!

Build the Texan stereo amplifier, then you can be doubly proud! For a start, you'll own a superb home entertainment unit. And have had all the pleasure of doing it yourself, with the Henry's kit.

The name behind every Texan amp is designer Richard Mann of Texas Instruments. He designed it especially for Henry's, the sole U.K. distributors.

Look at the Texan specification. Output 20 watts per channel.

Fully integrated stereo preamp and power amp. Less than 0.1% distortion at 1kHz.

And so on...

KIT PRICE £35.00, inc. VAT plus 50p p. & p.

Built and tested £45.00, inc. VAT plus 50p p. & p.

THE NATURAL FOLLOW-ON - THE TEXAN FM TUNER KIT!

Features advanced varicap tuning. Phase lock loop decoder. Professionally designed circuit. Everything you need is in the kit.

KIT PRICE £26.25, inc. VAT plus 50p p. & p.

Built and tested £31.20, inc. VAT plus 50p p. & p.



AM/FM AND DECODER BOARD

Containing Mullard Modules LP1185, LP1186 and LP1181 with MC1310 decoder IC on compact printed circuit board. Ready aligned, requires only Ferrite Aerial Tuning Gang and AM Oscillator Coil, Tuning Pot and Zener. 15V supply.

output 300mV, 75 ohms ariel input. Input circuit and instructions supplied. £16.50 inc. VAT & Postage.

SINCLAIR SPECIAL PURCHASES

*Project 60 stereo preamp £7.94 (p. 20p)
*Project 605 Kit £23.44 (p. 25p)

TEST METERS AND TEST EQUIPMENT



TE 22D AUDIO GENERATOR

SPEC as TE22

£26.50

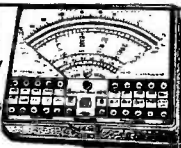
FE 400, 10 in 1 Mini-lab. 10 instruments in one, voltmeter, ohmmeter, resistance sub. box, capacitor sub-box, field strength meter, 9 volt power supply £16.75.

C1000M Multitester

Compact Test for Batteries, Car Electronics, house wiring etc. 1KΩ/V. £5.08

ICE 680R

Compact Precision multi-meter 20KΩ/V 10 fields of measurement and 80 Ranges 1% accuracy. Damped movement. Mirror Scale. Supplied with loads, Accessories and Shatterproof case. £19.98



Accessories for 680R

ICE 6803 Electronic Adden Amp £22.88
ICE 682 Transistor & Diode Tester £12.90
Hi Voltage Probe £2.80
Temperatures Probe £12.90
Gauss Meter £12.90
Current shunts 5-100A £4.85

Microtest 80

Pocket Precision Multi-meter 20KΩ/V 2% Accuracy 40 Ranges. Shatter Proof Case, Mirror Scale Auto-zeroing ohms range £12.50



TE 22 AUDIO GENERATOR

20-200 KHz in 4 bands. Sine and Square output

Max output 7V

Varior Dial

£25.00



TE40 AC MILLIVOLTMETER

1mV-300V, 1-0Hz-2mHz

±dB. Twin 0-10, 0-3-14

Scale with dB scaling

Input Impedance 11MΩ

Attenuator calibrated in 10dB stops. £26.50



TE 65 VACUUM TUBE VOLTMETER

6" scale, 1.5-1500V, Resistance Range to 100MΩ.

Appearance similar to TE-40

RF22 RF Probe for TE-65 £24.30

HV20 30KV Probe for TE-65 £3.18

£3.78

TE-15 GRID DIP OSCILLATOR

Absorption Wavemeter

400KHz-280mHz in 6 Ranges

Battery operation £21.54



TWO NEW STORES NOW OPEN

If you live in the Midlands come and see our new components section at **94-96 UPPER PARLIAMENT STREET, NOTTINGHAM.** Phone Nottingham 42668.

Components are back in Tottenham Court Road.

Try our new store at **231 TOTTENHAM COURT ROAD.** Phone 01-580 3459

YOUR NEAREST STORE

LONDON

EDGWARE ROAD LONDON W2

40/48 Electronics Centre & Supermarket 01-402 8381

303 Balgoin Centre

309 Electronics Supermarket

TOTTENHAM COURT ROAD W1

231 Electronics Centre & Supermarket 01-580 3459

OUT OF TOWN NOTTINGHAM

94/96 Electronics Centre Nottingham 42668

ALL MAIL ORDERS TO 303 EDGWARE ROAD W2

Prices correct at time of preparation.

Subject to change without notice. E & OE.



Barclaycard & Access welcome
ALL PRICES INCLUDE VAT

PRECISION PETITE LTD.

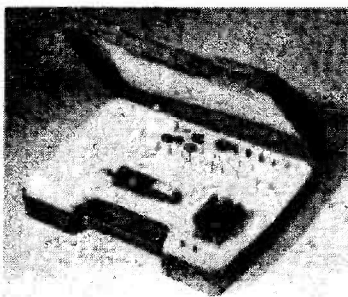
119A HIGH STREET,
TEDDINGTON TW11 8HG

Tel. 01-977-0878

INTRODUCING A
MINIATURE
PRECISION 12V. D.C.
DRILL DESIGNED FOR
THE ELECTRONIC
ENGINEER



Mk II Drill
only £8.00 p.p. 35p
Stand £3.76 p.p. 35p



Complete kit as illustrated (less batts.)
with a variety of 30 tools. Space for
Stand and Transformer.

KIT 30 TOOLS £16.00 p.p. 75p
STAND £3.76 p.p. 35p
TRANSFORMER £5.50 p.p. 75p

**S.A.E. FOR
DETAILS**

Wire Wound Resistors. Our selection
of mixed valves. 30 for £1.40. 100 for
£3.50.

Audio Amplifier Module. Mullard
LP1173. Output nominal 10 watt.
Supply voltage +24vt. With data and
circuit. £2.30.

Varicap Control Selector. 4 way
25K. £1.50. 6 way 14.5K. £2.00.

Mains Droppers. 10 mixed values
£1.00.

Edgewise Level Meters. 200µA. Size
3" overall 50p.

15 Assorted Switches. Micro, push
button, etc. £1.90.

Tag Strips. 3 way to 7 way. 50 for
£1.15.

Chrome Plastic Knobs. 3 Types 4 off
each with spring clip. £1.25.

Repanco & Denco Coils. New boxed,
our selection. 5 for £1.15.

Ferguson Stereogram Chassis.
Model 3357. All transistor. Med/LW.
FM. 3 watts per channel S/M. With
connection data. Less tuning scale.
£18.00. P/P free.

Ferguson Stereogram Chassis.
MW. LW. FM. With tuning scale (5+5
watts sine wave) 15 ohms £26.25.
P/P free.

Repanco Transformers. AF1. AF2.
TT45. 46. 47. 49. 53. 20p each.

Crystals HC6U. (MHz) 12700; 12891.6;
9455.55; 9530.55; 9087.5; 9456.25;
52.01667; 52.02500; 37.7625; 51.56667;
52.03333; 9090.62; 9531.94; 9533.33.
50p each.

Transfilter. 455KC. AM. 5 for £1.00.

Electrolytics. 32/32µF. 325v. 2" x
1 1/4" 35p; 80µF 150v 1 1/4" x 1" 20p;
2000µF 30v 2 1/4" x 1" 25p; 2000µF 35v
3" x 1" 30p; 470µF 100v 3" x 1 1/4" 25p;
2000/2000µF 25v 2" x 1 1/4" 35p; 700µF
200v 3 1/4" x 1 1/4" 30p; 16/16µF 275v 1 1/4" x 1"
20p; 40/40/20µF 275v 3" x 1" 50p;
4500/900/900µF 30v 2 1/4" x 1 1/4" 50p;
2500µF 40v 2 1/4" x 1 1/4" 40p; 470µF 25v
1 1/4" x 1 1/4" 15p; 4000µF 25v 3" x 1 1/4" 40p;
32µF 450v 1 1/4" x 1" 30p; 8µF 16µF 450v
1 1/4" x 1" 30p; 1000µF 12v 1 1/4" x 1" 15p;
5000µF 50v 2" x 1 1/4" 50p; 150/200/200µF
300v 3" x 1 1/4" 50p.

Try our parcel of small capacitors 20
mixed values £1.50 + post.

Miniature Presets—Selection of vari-
ous values 10 for 65p.

Coil Formers. 50 mixed. £1.25.

Slider Volume Controls. 1K Lin;
100K Log; 1 Meg Log; 25K Lin; 25K Log;
10K/100K Log; 100K/100K Log; 50K
Log. 35p each.

U.H.F. 625. Transistor push button
tuner (NSF Telefunken), as used on
Decca MS2400. Brand new and boxed.
Circuit diagram supplied. £3.00.

Thorn T.V. 1F. Chassis 950 Series
(less valves) £1.60.

Aluminium Chassis. 7 1/4" x 5 1/4" x 2 1/4"
65p. 10" x 7 1/4" x 2 1/4" 75p. 11" x 7 1/4" x 2 1/4"
85p. + 8%.

500 Metres. 1/-0148 TC. Single poly-
thene lapped screen wire. £5.00 + 8%.

Please add 10% P/P. Unless stated
free P/P. VAT 25% to be added to
total order unless stated 8%. No
goods despatched outside U.K.

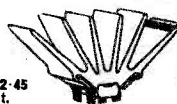
SURPLELECTRONICS

216 LEAGRAVE ROAD,
LUTON, LU3 1JD, BEDS.

JC12 AMPLIFIER

6W IC audio amp
with free data
and printed
circuit £2.80

Special offer:—only £2.45
if bought with de luxe kit.



DE LUXE KIT FOR THE JC12

Includes all parts for the printed circuit and
volume, bass and treble controls needed to
complete the mono version £2.29. Stereo model
with balance control £4.95.

JC12 POWER KIT

Supplies 28V 0.5 Amps £2.95.

PREAMP KITS FOR THE JC12

Type 1 for magnetic pickups, mics and tuners.
Mono model £1.75. Stereo model £3.25. Type 2
for ceramic or crystal pickups. Mono £0.95.
Stereo £1.90.

SEND SAE FOR FREE LEAFLET ON KITS

SINCLAIR

IC20

AMPLIFIER

SP20 10W 4Ω loudspeaker £2.95

SEND S.A.E. FOR FREE DATA LEAFLET

IC20 10+10W stereo amp.
kit with free booklet and
printed circuit £2.50

PZ20 power supply kit for
above £3.91

VP20 volume, tone control
and preamp kit with printed
circuits £7.95

BATTERY ELIMINATOR BARGAINS

4-WAY SPECIAL

Switched output of 3 1/4/6/7 1/2/
9/12V at 500mA with unique
4-way multi-jack connector
and free matching socket
£4.95

3-WAY MODEL

Switched output of 6/7 1/2/9V
at 250mA with unique 4-way
multi-jack connector and free
matching socket £2.95

RADIO MODELS

50mA output with poppet
battery connectors for transistors
for radios etc. 6V £2.95. 9V
£2.95 Double 4 1/2+4 1/2V £3.95.
6+6V £3.95. 9+9V £3.95.

TAPE RECORDER MAINS UNITS

7 1/2V output complete with 5 pin DIN plug to run
cassette tape recorders from the AC mains £3.45.

SINCLAIR CALCULATORS

Cambridge £3.95

Scientific £12.95

Oxford 100 £8.95

Cam. Mem. £14.95

Oxford 300 £22.95

Programmable P.O.A. £3.15

MAINS UNITS

For Oxford Series £3.19

For Cambridge, Cam.

Mem. and Scientific

CBM CALCULATORS

*776MD 7 digits/%memory £7.16

*887D 8 digits/%memory/constant £9.95.

385R 8 digits/constant/%rechargeable £10.85.

*GL976MD £9.50. GL976MR £13.60.

*GL976D £11.95. GL976R £15.30.

*SR7919D 8 digits/memory/scientific notation/
π/trig/log/power/roots £13.95.

SR4148R £39.95. Mains unit for * machines £2.95.

All others include mains charger unit.

FERRANTI ZN44

IC radio chip with data £1.69. Printed circuit and
extra parts for radio £3.60. Case £1 extra. Send
sae for free leaflet.

SINCLAIR PROJECT 80

AFU £7.55. FM tuner £13.25. Decoder £8.55.

Z40 £3.75. Z60 £8.95. PZ8 £8.20. Trans for

PZ8 £3.40. Stereo 80 £7.50. PZ5 £3.95. Project 805

£18.95. PZ6 £8.70.

S-DECS AND T-DECS

S-DeC £2.24

T-DeC £4.05

µ-DeC A £4.45

µ-DeC B £7.85

IC carriers:—

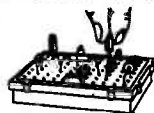
10 all: plain £1.18

With socket £2.21

10 TOS: plain £1.09. With socket £2.08

SS1 3 for £2. SSU1 3 for £2. SSN1 3 for £2.40.

25p off any order accompanied by PB Electronics
coupon.



SWANLEY ELECTRONICS

Dept. PW, PO BOX 68,
SWANLEY, KENT.

Prices include post and VAT.
Official orders from schools etc. welcome.
Overseas customers please deduct VAT (8% on
Calculators and S-Dec and T-Dec range, other-
wise 25%).

Radio Break-through

A look at interference in Hi-Fi equipment..... Part 2

H. LEEMING G3LLL, FSERT, T. Eng. (CEI)

IN Part 1 it was shown how the addition of a few capacitors at strategic points could greatly reduce or even eliminate radio interference break-through in audio amplifiers.

The addition of these components cannot have added more than pence to the cost of the amplifier, but the improvement was dramatic. Previous to the modification the noise produced by my own A21 as the 'fridge cut in was nerve-shattering, but now we cannot even hear it at all! Transmitters which previously produced a deafening response from a distance of 100m or more, now hardly produce a whisper with the aerial mounted, for test purposes, in the same room as the hi-fi installation.

From the above experience it would seem that there is now no reason at all as to why audio equipment should not incorporate RFI protection measures as standard practice the component costs being negligible. From the makers point of view RFI protection has much to recommend it. Apart from gaining greater customer satisfaction, manufacturers can, it would seem, reduce the cost of returns under guarantee by introducing these simple measures. Transistors, as readers will be aware, do not usually fade out like valves but suddenly "depart" leaving little evidence of the reason for their breakdown. Indications would seem to point to the fact that many transistor failures have been due to the effect of "spikes" on the mains supply voltage and there is direct proof that at least two hi-fi amplifiers blew their driver transistors at the same instant as the mains suppressor capacitor broke down, being a very strong indication of some high voltage transient.

Certainly the Sugden amplifiers, whilst being quite reliable in the first place, seem to have developed an almost phenomenal reputation for reliability since the RFI components were put in as standard and we can only presume that this is due to these components excluding mains transients from the circuit.

EXTERNAL CURES

Having now seen how protection can be built into audio equipment, let us next look at what can be done externally when the makers' attempts (or lack of same!) at RFI protection prove inadequate under a particular set of circumstances. The natural reaction of the non-technical user to the advent of RFI is to blame the source of radiation. Whilst it might be possible to suppress refrigerators and other switched appliances you can not, as suggested by one dealer, in reply to an RFI complaint, "get the GPO to suppress the transmitter" as the whole purpose of transmitting equipment is to radiate electro-magnetic waves. Apart from the very

occasional case therefore, where it may be possible to minimise a particular RFI problem by altering the type or position of the transmitting aerial, there is very little that the operator of a licenced radio transmitter can do to cure RFI problems. The onus of solving the trouble therefore falls on either the user of the audio equipment, or on the dealer who has supplied it.

It is worth pointing out here that it would seem that under recent legislation the retailer is liable to see that goods sold are "reasonably suitable for the purpose for which they are intended". I am no lawyer but I take it that if a customer of my company suffers a complaint of severe RFI with new high fidelity equipment which we have supplied, my company is at least morally liable, and more than likely, legally liable to sort out the problem. (*Perhaps on this point any reader who is better qualified to express a legal opinion might like to drop a line offering his comments to the Editor, whom I am sure will find room to publish anything dealing with this rather interesting question.*)

OUTSIDE LEADS

Fortunately, most audio system RFI troubles are due to signal pick-up on external leads which act as aerials. In general, low frequency radio signals tend to come in via the mains supply, signals at say 1 to 10 MHz via the speaker and VHF aerial connecting leads, and higher frequency signals tend to be received on the gram and radio connecting leads. This must only be taken as a very rough guide though, and the only way to be sure which lead is causing the trouble is to disconnect them one by one so that it can be ascertained as to how the RFI is entering the circuit.

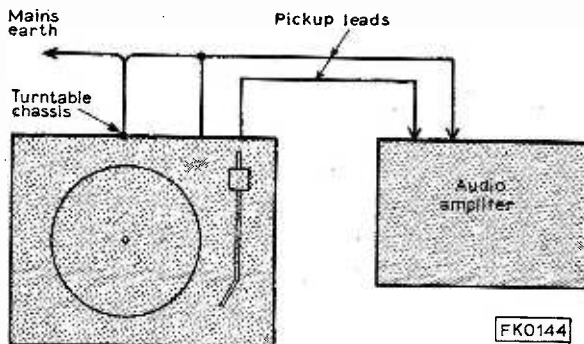


Fig. 5: If a turntable and amplifier are wired as shown here there is a risk of interference problems due to the common earth wire.

Where the loudspeaker leads are concerned, these should either be shortened to only a few inches whilst tests are made, or the leads should be disconnected externally and a test made via headphones fed through isolating resistors of say 220Ω each, so as to “choke off” the ‘phone leads, from an RFI point of view. Don’t forget to try disconnecting the earth and mains leads by pulling out the three-pin mains plug quickly, whilst the unit is operating. If the RFI fades out with the music, coupling via the mains is not to blame, but if it clears for the second or so that the equipment continues to operate from the charged up reservoir capacitors it can be taken that the interference is arriving via the mains or earth connections to the plug.

Whilst disconnecting leads do not forget to try disconnecting the FM aerial feeder, even if the trouble only occurs on gram. The coaxial cable makes a very good medium and short wave receiving aerial, and in some cases of RFI, the trouble will disappear if the VHF aerial is disconnected whilst playing records!

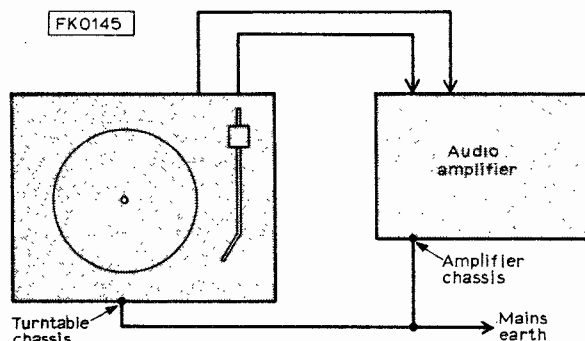


Fig. 6: Here the earth wire to the two chassis is separated from the pick-up leads.

Once it is established as to which leads seem to be causing the trouble, a general tidying up of the system can be tried, and will often work wonders. Leads are frequently much too long tending to increase their effectiveness as aerials. At this juncture however, do **not** cut the leads to shorten them as the extra length may be needed, but coil any excess length up into the smallest possible separate coils immediately at the rear of the amplifier. Besides reducing the effective length of the “aerial” such a coil tends to act as an RF choke, and where the trouble is not too bad, may be sufficient to effect a cure.

If the RFI appears to be coming along the gram pick-up leads it is as well to examine the earthing arrangements, as wiring the gram unit as Fig. 5 tends to send any RFI received on the earth lead straight into the amplifier’s input. Wiring the unit as Fig. 6 is far less likely to lead to trouble.

TIDYING UP

Having generally checked over the wiring of the system, tidying it up as necessary and sorting out which leads still seem to be acting as aerials, the final approach is to stop the offending leads passing on the radio frequencies to the amplifier. This can be done quite simply by the use of ferrite cores or ferrite aerial rods, as shown in Figs. 7, 8 and 9. If plenty of spare lead is available the original lead can be wound round the ferrite, otherwise adaptors

can be made up using a length of lead, a plug and a socket. The number of turns used is not critical and few turns only will be required to cure troubles in the VHF range, whilst 20 or 30 turns may be needed to cut out transmitters in the short wave bands. Note that the turns of wire should **not** be overlapped, so whilst a full core will be reasonably effective, even on the medium wave bands, two in series may occasionally be necessary at the lower frequencies.

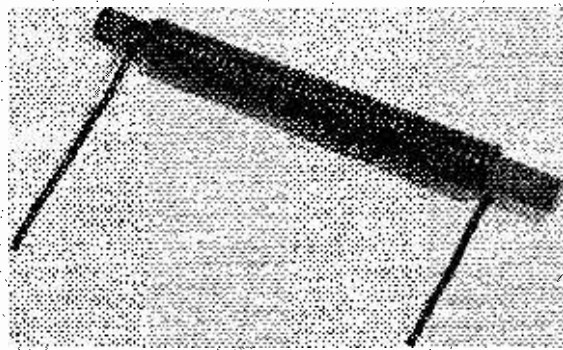


Fig. 7: Interference being picked up on a lead can often be reduced or eliminated by winding the lead on a ferrite rod as used in ferrite rod aerials.

Whilst on the subject of frequencies, it is almost too obvious to state that a much more intelligent approach to any RFI problem will be made if the frequency of the transmitter being received is known. With broadcasting stations this should not present much difficulty but with other stations, such as taxi services, details of the frequency may not be readily available so perhaps the simplest way is to ask the operators! Failing this, a glance at the aerial system used by the transmitter will usually give some indication as to the approximate frequency. Stations using the VHF band usually have aerials with elements not more than a few metres long, whilst stations on the short wave bands will either use wire aerials or beam aerials with the elements 5m or more long, usually.

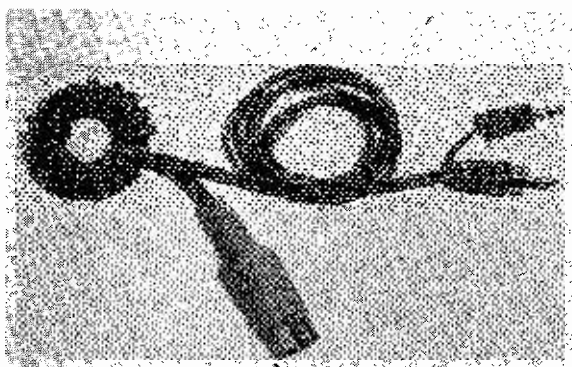
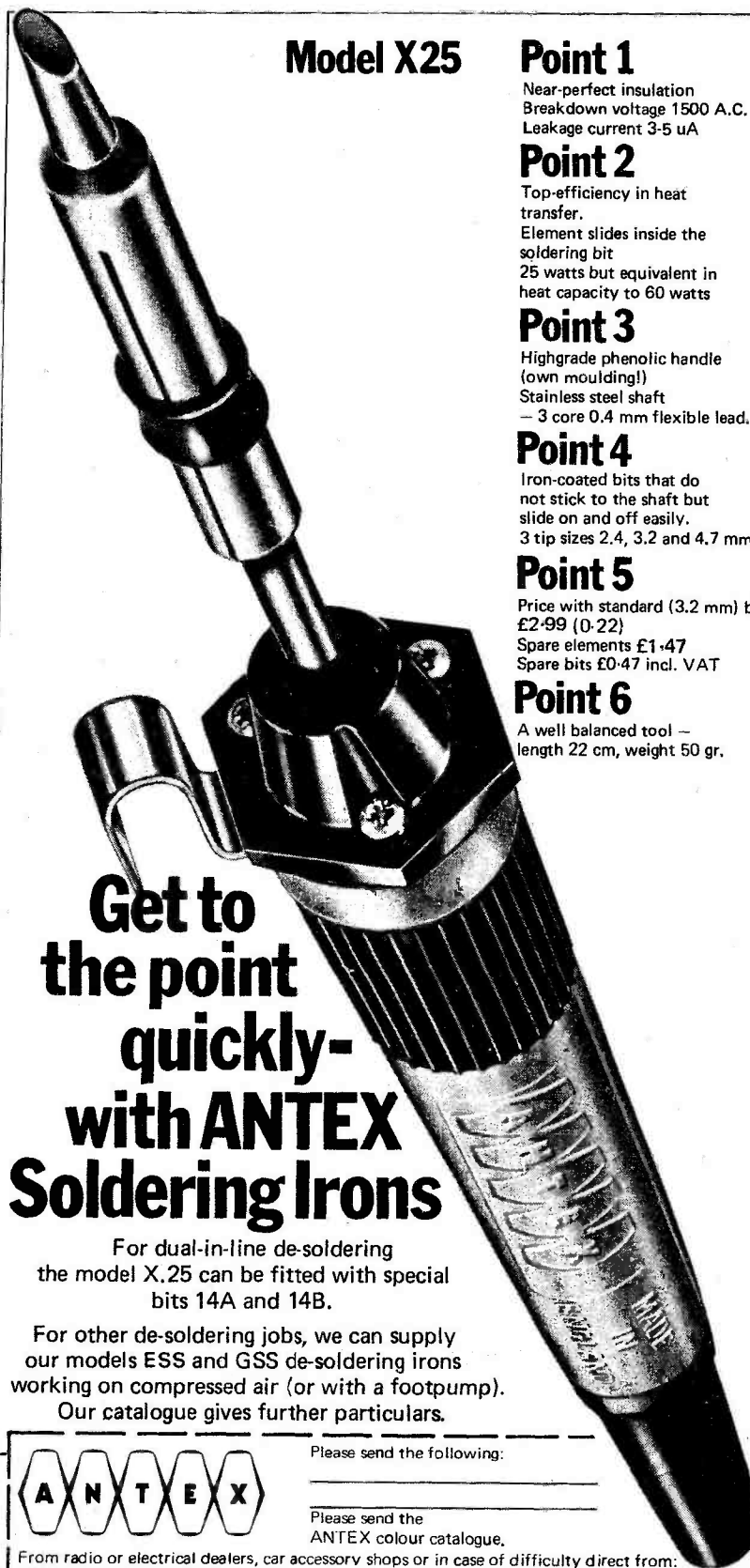


Fig. 8: Twin leads wound on a ferrite ring will be even more effectively decoupled than when using a ferrite rod.

The ferrite core treatment will be found extremely effective and is especially advised where it is not desirable to make any internal alterations to equipment. It is equally applicable to all the inter-connecting leads and also functions well if used on the mains lead to act as a mains filter. As an alternative, where troubles due to interference arriving via the mains



Model X25

Point 1

Near-perfect insulation
Breakdown voltage 1500 A.C.
Leakage current 3-5 uA

Point 2

Top-efficiency in heat transfer.
Element slides inside the soldering bit
25 watts but equivalent in heat capacity to 60 watts

Point 3

Highgrade phenolic handle (own moulding!)
Stainless steel shaft
— 3 core 0.4 mm flexible lead.

Point 4

Iron-coated bits that do not stick to the shaft but slide on and off easily.
3 tip sizes 2.4, 3.2 and 4.7 mm.

Point 5

Price with standard (3.2 mm) bit £2.99 (0.22)
Spare elements £1.47
Spare bits £0.47 incl. VAT

Point 6

A well balanced tool — length 22 cm, weight 50 gr.

Get to the point quickly—with ANTEX Soldering Irons

For dual-in-line de-soldering the model X.25 can be fitted with special bits 14A and 14B.

For other de-soldering jobs, we can supply our models ESS and GSS de-soldering irons working on compressed air (or with a footpump).

Our catalogue gives further particulars.



Please send the following:

Please send the ANTEX colour catalogue.

From radio or electrical dealers, car accessory shops or in case of difficulty direct from:
ANTEX LTD. FREEPOST, PLYMOUTH PL1 1BR (no stamp required) Tel. 0752 67377.

The Antex Range

All prices include VAT. P&P in brackets

MODEL C — 15 watt miniature soldering iron
Bits slide on and off stainless steel shaft. Elements fitted inside steel shaft for efficient heat transfer. Length 16 cm. Complete iron with 2.3 mm. iron-coated bit £2.99 (0.22) Spare elements £1.20 Spare bits £0.35 (nickel) £0.45 (iron-coated).

MODEL G — 18 watt miniature soldering iron
Looks exactly like model C, but because of the extra 3 watts should be kept going all day on repairs or production. Stainless steel shaft — fitted with standard iron-coated bit 2.3 mm. £3.21 (0.22) Spare elements £1.69 Spare bits 2.3, 3 or 4.7 mm. £0.45.

MODEL CCN — 15 watt miniature soldering iron
Unique — ceramic shaft — no measurable leakage — capacitance 30 pf. Tested at 2000 volts A.C. Length 16 cm. Complete with standard iron-coated bit 2.3 mm. £3.21 (0.22) . 4 other slide-on and-off bits available from £0.45 Spare elements £1.69. Suitable for the most delicate soldering job imaginable.

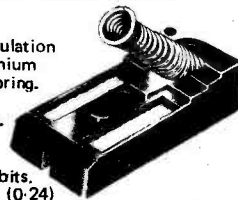
MODEL X.50 T.C. — 50 watt temperature controlled soldering iron
Leakage current negligible — Temperature controlled to 20°C either way. Ceramic shaft inside stainless steel shaft. Tested at 2000 volts A.C. Complete with 3 mm. iron-coated bit £10.55 (0.27) Normally set at 370°C Length 20 cm. Weight 50 gr.

MODEL SK.1 — SOLDERING KIT
Fitted with model C miniature iron (see above), 2 spare bits 2.3 and 4 mm., heat sink, reel of solder. Plastic base serves as stand. Booklet "How to Solder" gives useful tips for beginners. Price £4.62 (0.42)

MODEL MLX — 12 volt — 25 watt Soldering iron with 4% mtrs. lead and crocodile clips
Useful for repairs on motor cars, boats, model trains, etc. Can be worked off car-type battery. Complete with 3.2 mm. bit £3.53 (0.30) Two other bits available 2.4 and 4.7 mm. £0.47 each. Packed in a plastic wallet with guide "How to Solder".

STAND S.T.3

High grade insulation material, chromium plated steel spring. Suitable for all our models. Replaceable sponges, space for spare bits. Complete £1.21 (0.24)



I enclose cheque/P.O./Cash
(Giro No. 258 1000)

NAME

ADDRESS

PRICES INCLUSIVE OF VAT

Add 20p p & p—NO OTHER EXTRAS

TTL BY TEXAS			
7400	13p	7483	86p
7401	15p	7484	103p
7402	15p	7485	130p
7403	17p	7486	32p
7404	17p	7489	291p
7405	17p	7490	43p
7406	41p	7491	81p
7407	39p	7492	48p
7408	17p	7493	43p
7409	22p	7494	81p
7410	15p	7495	70p
7412	25p	7496	84p
7413	34p	74107	32p
7414	65p	74121	32p
7416	32p	74122	52p
7420	15p	74123	73p
7422	19p	74141	70p
7423	36p	74151	77p
7425	33p	74153	92p
7427	40p	74154	164p
7430	15p	74155	82p
7432	28p	74156	82p
7437	28p	74160	107p
7440	15p	74161	107p
7441	70p	74162	107p
7442	64p	74163	107p
7447	81p	74164	130p
7448	75p	74166	136p
7453	17p	74175	92p
7454	18p	74181	322p
7460	16p	74182	89p
7470	29p	74185	146p
7472	27p	74190	155p
7473	32p	74191	156p
7474	32p	74192	130p
7475	48p	74193	130p
7476	32p	74194	116p
7480	54p	74195	83p
7481	103p	74196	140p
7482	75p	74199	197p

CMOS LOGIC			
4000	19p	4016	54p
4001	19p	4017	123p
4002	19p	4018	247p
4009	67p	4022	182p
4011	19p	4023	22p
4013	55p	4024	125p

OP AMPS			
301A	Ext Comp 8 pin DIL	40p	
709	Ext Comp 8/14 pin DIL	30p	
710	Diff Comp 14 pin DIL	54p	
741	Int Comp 8/14 pin DIL	25p	
747	Dual 741 14 pin DIL	76p	
748	Ext. Comp 8 Pin DIL	49p	
776	Prog. OpA TO 99	153p	
CA3130S	CMOS OpA 8 Pin DIL	108p	
LM3900	Quad OpA 14 Pin DIL	75p	
MC1458	Dual OpA 8 Pin DIL	75p	
NE536T	FET OpA TO 99	300p	

LINEAR ICs			
CA3028	Diff. Cascade Amp	112p	
CA3046	S Transistor array	62p	
CA3048	Quad low noise Amps	250p	
CA3089E	FM IF System 16 DIL	250p	
CA3090E	FM Stereo Decoder	200p	
ICL8038CC	VCO Funct. Gen	300p	
ICL8038BC	VCO Funct. Gen	600p	
LM3900	2W Audio Amp	115p	
LM381	Stereo Pre Amp	200p	
M252	Rhythm Gen	1100p	
MC1310P	FM Stereo Dec.	220p	
MC1312/4/5	SQ Quad Dec.	1375p	
MFC4000B	1W Audio Amp	75p	
MFC6040	Electronic Attenuator	112p	
NE555	Timer 8 Pin DIL	40p	
NE556	Dual 555 14 Pin DIL	108p	
NE561B	PLL with AM Demod	350p	
NE562B	PLL with VCO	350p	
NE565	PLL	216p	
NE566	PLL Functon Gen	180p	
NE567	PLL Tone Decoder	180p	
2567	Dual 567	150p	
SN72733	Video Amp	150p	
TBA800	5W Audio Amp	112p	
TBA810	7W Audio Amp	125p	
TBA820	2W Audio Amp	100p	
XR2240	Prog/Timer Counter	400p	
ZN414	TRF Radio Receiver	140p	

Basic data sheet at 10p each + SAE

MM5314 Clock IC 24 Pin DIL 460p

LOW PROFILE SKTS BY TEXAS			
8 Pin 14p,	14 Pin 15p,	16 Pin 16p,	
24 Pin 54p			

Overseas Customers only:
Deduct 5% for order over £20.
Post free for orders over £10.

VOLTAGE REGULATORS (PLASTIC)			
723	1 Amp +ve	-ve	
14 Pin DIL 48p	5V	7805 150p	7905 215p
	12V	7812 150p	7912 215p
Data Sheets on	15V	7815 150p	7915 215p
Vol. Regs. 10p	18V	7818 150p	7918 215p
each	24V	7824 150p	7924 215p

OPTO ELECTRONICS			
OC707	33p	Seven Seg. Displays	LEDs
OC711	120p	3015F	130p
ORP12	54p	MAN 3M	65p (Red)
ORP60	70p	DL704	160p
ORP61	65p	DL707	160p (Green)
2N5777	43p	DL747	250p

SCR-THYRISTORS OTHERS			
1A 50V TO5	43p	BT106 1A 700V	150p
1A 100V TO5	45p	Plastic	
1A 400V TO5	56p	C106D 4A/400V	59p
3A 100V Stud	53p	2N4444 8A/600V	200p
3A 400V Stud	81p	TO66	
7A 100V	87p	2N3525 5A/400V	98p
TO5+HS	87p	TO92	
7A 400V	97p	MCR101 1A/15V	27p
TO5+HS	97p	2N5060 -8A/30V	38p
16A 400V	200p	2N5062 -8A/100V	45p
16A 600V	250p	2N5064 -8A/200V	50p

TRIACS			
100V	400V	500V	
3 Amp	82p	120p	130p
6 Amp	95p	150p	180p
10 Amp	117p	180p	200p
15 Amp	156p	220p	270p

BRIDGE REC- TIFIERS			
1A 50V	27p	1N914	4p
1A 100V	30p	BY100	31p
1A 400V	34p	BY126	15p
1A 600V	37p	BY127	15p
2A 50V	37p	OA47	9p
2A 100V	44p	OA70	10p
2A 400V	56p	OA79	9p
2A 600V	60p	OA81	9p
4A 100V	65p	OA85	11p
4A 400V	69p	OA90	7p
6A 100V	70p	OA95	9p
		OA90	7p
		OA202	9p

TRANSISTORS		
AC126/713p	BU105 175p	2N2484 32p
AC128 12p	BU108 312p	2N2904/5
AC141/220p	MJE340 49p	2N2926 22p
AC176 12p	MJE2955	2N2926RB
AC187/814p	107p	9p
AD149 46p	MJE3055	2N2926 10p
AD161/239p	70p	2N2926YG
AF114/5 18p	MPSA06	11p
AF116/7 18p	107p	2N3053 19p
AF139 35p	MPSA12	2N3054 43p
AF239 43p	62p	2N3055 54p
BC107/8 10p	MPSU06	2N3442 151p
BC109C 11p	78p	2N3702/314p
BC147/8 9p	MPSU56	2N3704/514p
BC149 10p	98p	2N3706 12p
BC157 11p	OC28	2N3707 14p
BC158/9 13p	OC35	2N3708/87p
BC169C 15p	OC71	2N3773 275p
BC177 20p	OC72	2N3866 75p
BC178 17p	OC83	2N3904 22p
BC179 20p	TIP2955 75p	2N3905/622p
BC182/3 12p	TIP29A 50p	2N4058 19p
BC184 14p	TIP30A 60p	2N4060 19p
BC187 32p	TIP31A 60p	2N4289 25p
BC212 14p	TIP32A 63p	4036 41p
BC213 12p	TIP33A 63p	40382 43p
BC214 17p	TIP33A 97p	40410 58p
BCY70 20p	TIP34A	40411 243p
BCY71 20p	124p	40584 81p
BD131 39p	TIP35A	40595 92p
BD132 43p	243p	FETS
BD135 54p	TIP36A	BF244 45p
BD139 70p	297p	MPF102 37p
BD140 87p	TIP41A 70p	MPF103/37p
BF115 24p	TIP42A 76p	
BF167 25p	ZTX108 11p	MPF105 37p
BF173 27p	ZTX300 16p	2N3819 27p
BF194 12p	ZTX300 16p	2N3820 50p
BF195 10p	ZTX504 60p	2N3823 54p
BF257 34p	2N697 14p	2N3825 32p
BFR39/40	2N698 32p	2N3845/932p
37p	2N706 13p	3N128 12p
BFR79/80	2N708 19p	3N140 52p
37p	2N930 19p	3N141 81p
BFX94 28p	2N1131/17p	40603 63p
BFX95/6 27p	19p	40673 54p
BFX87 22p	2N1306 30p	TJ43
BFX88 26p	2N1613 22p	2N2160 86p
BFY50 17p	2N1711 22p	2N2645 32p
BFY51 16p	2N1893 32p	2N4871 37p
BFY52 17p	2N2219 22p	
BRY39 39p	2N2221/17p	PUJ2
BSX19/20	22p	2N6927 60p
	2N2369 15p	

lead are concerned, a commercial type mains filter of the type used to suppress vacuum cleaner interference will also be found quite effective.

As mentioned previously it is quite possible for the coaxial feeder of the FM aerial to pick up local radio signals. The problem is to pass on the wanted FM signal, which is "inside" the cable, without allowing the unwanted signal, which is on the outside

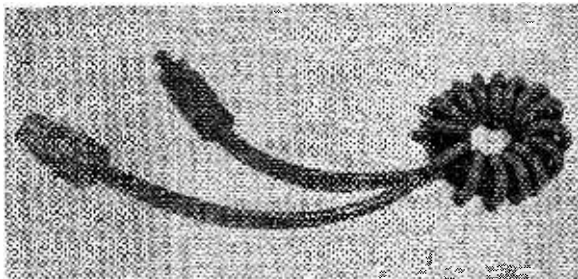


Fig. 9: Coaxial leads can also be wound on a ferrite ring. The leads should be anchored to the core with fine thread.

of the cable, to pass. This can be done as shown in Fig. 10, whilst a practical transformer using a miniature ferrite core, and another type of transformer using only coaxial cable is shown in Figs. 11 and 12. The ferrite transformer gives the minimum loss of wanted signal with the maximum attenuation of RFI, but the coaxial Faraday loop has the advantage of simplicity and does not need any special parts.

SELF-HELP

Perhaps it is worth noting that curing RFI does take a lot of time and patience, particularly as the co-operation of an operator of a radio station may have to be sought, to make test transmissions. The main requirements for solving the problem are not

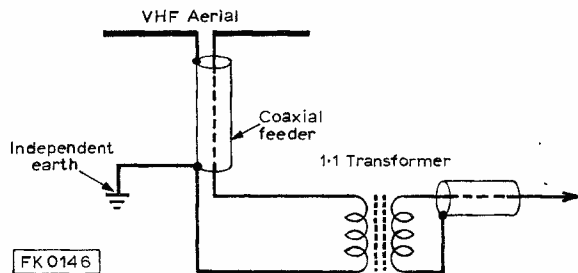


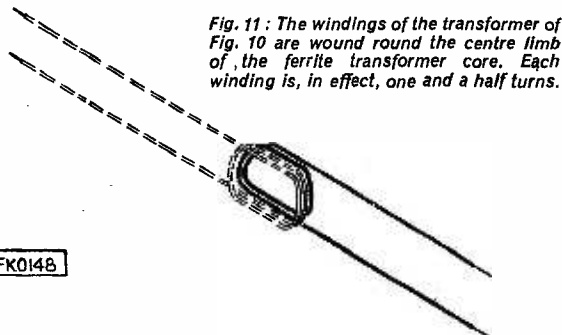
Fig. 10: Method of reducing interference introduced on aerial feeder, using a 1:1 ratio transformer.

technical skill, but trial and error which can be extremely time consuming, hence unless the equipment is new and is attended to free under guarantee the cost of getting an outside technician to do the work for you, could well be exorbitant. The best approach therefore is self-help, although it is always worthwhile writing to the manufacturer of the equipment to see if they have any standard remedies that are simple to apply.

If, after trying your best, you do require further help it will usually be well worthwhile having a word with the local Post Office interference engineers.

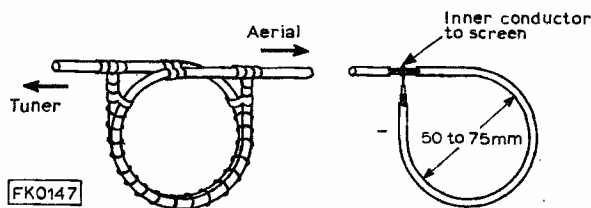
Where the amateur radio operator is concerned the problem is often in "reverse", being one of a

Practical Wireless, March 1976



FK0148

neighbour's complaint of "interference". Here the difficulty is one of, first, delicately pointing out the position. A statement on the lines of "Yes, it is a nuisance, lots of audio equipment pick up refrigerators and radio transmitters due to inadequate protection in the design" may be a good start, as the owner of an inadequately protected high-fidelity installation is more than likely to be suffering from the electrical noise from his own refrigerator. If the equipment is relatively new and under guarantee, suggest that the owner contact his dealer and state that test transmissions can be made to help them cure the fault. Don't get into any



FK0147

Fig. 12: Method of constructing the Faraday loop form of coupling transformer.

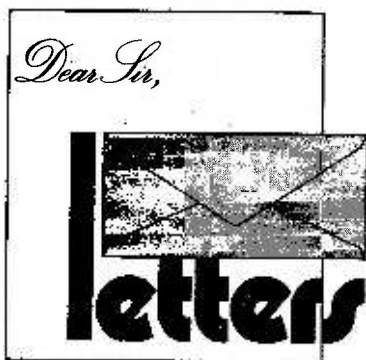
argument, and if the user or the dealer tries to argue the position, suggest that they contact the local Post Office engineers for an independent opinion.

On the other hand, where the complainant takes a reasonable view of the trouble, especially if the equipment is out of guarantee, a little help is a very good way to build up good neighbourly relations. With the increase in sales of audio equipment, no active amateur should be without knowledge of the problem, and in this connection a small stock of ferrite cores is very advisable, so that any troubles can be cured at an early stage.

LEGISLATION

As a final point, it is interesting to note that at the moment an attempt is being made to get legislation passed in the US Senate to the effect that it will be illegal to sell, in the United States, audio, radio and television equipment which is not protected against the unwanted reception of local radio transmitters. If this bill should become law there is no doubt that manufacturers in other countries will have to take note of it, or loose a vast export potential. Hopefully, such a move could well do much to solve the problem on a world-wide basis. Pw

The larger ferrite cores are available from Waters and Stanton Ltd., 31 Spa Road, Hockley, Essex, for 30p each plus 30p p/p any quantity. The small core for the transformer can be obtained from the author at Holdings Ltd., 39 Mincing Lane, Blackburn BB2 2AF for 10p plus an SAE.



Indian reader

I am a radio hobbyist and have occasionally read old copies of *Practical Wireless* which has captured my imagination. I have also constructed some of the projects described in your magazine. However, nowadays I don't even get those occasional old copies.

Although I would dearly love to subscribe to PW, I can't due to recent restrictions. To get by this problem I was wondering if any of your readers would be kind enough to offer gift copies, which will be fully compensated for, by either similar copies of an Indian journal or through supply of any material of interest.

Failing this, I would be more than happy to receive mailing of old copies. Many thanks.—**CT Aloysious Williams**, c/o Champadi Trades & Agencies, Champadi House, No. 1/884, Cochin-1, S. India.

Buzz words

After reading your editorial 'Software Gobbledegook' I felt that I must attempt to put the situation in perspective. The Microprocessor is regarded by those who use them as 'God's gift etc.' because it is the solution to problems of control and/or computation that would otherwise require costly hard-wired logic, but for which, it is hard to justify full Minicomputer control.

The Microprocessor cuts development time of a project by allowing the designer to wire-up his circuit with numbers rather than copper and this brings two main advantages. First, any modifications that are required during

development can be implemented more quickly, and secondly, a system once constructed using such a technology is quickly repeatable.

There are a number of Microprocessors on the market, all doing a similar job but often in different ways and it is the task of the designer to select that which is most suitable for his task. To embark upon this daunting venture the engineer must first become educated in this 'Software Gobbledegook' and it was with some fear that I commenced this self-education.

The 'Computer Language' worries the newcomer because it is strange, and it is all the more strange because he has never even heard the words before. He has never needed to hear the words before! Not long ago the word Laser did not exist, it was created out of five other words to name a device that has had a considerable effect on our technology. However we do not ridicule the word, because it has been completely assimilated into our vocabulary.

Although it is hard to swallow, my point is that Mr Average Engineer will have to carry on complaining about not understanding these devices because apart from the enticing propaganda, no short article will ever convey the operation of them. The only way to come to terms with them is to get down and understand the 'software Gobbledegook'.

Systems have now reached a state of complexity that often call for these annoying 'Buzz Words'. They have been invented to combine a patching-up of holes in our language and stimulate memory recall of certain operations. They have resulted in 'Buzz Word artists' who talk in them because they are the sole tools of their trade. The only solution is to learn to talk them yourself; become your own interpreter.—**Brian Frost BSc** (Paignton).

6p per page

I have noted the inserts in *Practical Wireless* CQ columns for back issues of PW which you no longer supply. I have a library of over 20 years of PW (and other mags. such as *Practical Electronics*, *Practical Television* etc) and would like to supply copies

of wanted articles to help out those readers who cannot obtain back issues, or have no easy access to libraries.

I can only supply copies of specific articles, not back issues, but it would be of help to some of your readers.

I think a charge of 6p per page would be reasonable, and hope that you will mention the service in your letters or CQ columns.—**J Heinrichsons**, Belle Vue, Kirkpatrick Fleming, Lockerbie, Dumfriesshire.

Inconsistent prices

I am wondering if you are aware of the excessively wide price ranges offered by your advertisers. For my sins I run a small evening institute class for budding electronics enthusiasts, and needing some OC71 transistors for a project I went into a well-known retailer's shop. On being told that the OC71's were 25p plus 25% VAT I decided that eight would be enough.

On reaching home I thought that, out of idle curiosity, I would consult my Jan '76 PW to see how I had fared. The price range for six suppliers taken at random ran from 10p to 18p, all plus 25% VAT. I am trying to allow for the 'caveat emptor' aspect of it all but I am still left with the feeling that the whole thing is more than a mild racket. I am aware of the 'old' and the 'new' stock and 'prices ruling at the time of despatch' platitudes so regularly trotted out but having allowed for all this one still has the conviction that we are being 'taken for a ride' in no uncertain terms!—**B A Pearson** (Beckenham, Kent).

While sympathising with Mr. Pearson it must be remembered that the ads. in PW are finalised weeks before the date of publication of a particular issue. The transistor advertised for 18p could very well cost 25p by the time it was bought by Mr. Pearson. Transistors range from brand new ones by reputable makers to unmarked ones of dubious characteristics which may very well account for the variations in price. Would any of our advertisers care to comment?—Ed.

Practical Wireless, March 1976

GENERAL SERVICING

An occasional series by LES LAWRY-JOHNS

chatting this time on—

2-CAR RADIOS

EARLY car radios were fearsome devices seemingly weighing as much as the vehicle in which they were painstakingly fitted! First, the power unit probably sited under the bonnet so that the buzz of the vibrator did not intrude into the plush comfort of the interior. Next, the amplifier, somewhere near the front passengers' feet or knees, with only the tuner fitted into the dash, and the loudspeaker cunningly concealed in or around the glove compartment with perhaps a second under the rear parcel shelf.

Dismantling this lot for service was the work of many a terrified junior and the bench service was a daunting prospect if only the number of screws holding the screening covers in place was considered! Fortunately we do not have to think about such complication in these days of solid state compact presentation but this has its own drawbacks as our fingers do not get any smaller and our eyes do not magnify on their own.

Getting started

This article will assume the radio is not more than about ten years old, as things can get complicated if we have to consider hybrid designs which abounded before this. Therefore we have an all-transistor set needing only the addition of a loudspeaker and an aerial to get things going from our bench supply of a fairly steady 12V or so. The first essential is a means of **stopping** it working! A quick-blow fuse of some 1A must be included in the supply line to prevent damage should a fault develop or the supply accidentally reversed, as human beings are remarkably slow at switching off when the smoke starts to rise!

Let us start therefore with an inoperative radio. If the fuse has failed and it can be inspected, it is instructive to have a quick look at this. If it is severely blackened it is likely to have been underrated in the first place or may be of the anti-surge variety (small built-in spring) and the set is likely to have been damaged more than would have been the case had the correct type been fitted. The first thing to ascertain is whether the radio has previously worked in the vehicle or if it has just been fitted. If the latter is the case it is obviously possible/probable that the radio is wired or switched for positive earth and the vehicle is negative earth.

If this has happened it may only be necessary to reverse the polarity of the set supply to get it

working, although the supply input filter choke may appear to be the worse for wear. It is quite common for the supply input to be taken to this type of choke before the on/off switch but there are variations. The choke itself is pretty robust and can take a heavy overload without becoming open-circuit but it may appear somewhat discoloured and even swollen as a result. On the other hand, on/off switches are not so hardy and will often be found inoperative as the result of an overload, or inoperative due to no other reason than their own fragility.

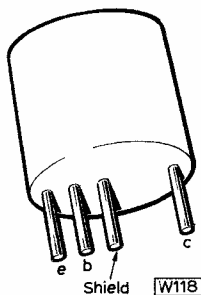
Some more up-to-date radios have a safety diode which will blow the fuse if the wrong polarity is applied, which can also short out on its own account and blow the fuse anyway, whilst some have a bridge rectifier which applies the correct polarity to the set whichever way it is connected. Usually, however, there is a cross-over switch marked + and - or a means provided internally to reverse the supply. Earlier Radiomobile and Motorola sets of 1964 vintage needed two separate lots of lead swops, one on the rear panel and another on a small strip near the on/off switch. Later versions needed only two leads to be swopped over and then this was changed to a carousel which was rotated to point to the required polarity.



—human beings are slow at switching off when the smoke starts to rise—

Common faults

On the subject of these earlier Radiomobile and Motorola receivers, they did exhibit one or two very common defects which, if known, can cut servicing time by half. One is the habit of AF117 transistors to develop collector to screen shorts. It is a fair bet that if the volume control can be heard to be operating when switching on or a nice hum is heard when the centre contact of the control is touched, one of the AF117 transistors has this defect. Happily, the screen lead can be nipped through without much trouble and can likewise be reconnected if desired, such disconnection not introducing instability or changes in alignment.



AF117 transistors can develop a short between the collector and the screen. Cutting the screen lead-out can cure some of the problems that arise.

It is a matter of moments to inject signals or make disturbance tests working back from the detector through the IF stages (or stage, in some cases) to the mixer-oscillator and then the RF. Once the stage has been identified the lead can be nipped in the bud to restore normal working. Looking at the base of an AF117, there are three leads close together, the screen being the last of the three and in the centre of the transistor, there being a gap between this and the collector which is the remote one.

Having made this point we hasten to add that there are lots of other faults which can occur to produce the same symptoms and we do not wish a horde of berserk wirecutters to descend upon innocent transistors in the belief that one snip is all that is needed to restore cheerful news from Radio 4! Oh! no, many a slip 'twix cup and snip. The more routine tests will be described later and should be followed when there is any doubt at all. Short cuts (no pun) are all very well but are no substitute for logical stage by stage testing.

Intermittent faults

Another common and very irritating fault is that which comes and goes very intermittently. The following case is an illustration. "My set will go perfectly for days and then suddenly it will go quiet so that I can only just hear it. Sometimes I can switch it off and then on again and it will be fine, another time I can't get it back no matter what. My brother reckons it's the power valve as it often happens when I go under a bridge". We write, "intermittent reception" on the label and assure the customer that his brother could well be right since bridges are not all they should be nowadays but we will put it on a soak test to see what it does.

The customer then goes home to tell his brother



—a horde of berserk wirecutters descend upon innocent transistors—

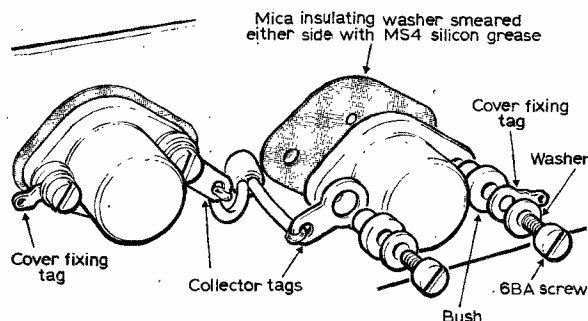
that he's a little worried because we must have thought he meant a bridge over a river and we were going to try the set in a bucket of water. Thinks, "Still, if they muck it up, they'll have to give me another one, won't they?"

On test, the set may behave itself for a time or may go quiet as described until disturbed by test signals or voltage readings being taken which may restore normal signals, again for an indefinite time. This can be most annoying to say the least but sooner or later it will go quiet (not right off) long enough to locate the offending stage. In all probability the source of the trouble will be found around the final IF transformer and that one of the coil cores will not tune. At this point the sound may well come back at full blast and the coil core will then tune. This is because the seat of the trouble has been disturbed. The circuit shows that each coil is shunted by a 400pF capacitor. One of the capacitors is becoming intermittently open circuit and will therefore have to be replaced.

To do this it is necessary to remove the solder from the tags on the print including the tags of the screening can. Once removed the can can be dismantled to reveal two small capacitors sitting on top of the coils. If one has the patience and industry to get as far as this, no further advice is needed except to say that both capacitors should be replaced and that the value is not unduly critical (we usually fit 390pF as we have these to hand as a rule) since the final tuning is by means of the cores. The fact that the earlier IF stage uses identical capacitors of course means that these could equally be responsible. However, we have not found this to be the case and that is the can nearest the volume control (on a separate panel) which has been found to be the one hiding the offender. This, of course, relates to the Radiomobile 900 Motorola 717 and associated models only, and similar faults in later models and other makes will almost certainly be due to other causes.

Coming much more up to date and still concerning Motorola and their different models in the 112 range, now completely different to Radiomobile, we find the majority of troubles are due to transistors, not now

quite so easily dealt with. The output transistors are bolted to a separate heat sink screwed to the panel at each end, with the transistor leads going through the panel in neat little groups of three. Having established that one of the output transistors is at fault, the task of replacing it, or them, at first sight appears daunting. In actual fact it is not at all difficult once one accepts that all three must come out at once complete with the heat sink. Using some sort of solder-sucker or desoldering braid, remove the solder from all nine contacts, remove the two screws holding the heat sink and lift the lot out. Having removed the defective item(s) one then has to nicely bend the lead outs so that they all go into their respective holes without too much fiddling. It is often the case in these models that the output (and audio) is in order however and a hum test at the detector diode or volume control will confirm this.



[W119]

Close-up of an output transistor assembly. Re-assembly of the bits in the right order calls for a certain amount of care.

We then have to check through the IF stages with signal injection followed up with voltage readings to ascertain the point where the signals stop and the voltages are wrong. Nine times out of ten one of the small black transistors will be found at fault. The actual type number may be almost too small to see but it will probably be something like ED1502C or some such number. There are a host of suitable replacements in the range of NPN IF transistors with or without forward gain characteristics. If the stage is AGC controlled, fit one with forward gain suitability; if it is straight biased fit one without. If in doubt use a BF241 or equivalent.

This assumes the voltmeter has said that there is something wrong and that a "cold" ohms test confirms that the transistor is defective. But, there are times when the signals stop at a particular stage and the associated transistor cannot be faulted. The particular IF transformer shows continuity of windings but one winding seems to be almost a dead short. So you take it out and guess what . . . a little silver capacitor (just about where we came in, isn't it?). It's probably 390pF too! Surprise! Surprise!

The Pye-Ekco series

Another popular range of car radios came from the Pye stable, differing in presentation and facilities yet following a common pattern of basic circuitry. From the front they could be recognised by the push button on/off on one side and the wavechange on the other and from the rear by the AD161-AD162 output transistors, sometimes covered by a plastic housing. Typical models would be Pye 2070 or Ekco CR938.

Polarity change over is effected by swapping over the green and blue leads, roughly behind the volume control, and access is by means of removing the 6BA screws from the rear and swinging up the covers. Access to the components under the push button assembly at first sight appears a formidable task but in fact presents few problems as the whole unit can be removed once the four leads are removed from the rear and the front (8BA) and rear two screws and pillars are taken out. Usually this is only necessary when it is desired to replace the BC108 audio preamplifier, which isn't very often.

The IF module which occupies the rear centre gives very little trouble and nor does the associated circuitry. It is fair to say that most faults which do occur can be rectified with only the covers swung open. These faults seem in the main to concern the output transistors, AD161-AD162, and the driver AC128. In nearly all cases where the supply fuse has blown (and not due to connecting to the wrong polarity) the output transistors will be found at fault.

Usually the AD162 will be found to have an emitter-to-collector short. It is rare to have to replace any resistors as the only low value one is that between the base pins (10 ohms) which incidentally must be correct. There are no emitter resistors to cook up.



—the task of replacing it appears daunting—

Usual routine is to remove the base and emitter leads, test the transistors to ensure that these are indeed at fault and then replace them as a pair, together with the AC128 which could well have caused the trouble in the first place (although it may bitterly deny this). Replacement of one of the output pair may prove less costly but in all probability the thing will fail again in a short time and therefore prove even more costly both in money and in goodwill. When tests tend to suggest that non-operation is not due to a fault in the output or driver stages, it is likely that the BC108 is at fault and a meter check on the print side, having identified the base, emitter and collector tracks, may well prove this to be the case. It should be appreciated that a fault in

the preamplifier stage can shut off the succeeding stages or cause the output to be very weak and distorted.

General notes

It is unfortunate that the average car owner tends to regard fuses as pieces of thick wire and that any one will do provided it is about 35A! The fact that the type of radio we have been considering needs a fuse link of no more than 2A is often ignored or just not realised. The consequence is that in the event of a short in the set or the set being incorrectly connected, a heavy flow of current looks for the weakest point and all too often this is not the fuse. Therefore we often find that when the set is connected up for test, it is evident that although the supply is being applied, it is not getting very far. It then becomes necessary to trace it from the input through the choke(s) to the on/off switch.



—thought we were going to try the set in a bucket of water—

If the choke is intact, but the switch is dead, it is very likely that the print is being used to connect the two and that this has curled up and died in some quiet corner of the panel. If a lead is used the switch may be blown out or the switch may be intact and the return to the panel somewhere along the print is open circuited. This is particularly the case in some of the very small sets imported from the Continent generally, and indeed some of the print is deliberately made weak at one point so that the break will occur here.

Loudspeaker wiring

From time to time we still come across loudspeakers which have one speech coil tag earthed to the speaker frame. In one case we found that this was the reason why the fuse failed when the set was fitted in the car but worked well on the bench. It should also be borne in mind that loudspeakers in cars are subjected to extreme of heat, cold and damp which can distort the speech coil thus causing it to rub against the pole-piece. As the body of the speaker could well be earthed this could give rise to the above mentioned trouble.

Incidentally, domestic audio systems, such as I discussed in the first part of this series, often suffer from a form of distortion not easy to describe but easy to recognise, usually confined to one channel in a stereo system or, more precisely, to one loudspeaker. With the volume well up the effect is not so noticeable but as it is reduced the effect is more obvious and objectionable. Having changed the speakers over to confirm that only the loudspeaker is to blame, one is faced with the fact that it will have to be replaced. Taking it out of the cabinet and applying pressure gently on the cone it will be heard rubbing against the central magnet. This is usually caused by heat (too loud, too long!) which has distorted the speech coil, or perhaps it is just another one which was never centred properly in the first place!

Cheaper radios

A large number of imported sets, usually from the Far East, are or were cheap to buy but rather expensive to repair. The majority suffer from a burned-out output stage and the design is such that the repair involves not only the replacement of the output pair, usually equivalents of the AC128, but also the replacement of up to four resistors at the same time. Such a repair is rarely worthwhile and should not be undertaken other than as a self inflicted exercise!

BINDERS FOR PW

Keep your copies together
Keep them clean
with the
PW Easi-Binder

The Easi-Binder is attractively bound with the title blocked in gold on the spine with the current (or last) volume number and year. For any previous volume numbers please advise year and volume and a separate set of gold transfer figures will be supplied.

£1.90 inclusive of VAT, post and packing from:
Post Sales (Binders) IPC Magazines Ltd.,
Carlton House, 66 Great Queen Street,
London WC2

GET YOUR BEARINGS!

with our

IN NEXT MONTH'S PRACTICAL WIRELESS

Direction Finding receiver



This sensitive receiver tunes from 160kHz to 1.5MHz in three switched ranges, covering the long and medium wave bands and marine bands. The ferrite rod aerial can be rotated to give an instant null, indicated on the panel meter. A 'Sense' switch removes any ambiguity of bearing.

plus:~ **Extra inside**

8-PAGE SUPPLEMENT FAULT~FINDING GUIDE

TOOLS~CHECKING COMPONENTS~IDENTIFYING
TRANSISTORS~TEST EQUIPMENT~
COMPONENT STOCK

ON SALE IN MARCH

HAVING got thoroughly fed up with playing my small collection of tapes over and over again I had a yearning to be able to listen to some of the radio programmes by means of my cassette player. I had made up a simple radio tuner and fed it into my audio hi-fi system and it worked, after a fashion.

One day I had bad tape-jamming trouble in a cassette. As I fixed the tape and was putting it back together again I realised that the two parts of the case were held together with four screws and it suddenly dawned on me that an empty cassette might, just might, be a home for a radio tuner. The tuner would just be pushed into the player like any ordinary cassette. Problems immediately loomed up, most of which were concerned with the very limited height available for components inside the cassette.

I remembered seeing adverts for the Ferranti ZN414 integrated circuit that seemed to be almost a complete radio in itself. That would go in the cassette as would a single mercury cell and that was supposed to be enough for a ZN414. Flat ferrite rod, instead of the more usual circular type, was available so that headache was removed. But, how to connect the output of the tuner, presuming it worked at all? I had made up my mind that the cassette had to snap in and that no other external connections could be tolerated.

Normally, the tape, carrying a varying magnetic field, passes in front of the head inducing currents which are amplified. In effect the tape is a one-turn primary of a transformer. The solution seemed to be to construct the equivalent of a head which would automatically couple to the head in the cassette player when the tuner cassette was pushed in. The tuner head would carry the output from the radio receiver.

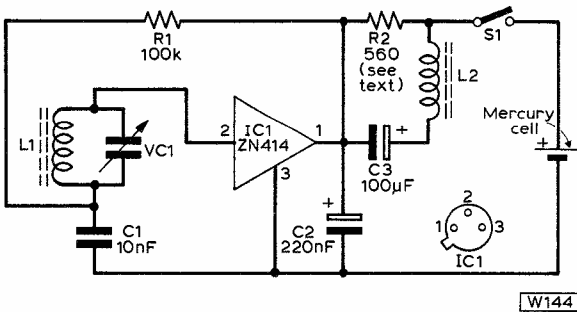
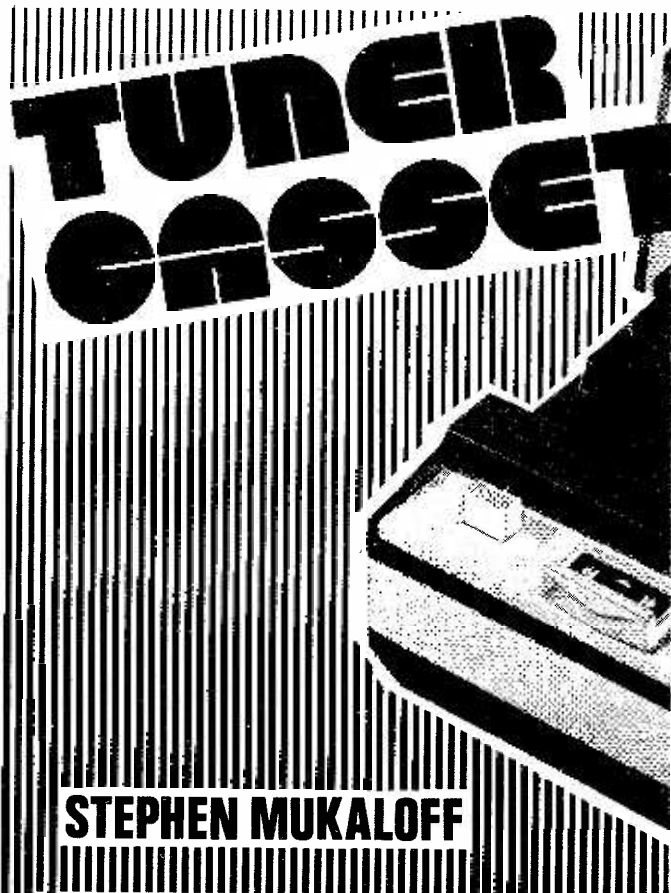


Fig. 1: The circuit of the Tuner Cassette is very simple. The output coupling coil is shown as L2.

Although the drain on the mercury cell was very low, around 300µA, it was felt necessary to include a switch operating automatically when the cassette was inserted or removed. In the end the switch turned out to be a short piece of phosphor bronze wire!

Owing to the very high input impedance of the ZN414 a single tuned circuit at the input provided good selectivity. In ordinary crystal sets and simple transistor radios the tuned circuit is quite heavily damped producing the poor selectivity that is the usual complaint with these circuits. The frequency range covered by a parallel tuned circuit with a

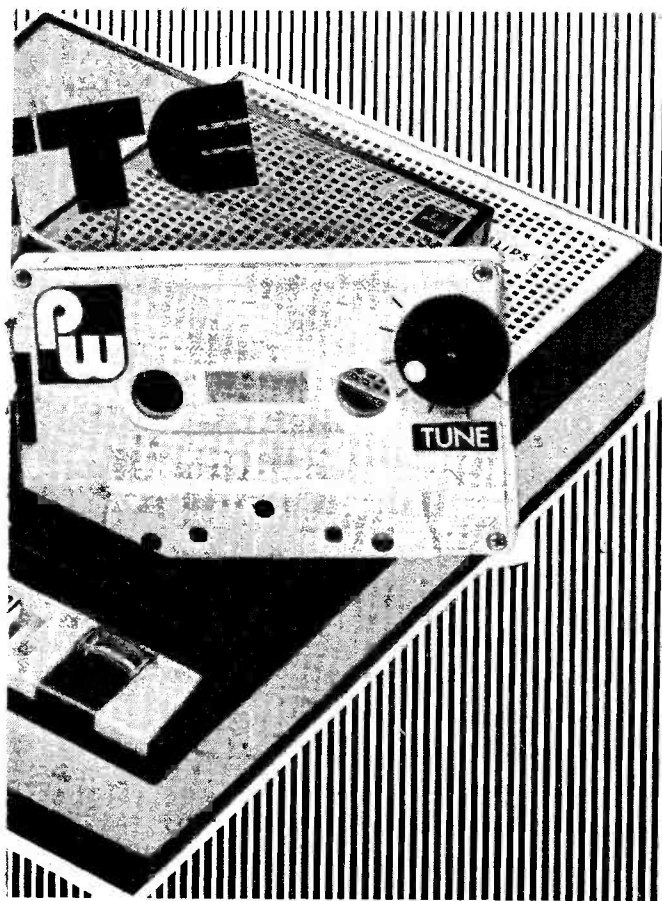
variable capacitor is equal to the square root of the ratio of capacity change (minimum to maximum). For instance, if the capacity range is 30 to 270pF the tuning range will be root 270/30 or 3. If a coil is wound so that the LF end of the range is, say, 500kHz then the HF end will be 3 x 500kHz or 1500kHz. These calculations would, in practice, be modified by stray circuit capacities but they show how coils can be wound for any required range. In the tuner cassette described here the tuning capacitor is 60pF maximum and tunes a range from 650 to 1500kHz.

It was thought that the aerial, wound on a flat ferrite rod, would be badly screened when the cassette was in the player but in practice this did not happen and has not proved a handicap. The player should be rotated to give the best results with any particular station as should be done with any radio employing a ferrite rod aerial for signal pick-up. In the south-east of England many stations could be received during daylight and many more after dark but results may vary considerably over other parts of the country.

The Circuit

As can be seen from Fig. 1 the circuit is very simple indeed. Resistor R2 has an effect on both the sensitivity and the selectivity of the tuner and values between 100Ω and 1.5kΩ can be tried. Temporarily a small preset of say 1.5kΩ can be connected in series with a resistor of 100Ω and adjusted

The Tuner Cassette is the subject of British Provisional Patent 52095, held by the author.



for optimum results. The part of the preset in use can be measured and a similar value resistor used in the tuner in place of the 100Ω and preset.

The head in the tuner is shown as L2 and this is placed in such a position as to offer maximum coupling with the head in the player.

Construction

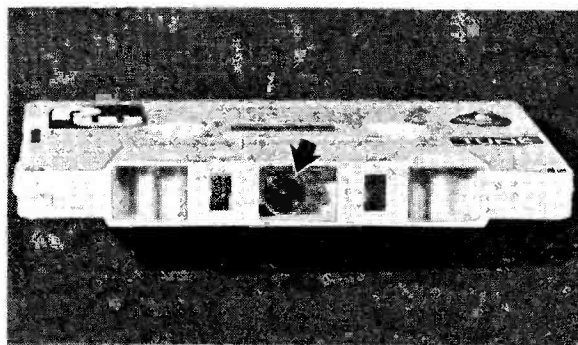
Two types of cassette will generally be found, one with the halves pressed or cemented together and the other with four or five screws so that the cassette can be opened easily. The latter type is recommended for this project. Unscrew the cassette and remove all the innards including the tape, magnetic guard and any pulleys. The half carrying the magnetic guard will be considered as the bottom part of the cassette. Any labels are best removed with methylated spirit rather than solvents of the thinners type.

Remove pips A and B from both halves, Fig. 2, and cut away part of the web from the bottom half, shown as C. This is best done by cutting the web vertically with a small hacksaw-type blade and breaking it away with a pair of pliers. Cut away the edge of the bottom at D for a distance of 20mm. Then cut a similar slot in the top half but 3mm deep as shown in Fig. 2. Ensure that the edges of the slot coincide when the halves of the cassette are fitted together.

The mercury cell holder, Fig. 3, was made from Perspex about 3mm thick but any similar insulating

material will suffice. A strip of the same Perspex was glued to the holder as shown. The complete holder should be filed until it is a good fit in the slot in the cassette. Now drill a pilot hole through the Perspex and follow this with a drill about 10mm diameter but take great care not to split the material. Now countersink the hole on the correct side with a 12mm drill until the cell rests as shown in Fig. 3 with the smaller diameter (negative) side just proud of the Perspex. The countersinking is best done by hand to avoid damage to the holder if the drill should snatch. The holder is eventually plugged in with the negative pole upwards.

Now, drill, or preferably file, a hole E, Fig. 2, in the top of the cassette, through which the tuning capacitor will protrude. The ferrite aerial L1 consists of 120 turns of 36SWG enamelled copper wire closewound on one end of a ferrite slab 18 x 4mm x 65mm long. The ferrite as supplied will be longer and can be snapped off in a vice or the required line of break struck on a sharp edge. The end can



The output coupling coil L2 is shown arrowed in this photo of the finished Tuner.

be nibbled with flat nose pliers to finish it off if the break is rough. Secure the ends of the winding with adhesive or Sellotape and then glue the assembly into the bottom of the cassette as shown in the photographs.

The tuning capacitor VC1 is a 60pF ceramic trimmer glued into the bottom of the cassette, using the hole in the top as a guide to its exact position. The trimmer's tags should be cut off short. The rim of the ZN414 should be filed away on opposite sides

★ components list

Resistors

R1 100k Ω R2 560 Ω Both 5 or 10% or $\frac{1}{4}W$

Capacitors

C1 10nF ceramic disc
C2 220nF tantalum bead
C3 400 μF tantalum bead
VC1 60pF ceramic trimmer

Miscellaneous

IC1 ZN414, Mercury cell, Mallory RM675, L1, see text. Ferrite slab, 18 x 4mm x 65mm long. Ferrite bead (anti-parasitic type) usually 5mm long, 4mm dia. with 2mm hole. Cassette, preferably empty. Piano or phosphor bronze wire, about 22SWG. 7m of 44SWG enam. copper wire. About 6m of 36SWG enam. copper wire.

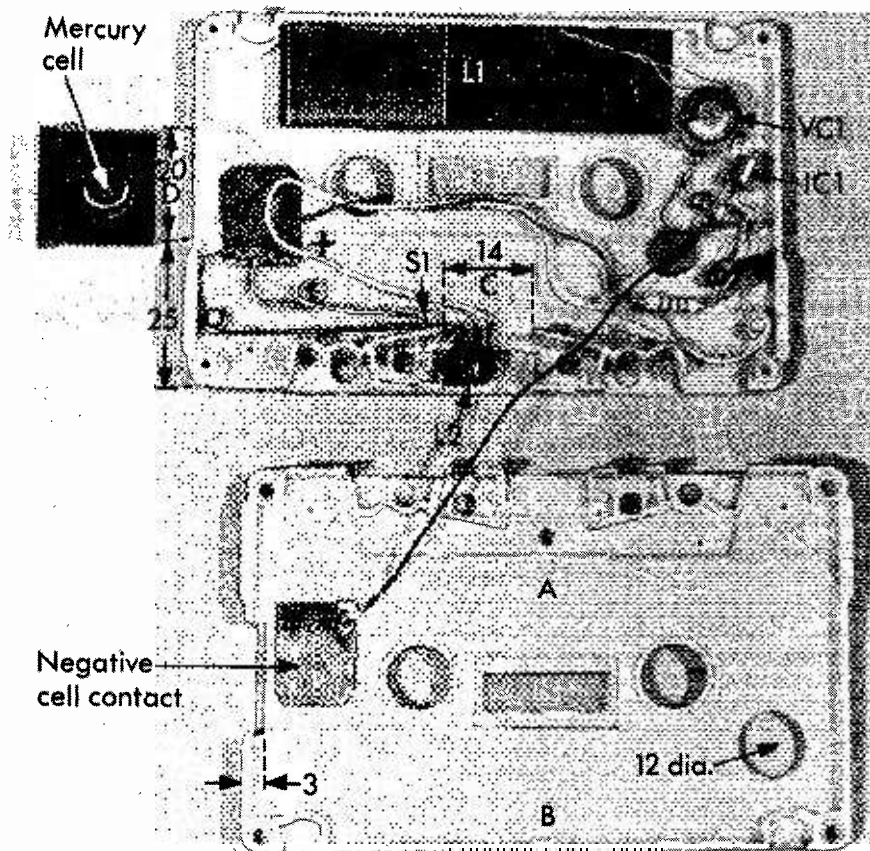


Fig. 2: left, the halves of the cassette opened out to show the details of the slot for the mercury cell, the contacts for the cell, and the general assembly of the Tuner. Switch S1 is formed by the contact between the two spring arms.

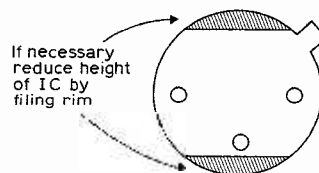
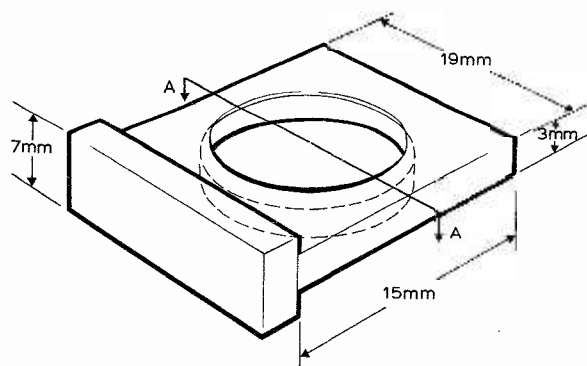
Fig. 3: bottom left, illustrates the holder for the mercury cell as devised by the author but any other similar arrangement will be satisfactory.

Fig. 4: below, shows how the rim of the IC can be filed away carefully to reduce its height to fit the cassette.

Hole to the left is referred to as hole 'E' in text.

AM0437

All dimensions in mm.



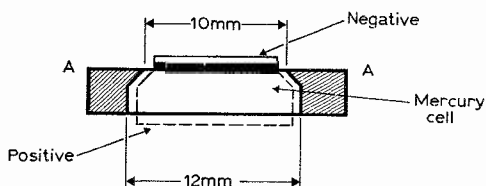
W146

such as used for shims. Tin or other metal which can be soldered can be used but it must be thin or the cell assembly will not fit in the cassette.

Coupling Coil

The coupling coil L2 is wound on a ferrite bead. Make two cardboard cheeks and bolt them to the bead with a bolt and nut, usually 8BA will do, Fig. 5. Wind on 7m of the 44SWG enamelled copper wire in uniform layers. This is best done by holding the bolt in the jaws of a hand drill and securing the drill in a vice. A power drill is not recommended with this very fine wire. Apply a few drops of Durofix or aeroplane dope on top the winding, keeping it clear of the cheeks. When dry remove one cheek only and dope that side of winding. Remove other cheek and dope remainder of coil.

The coil is glued to one end of a spring arm, Fig. 6a, made from piano or phosphor bronze wire, the loops in the arm being formed round a small drill.



W145

if it is too large for the particular cassette used, see Fig. 4. The IC should be treated gently in this process, holding it in the fingers. Do not use pliers or a vice! But check first before filing.

The battery contacts are made from thin brass,

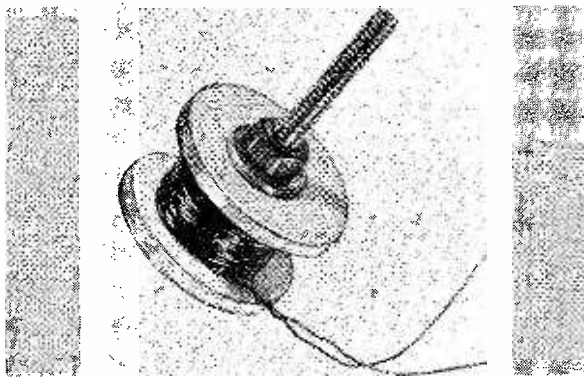
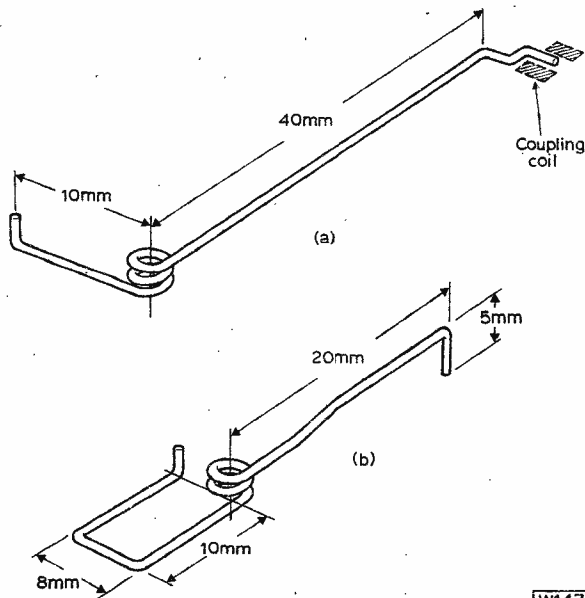
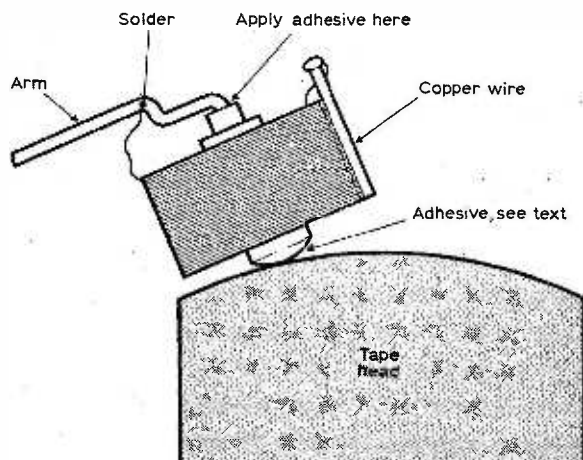


Fig. 5: The ferrite bead is held between cardboard cheeks while about 400 turns (7m) of wire is wound on.



W147

Fig. 6: Details of the two spring arms. The coupling coil L2 on its ferrite bead is fitted to the end of the upper arm.



W148

Fig. 7: The position of the coupling coil on the head of the cassette player is fairly critical but can be adjusted when the Tuner is finished.

Practical Wireless, March 1976

Check the arm for fit in the bottom of the cassette, the loop going over the spigot in the bottom left hand corner. Now drop the bottom of the cassette into the tape recorder, switched to the "Play" position. The coupling coil should be placed on the end of the arm and adjusted so that it is resting on the left-hand side of the head. This adjustment is important because if the coil shades both poles of the head the induced voltages will cancel out. Apply a couple of drops of adhesive to the coil and arm and allow to dry in position. Carefully remove arm and coil and apply more adhesive to make a solid joint. A very thin coat of adhesive can be applied to the face of the ferrite bead where it rests on the head. This will eliminate any risk of electrical noise being caused between the head and the bead.

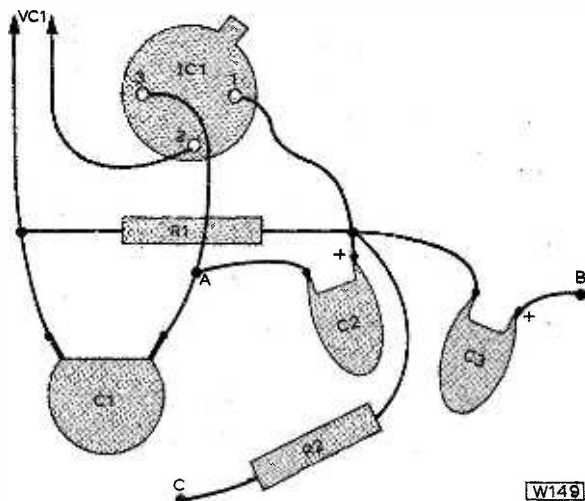
Solder one end of the coupling coil to a short length of copper wire glued to the coil, Fig. 7 and solder the other end of the coil to the arm. A thin flexible wire goes from the copper wire to the end of C3. Another similar wire runs from the end of the arm to resistor R2.

Switching

A second spring is formed as shown in Fig. 6b and then glued to the bottom of the cassette so that there is a small gap between this arm and the arm carrying the coil. This forms the on-off switch S1. Solder end of contact arm directly on the positive contact plate. Place the bottom of the cassette into the player and connect an ohmmeter across the switch contacts. Adjust the gap between the arms so that a short circuit is indicated when the player control knob is pushed forward and an open-circuit when it is switched off.

As there is no room for a circuit board the few remaining components are soldered together as shown in Fig. 8 and the assembly glued to the bottom of the cassette, see photographs. Keep all leads as short as possible or feedback may result. If flats have been filed on the IC ensure that these are horizontal or the halves of the cassette will not close.

Connect the ends of the ferrite rod aerial winding to the tags on the tuning capacitor plus the two



W149

Fig. 8: The components shown above are wired together before being fitted into the bottom half of the cassette.

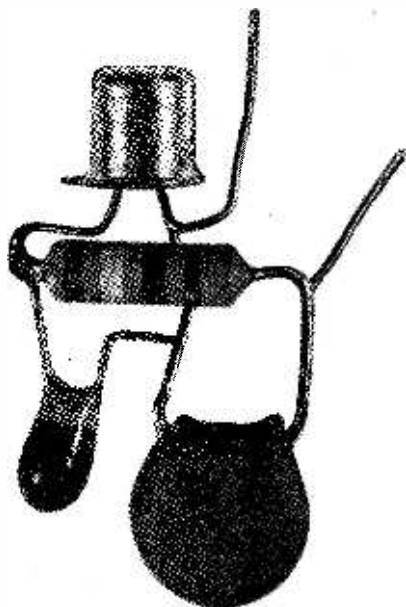


Photo of part of the component assembly shown in Fig. 8.

leads from the component assembly. Remember to scrape the enamel from the ends of the wire before soldering. Connect a flexible wire from the cell negative plate, top half of cassette, to point A, Fig. 8, the lead from the coupling coil to point B. Finally, another flexible lead from the end of the coil supporting arm to R2, point C. And that's it!

The tuning capacitor can be adjusted to a particular station and left or a thin plastic disc can be glued to the top of the capacitor ensuring that it is close to the top of the cassette. The author used an edge control knob taken from the volume control of an old transistor radio.

Checking out

Check that the wiring is correct and then screw the cassette together. Insert the cell holder with the cell in place with the negative side (smaller diameter) at the top. Slip the cassette into the cassette player and switch to "Play". Turn up the volume control and tune in a few stations to get the feel of the tuner. If the volume control has to be turned up too far to get reasonable volume try adjusting the position of the coupling coil on the head, as explained earlier, as this adjustment can be very critical. Don't forget that the player may need turning round for best volume from a station.

PW

AVAILABLE NOW!
REPRINT OF PW's
TELE-TENNIS SERIES
July-November 74

Send 75p + 10p (post & packing) to: Chief Cashier
(PW Tele-Tennis), IPC Magazines, Tower House,
Southampton St., London, WC2E 9QX.

GENERAL COVERAGE RECEIVER—contd from page 940

an audio load for the IC. Because of the limiter action, RF and IF gain controls must be set so that severe clipping does not arise, so these controls will only be at or near maximum gain for weak signals.

MAINS POWER UNIT

The unit shown in Fig. 18 may be constructed to the same dimensions as a PP9 battery, see photograph in Part 1. The case is readily made from a single 8 x 2in universal chassis flanged runner, with the flanges cut so that it can be bent into an open box $2\frac{3}{4} \times 2\frac{1}{2} \times 2$ in. A PP9 battery top with studs is fixed across the end and the sides are closed with $2\frac{3}{4} \times 2\frac{1}{2}$ in pieces held with self-tapping screws. Anchor mains L, N and E wires at a tag strip, which also earths the box. A further tag strip supports the diodes and capacitor. Ensure that the connections to the battery studs are in the correct polarity.

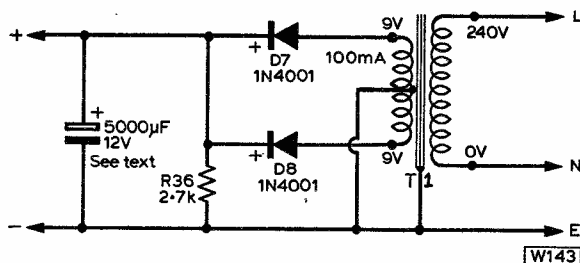


Fig. 18: Circuit of the optional power supply unit built into an old battery case, shown in Part 1.

The capacitor across the battery supply at the audio amplifier (C23) can be changed to 5000µF 12V when it was found that no hum whatever accompanied reception. The actual voltage is somewhat higher than that from the battery and it may be found necessary to back off the RF gain a little on high frequencies, to avoid instability, though this depends on loading by the aerial.

Note:—In Fig. 9 Part 1, should read "S1 is ganged with VR2," not VR1.

PW

KINDLY NOTE!

EMERGENCY LIGHT UNIT January 76

We wish to acknowledge the considerable assistance given to the author of this project by the Special Batteries Division of Ever Ready and by Doram Ltd. who supplied the cells for the prototype.

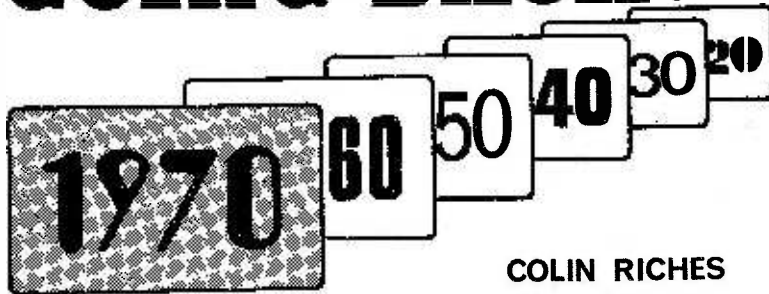
TV SOUND TUNER November 75

In Fig. 5 the bottom edge of the panel cut-out should be 34mm and not 44mm from the bottom of the panel.

DIGITAL READOUT SYSTEM December 75

In Fig. 12, page 653, the polarity of the 5V supply to the board is incorrect and should be reversed to that shown.

GOING BACK...



COLIN RICHES

Wireless Notes—1922

IN the summer of 1922, Paris police found a wireless outfit amongst the apparatus of a group of burglars, Buckingham Palace had a wireless receiver installed and New York City was told it could have its own broadcasting station. The sum of £10,000 was set aside for this purpose and the aerial was erected on the roof of the Municipal Building.

Amundsen's expedition to Wrangel Island took a wireless outfit with it. The apparatus was capable of receiving messages within a radius of 2,000 miles. The receiving station at Clifden, which had been in the hands of Irish 'rebels' was burned down by them and the work of this station was taken over by Ongar, in Essex.

An enterprising fairground manager installed a wireless station amongst his booths and roundabouts and charged the public 6d. to listen in to wireless concerts.

Three wireless exhibitions were held during the Autumn, two were housed in the Central Hall, Westminster and the third at the Horticultural Hall.

Also in 1922 one could obtain a pamphlet entitled "the Wireless Weather Manual: A Guide to the Reception and Interpretation of Weather Reports and Forecasts Distributed by Wireless Telegraphy in Great Britain." It was published by the Meteorological Office and could be obtained from H. M. Stationery Office.

A Service offered

IRECENTLY received a letter from Mr. Tom Bowett. He says, "As a reader of your 'Going Back' feature I am writing to offer a service which may be of

interest to other readers.

"I have in my possession a copy of a booklet entitled 'A Handbook of Call Signs' as given free with *Amateur Wireless*, September 19th, 1925. During the past few years I recall some people writing to radio magazines trying to trace the holder of a particular call sign and I have also heard such references over the air.

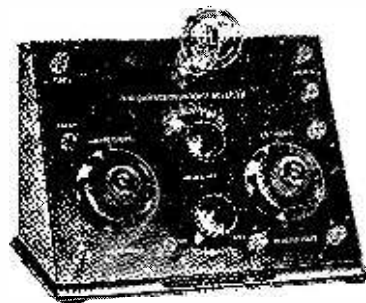
"I would be pleased to check through this booklet to try and trace either the holder of a particular call sign or the call sign of a particular radio amateur of the period. Call signs 2AA-6ZY plus certain international call signs are listed.

"I would obviously appreciate an s.a.e. with any enquiries." So, if anyone does need to trace a vintage call sign, they can contact Mr. Bowett at 167 Burnage Lane, Burnage, Manchester, M19 1EE.

Gamages again

SEVERAL readers have written expressing interest in the Gamages wireless sets so here is some gen on another Gamage favourite—the Single Valve Broadcast Receiving Set. This was described as, "A most efficient and compact set, comprising tuning unit and valve detector. Wavelength 300-500 metres, but any wavelength may be obtained by the addition of an ordinary Honeycomb coil. Note the position of the Marconi 'R' valve—the filament being held vertical, cannot touch the grid when sagging takes place. The tuning coil entirely eliminates self-induction and self-capacity effects.

Telephony can be received up to 40 miles, and spark signals over a considerable distance. The complete set, licensed by the P. M. G. and the Marconi Com-



Gamages single valve broadcast receiving set.

pany comprising the 'Broadcaster' HT battery, LT battery, phones, aerial wire, insulators, switch and tube. Price complete £22.10s."

A Flick of the Switch

THIS book contains over 1000 photographs of vintage U.S. receivers ranging from 1930 to 1950. Also included are sections on amateur gear, commercial and military equipment.

The author, Morgan McMahon became a radio amateur in the days when, as he says, the local ham was considered the 'neighbourhood nut'. His aim, and an exceedingly commendable one—is to preserve the heritage of vintage radio in an enjoyable way, by writing a series of books on the subject.

The book is published by Vintage Radio, Box 2045, Palos Verdes Peninsula, California, 90274 and copies are obtainable, in the UK from Tudor Rees, 64 Broad Street, Staple Hill, Bristol, BS16 5NL. Price is £4.15 soft cover post paid (no VAT to pay) and £5.75 hard cover post paid (no VAT).



Front cover of the book

Now...the most exciting Sinclair kit ever

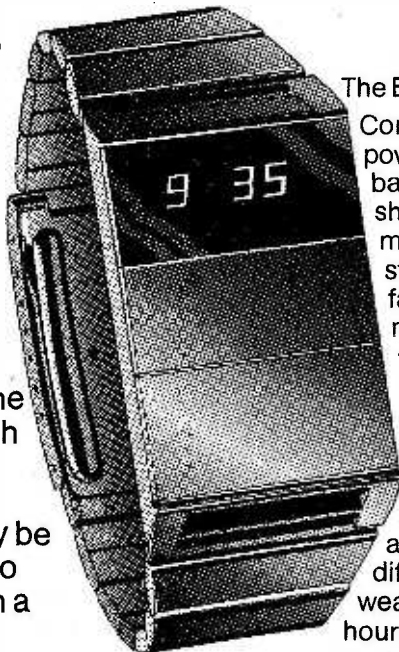
The Black Watch kit

At £14.95, it's

★ **practical** – easily built by anyone in an evening's straightforward assembly.

★ **complete** – right down to strap and batteries.

★ **guaranteed**. A correctly-assembled watch is guaranteed for a year. It works as soon as you put the batteries in. On a built watch we guarantee an accuracy within a second a day – but building it yourself you may be able to adjust the trimmer to achieve an accuracy within a second a week.



The Black Watch by Sinclair is unique. Controlled by a quartz crystal... powered by two hearing aid batteries... using bright red LEDs to show hours and minutes and minutes and seconds... it's also styled in the cool prestige Sinclair fashion: no knobs, no buttons, no flash.

The Black Watch kit is unique, too. It's rational – Sinclair have reduced the separate components to just four.

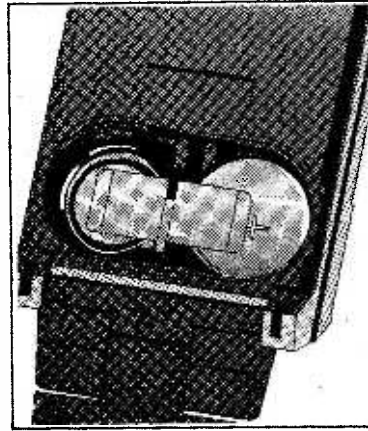
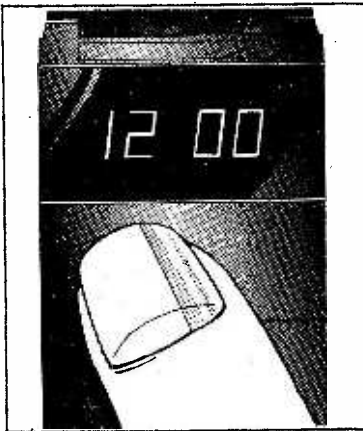
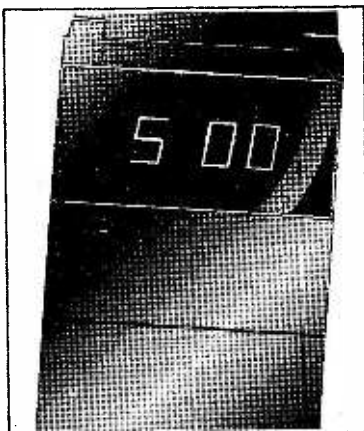
It's simple – anybody who can use a soldering iron can assemble a Black Watch without difficulty. From opening the kit to wearing the watch is a couple of hours' work.

The special features of The Black Watch

Smooth, chunky, matt-black case, with black strap. (Black stainless-steel bracelet available as extra – see order form.)

Large, bright, red display – easily read at night.
Touch-and-see case – no unprofessional buttons.

Runs on two hearing-aid batteries (supplied). Change your batteries yourself – no expensive jeweller's service.



The Black Watch—using the unique Sinclair-designed state-of-the-art IC.

The chip...

The heart of the Black Watch is a unique IC designed by Sinclair and custom-built for them using state-of-the-art technology—integrated injection logic.

This chip of silicon measures only 3 mm x 3 mm and contains over 2000 transistors. The circuit includes

- a) reference oscillator
- b) divider chain
- c) decoder circuits
- d) display inhibit circuits
- e) display driving circuits.

The chip is totally designed and manufactured in the UK, and is the first design to incorporate all circuitry for a digital watch on a single chip.

...and how it works

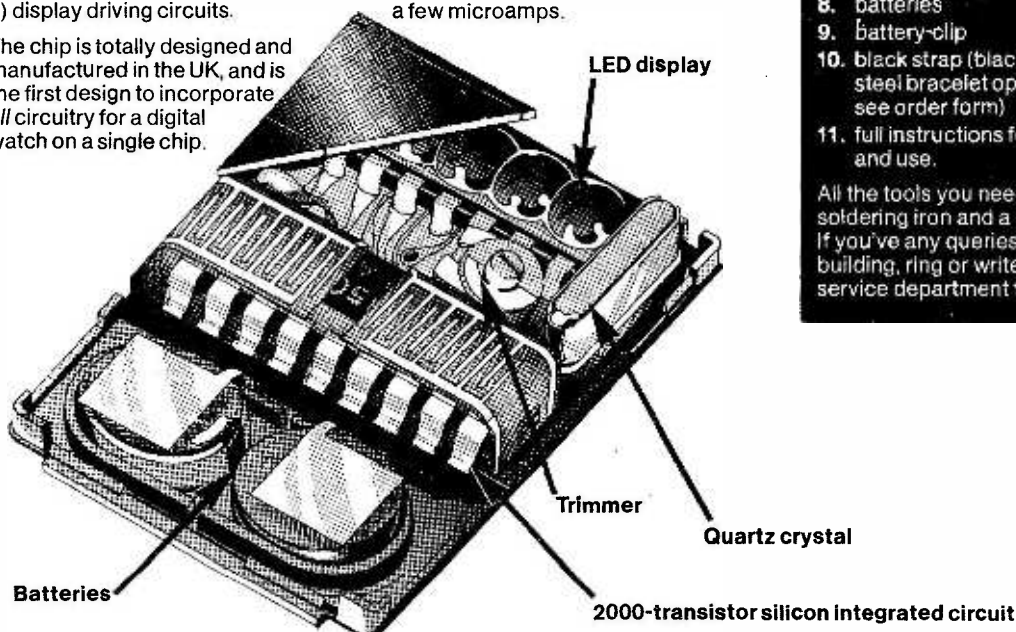
A crystal-controlled reference is used to drive a chain of 15 binary dividers which reduce the frequency from 32,768 Hz to 1 Hz. This accurate signal is then counted into units of seconds, minutes, and hours, and on request the stored information is processed by the decoders and display drivers to feed the four 7-segment LED displays. When the display is not in operation, special power-saving circuits on the chip reduce current consumption to only a few microamps.

Complete kit £14.95!

The kit contains

1. printed circuit board
2. unique Sinclair-designed IC
3. encapsulated quartz crystal
4. trimmer
5. capacitor
6. LED display
7. 2-part case with window in position
8. batteries
9. battery-clip
10. black strap (black stainless-steel bracelet optional extra—see order form)
11. full instructions for building and use.

All the tools you need are a fine soldering iron and a pair of cutters. If you've any queries or problems in building, ring or write to Sinclair service department for help.



Take advantage of this no-risks, money-back offer today!

The Sinclair Black Watch is fully guaranteed. Return your kit in original condition within 10 days and we'll refund your money without question. All parts are tested and checked before despatch—and correctly-assembled watches are guaranteed for one year. Simply fill in the FREEPOST order form and post it—today!

Price in kit form: £14.95 (inc. black strap, VAT, p&p).

Sinclair

Sinclair Radionics Ltd,
London Road, St Ives,
Huntingdon, Cambs., PE17 4HJ.
Tel: St Ives (0480) 64646.

Reg. no: 699483 England. VAT Reg. no: 213 8170 88.

To: Sinclair Radionics Ltd, FREEPOST, St Ives, Huntingdon, Cambs., PE17 4BR.

Please send me

Total £

..... (qty) Sinclair Black Watch
kit(s) at £14.95 (inc. black
strap, VAT, p&p).

..... (qty) black stainless-steel
bracelet(s) at £2.00
(inc. VAT, p&p).

* I enclose cheque for £.....,
made out to Sinclair Radionics Ltd
and crossed.

* Please debit my *Barclaycard/Access/
American Express account number
.....

Name

Address

PW/3

Please print. FREEPOST—no stamp required.

*Delete as required

CMOS Crystal Calibrator

M.E.THEAKER B.Sc

RADIO AMATEURS, short wave listeners and users of digital measuring equipment frequently require a signal source of precise known frequency. The crystal calibrator here described provides such a source and is suitable for the calibration of VFO's, communication receivers, frequency meters, etc. It provides accurate outputs at 1MHz, 100kHz, 10kHz, 1kHz, 100Hz, 10Hz and 1Hz. The lower frequencies, although possibly superfluous for the calibration of receivers and frequency meters, are suitable for checking counters and provide a general source for operating digital circuits at a slower speed than normal in order to examine their operation in more detail, when fault-finding for example.

OPERATION

The crystal calibrator, Fig. 1, comprises five sections: a crystal oscillator, a six decade divider circuit, a frequency selection circuit, an output stage and a voltage regulator to supply the circuits. The crystal oscillator produces an approximately square wave at 1MHz which is fed to the six decade divider and to the frequency selection circuit. The six decade divider provides outputs at 100kHz, 10kHz, 1kHz, 100Hz, 10Hz and 1Hz which are also fed to the frequency selection circuit. This circuit provides the means of selecting any one of the seven frequencies or a combination of frequencies simultaneously.

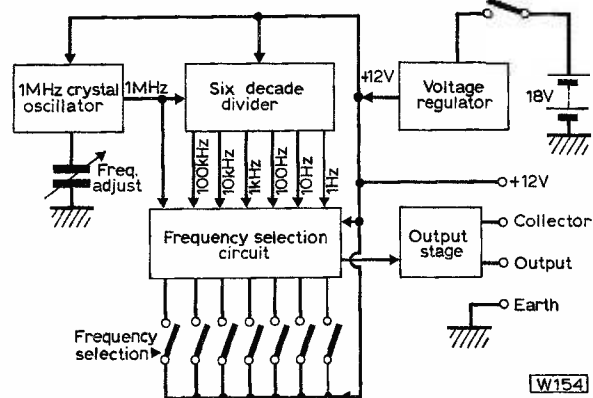


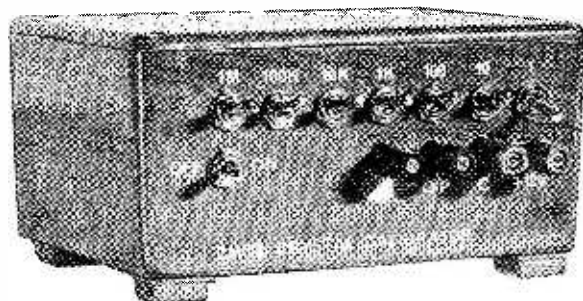
Fig. 1: Block diagram of the crystal calibrator.

CMOS integrated circuits were used to build the calibrator in order to minimise the current consumption of the calibrator. Even with fairly frequent use the batteries should last for a long time. The output current available from CMOS circuits is rather

low, typically no more than 500 μ A, so for this reason an output stage follows the frequency selection circuit in order to boost the calibrator's output capability.

THE CRYSTAL OSCILLATOR

The heart of the calibrator is a 1MHz crystal oscillator, Fig 2a. This is constructed using one-third of a CD4007A circuit as an inverter. Two feedback circuits are applied to the inverter; the first is DC feedback through resistor R1, which biases the output voltage to be equal to the input voltage, typically one half of the supply voltage. The second is AC feedback through the crystal X1. The equivalent circuit of the crystal is shown in Fig. 2b and it can be seen that two resonant frequencies can occur,



the series resonance of L and Cs, and the parallel resonance of L and Cp. These two frequencies are in practice quite close together.

The crystal is incorporated in a pi network consisting of R2, X1, C1, VC1 and C2. This network provides feedback for the inverter only at the series resonance frequency of the crystal. The variable capacitor, VC1, provides the necessary trimming to ensure that the oscillator can be adjusted to run at exactly 1MHz. The AC feedback is quite large to ensure that the output remains in saturation for as long as possible. This not only ensures fast rise and fall times, but also minimises the current consumption.

THE DECADE DIVIDERS

There are seven different decade dividers available in the various CMOS ranges of integrated circuits. One of these, the MC14518C/CD4518BE, is a dual decade counter/divider and was chosen in order to produce a compact layout for the crystal calibrator. Two divide-by-ten outputs are available from each decade counter, Fig. 3. One, Q2, has a mark/space

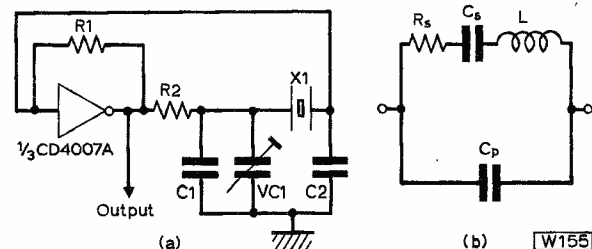


Fig. 2: Crystal oscillator circuit and equivalent electrical circuit.

★ components list

Resistors

R1	20M Ω (2 x 10M Ω)	R10	27k Ω
R2	22k Ω	R11	1k Ω
R3 to 9	1M Ω (7 off)		
All 5 or 10% $\frac{1}{4}$ or $\frac{1}{2}$ W			

Capacitors

C1	100pF polystyrene	VC1	60pF trimmer
C2	22pF polystyrene		

Semiconductors

IC1	CD4007 AE or MC14007CP	IC6	CD4068BE or MP14068CP
IC2	CD4518BE or MC14518CP	IC8	78L12WC (Fairchild) or equivalent
IC3		Tr1	BSX20 or 2N2369A
IC4			
IC5 & 7	CD4011AE or MP14011CP		

Miscellaneous

X1, Crystal 1MHz type HC6U. Switches, SP on-off, miniature, 8 off, OR 1 off and 1 SP 8-way rotary switch. Terminals, miniature 4 off. Batteries PP3, 2 off, with connectors. IC holders, 14 pin 4 off, 16 pin 3 off. Diecast box, approx. 115 x 88 x 55mm ($4\frac{1}{2}$ x $3\frac{1}{2}$ x 2 $\frac{1}{4}$ in.) or similar. PCB, Readers PCB Services, (see ad.) The eight IC's with IC socket strip are available from Sintel, 53N Aston Street, Oxford for £5.27 inc. VAT and p/p.

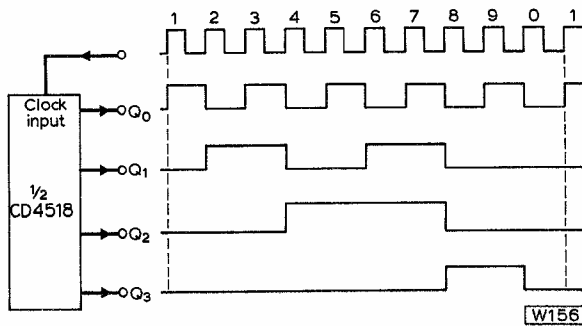


Fig. 3. Waveforms to be expected from the decade dividers.

ratio of 2:3, the other, Q3, a mark/space ratio of 1:4. The choice of mark/space ratio has considerable influence on the harmonic content of the output waveform. This choice is of particular significance when using the calibrator with a communication receiver as it will determine the number of useful calibration points.

The Fourier Analysis of a repetitive rectangular waveform, such as produced by the oscillator and divider circuits shown in Fig. 3, states that the amplitude of the n th harmonic, A_n is $A \sin(n\pi d/T)/n\pi$ where A is the amplitude of the rectangular wave. This means that for a square wave with a mark/space ratio of 1:1, the ratio d/T is equal to 0.5 and therefore the amplitude of the first harmonic is the same as that of the square wave, the third harmonic has an amplitude of one-third that of the square wave, the fifth harmonic's amplitude is one-fifth, etc. There are, in theory, no even harmonics. In practice, because of the slight differences in the top and bottom of the waveform and differences in the rise and fall times, there will be some even harmonics, but they will be much less in amplitude than the odd harmonics.

The dual decade divider chosen does not possess a square wave output but instead provides a choice of a mark/space ratio of 2:3 or 1:4. The corresponding

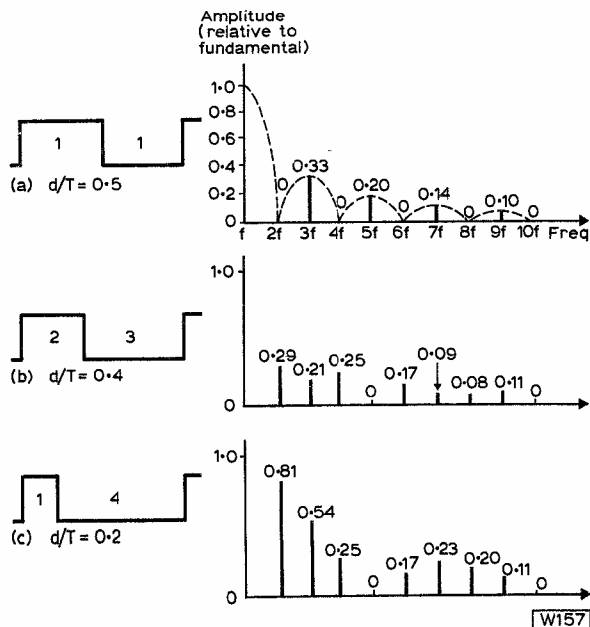


Fig. 4: Diagrams to show the harmonic content of the waveforms.

d/t ratios are 0.4 and 0.2 respectively. The effects of the different ratios are shown in Fig. 4. This shows the amplitudes of the harmonics relative to the fundamental (or first harmonic). It can be seen that the square wave has (in theory) all even harmonics missing and that the waveforms with mark/space ratios of 2:3 and 1:4 have no fifth, tenth, etc. harmonics. In practice there will be small amplitudes of these harmonics for the same reason as explained above. Fig. 4 also shows that the amplitude of the harmonics with a mark/space ratio of 1:4 is generally greater than that of the other two examples. For this reason the Q3 output of the decade divider which provides the mark/space ratio of 1:4 was chosen and the Q3 outputs of the six decade dividers, together with the approximately square wave from the 1MHz crystal oscillator are fed to the frequency selection circuit.

FREQUENCY SELECTION CIRCUIT

To avoid the unnecessary routing of the signal via a front panel switch, the frequency selection switches operate gates situated on the circuit board. The basic logic circuit for frequency selection is shown in Fig. 5a. There are seven frequency selection switches, one for each frequency. This enables each frequency in turn or all frequencies simultaneously to be switched to the output stage. This method of switching as opposed to a rotary switch selecting one frequency has the advantage that one frequency may be modulated by another or several others, Fig. 6. So if S1 alone is closed, the 1MHz signal appears at the output. If S1 and S2 are closed, the 100kHz signal modulates the 1MHz producing a frequency spectrum of 1MHz, 2MHz etc., each with sidebands of 100kHz, 200kHz, etc. Or if S1 and S3 are closed, the frequency spectrum consists of 1MHz, 2MHz, etc., each with sidebands of 10kHz, 20kHz, etc.

The inputs of CMOS circuits must never be left open-circuited. For this reason the switched inputs

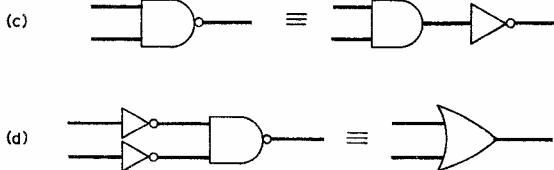
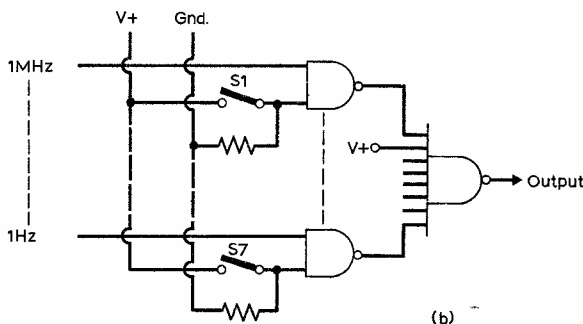
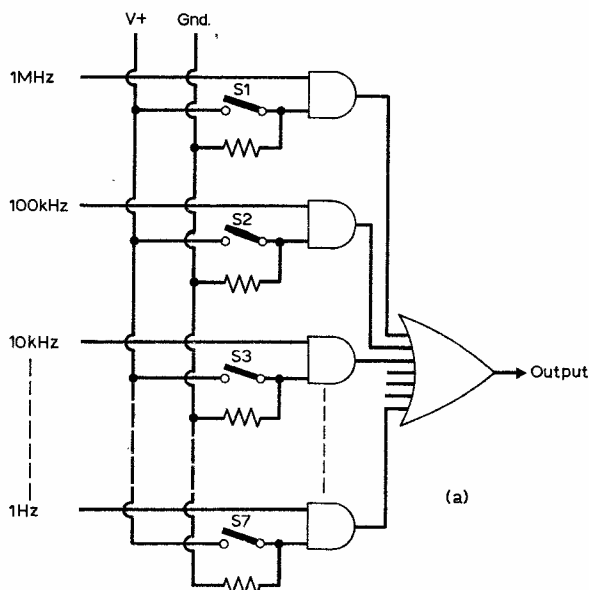
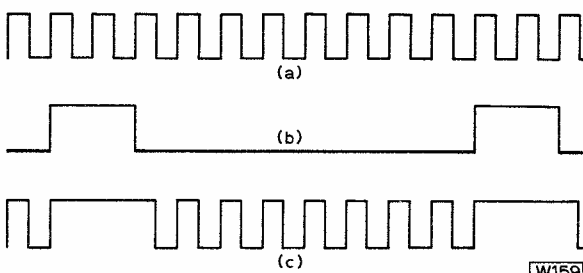


Fig. 5: Simplified circuits to illustrate the frequency selection method used in the calibrator.

Fig. 6: below, shows (a) 1MHz output waveform, (b) 100kHz output and (c) the 1MHz signal modulated by the 100kHz signal.



of the gates are connected via $1M\Omega$ resistors to earth. Closing the appropriate switch applies a logic "1" to the input of the gate enabling the selected signal to pass through the gate. Opening the switch applies a logical zero to the gate input preventing the signal applied to the other gate input from passing through the gate. Although 2-input AND gates are available in CMOS, 8-input OR gates are not. So the circuit of Fig. 5b is used instead. This circuit is functionally identical to that of Fig. 5a. The reason for this is that a NAND gate may be considered as an AND gate followed by an inverter Fig. 5c and a NAND gate with inverters at each input may be considered as an OR gate Fig. 5d.

THE OUTPUT STAGE

The drive capability of CMOS circuits is, typically, only $500\mu A$. Whilst this is sufficient for driving 50 or more other CMOS circuits, it will not drive TTL, DTL or other logic families. For this reason an output stage consisting of a BSX20 high-speed switching transistor Tr1, Fig. 7, in an emitter follower configuration is used. In order that the output voltage level from this will be compatible with any circuit to which it may be connected, the collector of Tr1 is not connected to the calibrator's own supply but is instead brought to a terminal on the front panel. If this terminal is connected to the supply rail of the circuit being driven, then the voltage swing of the output stage will not exceed the maximum ratings of the circuit being driven. If, however, the calibrator does not make direct connection with the equipment being calibrated, as, for example, when loosely coupled to a receiver, then the collector terminal of Tr1 may be connected to the calibrator's own supply, via the front panel terminal.

THE POWER SUPPLY

Since the current consumption of the circuit is very low, battery operation is employed. A stable supply voltage is required in order to prevent undue frequency drift in the crystal oscillator and so a Fairchild 78L12WC IC voltage regulator, IC8, is used to stabilise the 18V battery supply to 12V. This three terminal voltage regulator is thermally limited and will supply 100mA, well in excess of the calibrator's requirements. A front panel terminal is connected to the output of the regulator to enable the output stage to be powered when required. This 12V terminal may also supply external circuits under test if required but the maximum current drain should not exceed 90mA or so.

CONSTRUCTION

Much has been said about the dangers of handling CMOS devices. Do not be afraid of them but take the following simple precautions and all will work out well. When the ICs are received they may be packed in electrically-conducting foam. Leave them in this until inserted in the circuit. If you wish to solder them directly into the circuit rather than use sockets as suggested below, use a soldering iron which has either an earthed bit or a highly insulated bit. Both types are sold specifically for use with MOSFET devices. When transferring the CMOS devices from the conducting foam to the circuit or IC socket, take care not to let them come into contact with plastic materials or synthetic materials, such as

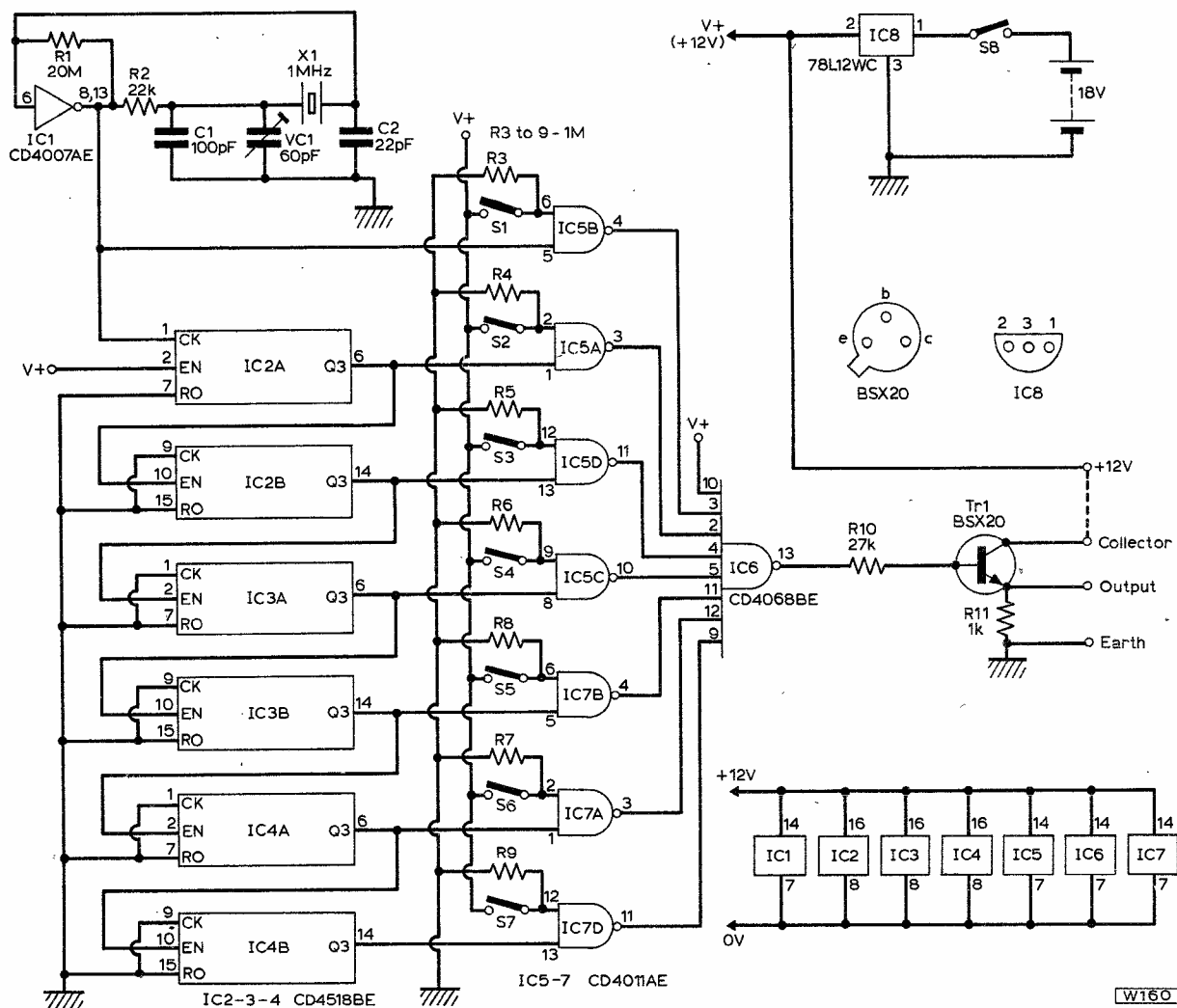


Fig. 7: Final circuit of the crystal calibrator. The frequency selector switches could be replaced by a rotary wafer switch but the facility of having one signal modulated by another would be lost.

nylon. As far as possible try to wear clothing of natural materials such as wool or cotton. On no account wear a nylon overall!

Try to minimise touching the CMOS leads, but touching them should rarely prove fatal for the device. A humid atmosphere is better than a dry one as it minimises the building up of static charges. Finally, don't worry! I have never known a CMOS device to die through electrostatic damage caused by mishandling. They do have input protection diodes and they are much more hardy than a lot of people are prepared to admit.

The circuit is built on a PCB, Fig. 8, then the wire links, resistors, capacitors and sockets for the ICs and quartz crystal connected. On no account solder directly to the pins of the crystal, nor to the crystal socket with the crystal inserted. Flying leads for connection to the switches and sockets can then be connected. After the case is drilled it should be painted and the lettering applied using Letraset, which is then varnished.

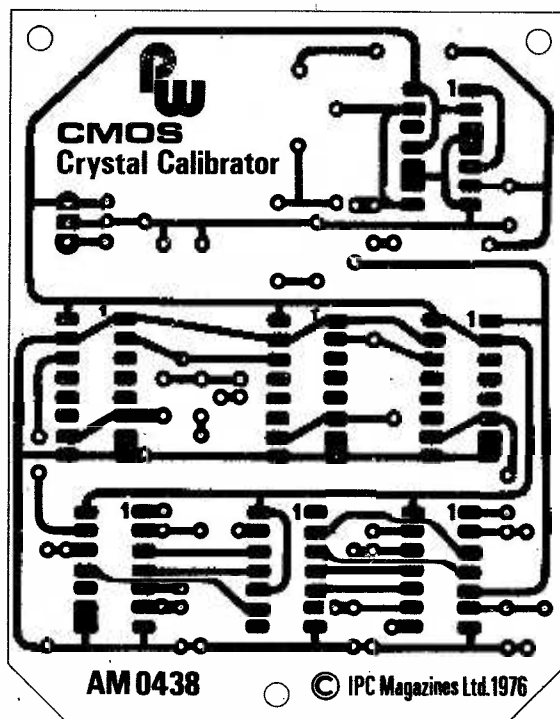
The board is then inserted into the case, Fig. 9, and held there by three 6BA screws with spacers and

nuts. The switches and terminals may then be connected to the circuit board and battery and, finally, the CMOS devices inserted in their sockets. The batteries may then be connected and the calibrator is ready for use. For those not requiring the multi-frequency output facility the wiring of a rotary switch is shown in Fig. 10.

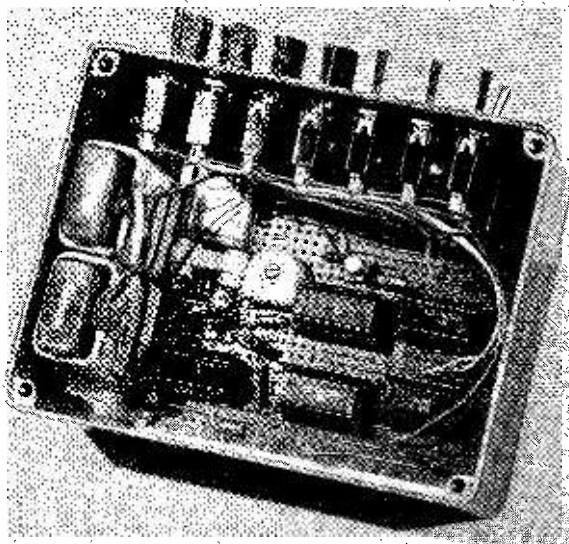
USING THE CALIBRATOR

Connect the output collector terminal to the internal supply terminal. If an oscilloscope is available, the output waveform may be examined by switching the calibrator and selecting the frequencies in turn and together. If a frequency meter is available, the calibrator output may be checked for functioning. The standardisation of the calibrator must be carried out against a standard source. A digital frequency meter is not good enough for this purpose. In any case, this is one of the pieces of equipment you will wish to calibrate using the calibrator!

An extremely accurate frequency standard is available from the long wave BBC Radio 2 trans-



missions on 200kHz. Tune a radio receiver to this programme and loosely couple the output of the calibrator by means of a wire lying near to the receiver aerial. With the calibrator switched on and the 100kHz frequency output selected, a beat frequency will be heard at the receiver due to the second harmonic of the 100kHz signal beating with the Radio 2 transmission. The variable capacitor VC1 should be adjusted for minimum beat frequency. If this is done by ear the calibrator can be adjusted within 2 or 3 Hz of the Radio 2 frequency, but if the



The finished calibrator with two PP3 batteries to the left, the crystal trimming capacitor in the centre and the 1MHz crystal in between.

receiver is equipped with a signal strength meter the adjustment can be better than a fifth of a hertz.

Bear in mind that this closeness of adjustment is at 200kHz and the corresponding accuracies of adjustment are 10 to 15 parts per million and 1 part per million respectively.

The calibrator may now be used to check a frequency meter. This is done by connecting the output stage collector to the calibrator's internal supply and connecting the calibrator output to the frequency meter to be checked. With the calibrator

continued on page 975

Practical Wireless, March 1976

SPECIAL PRODUCT REPORT

HEATHKIT HD~1410 ELECTRONIC KEYER

THE relatively simple operation of sending Morse with a straight key has, like so many otherwise simple electronic functions, been a victim of progress in the last few years. With the ardent CW operator it has always been a matter of personal pride that he should send good Morse. Many, including the writer, still try to keep the standards up but it must be admitted that it gets a bit wearisome in a contest with many operators sending at 25 words per minute or more. But having mastered the code I see no reason not to use any aid which will make life easier!

HISTORY

There have been variations of the straight key but the breakthrough came with the 'bug' key with its horizontally operated paddle and vibrating dot contact, with a sliding weight for speed control. The newcomer to the 'bug' is always recognizable because he sends dots at 60wpm and dashes at 10wpm! However it is quite a simple matter to get the dot and dash ratio right using just an ohm-meter.

The mechanical 'bug' key was followed by electrical devices using relays and valves, pioneered by the late OZ7BO, with a single paddle. The newcomer could still make a mess of it however, with 'CQ' coming out as 'NNMA' without too much trouble! The development of transistors and integrated circuits brought new techniques and rapid changes to the 'el-bug' or electronic key, culminating in the 'squeeze' or 'iambic' keyer as exemplified by this Heathkit HD1410 Electronic Keyer.

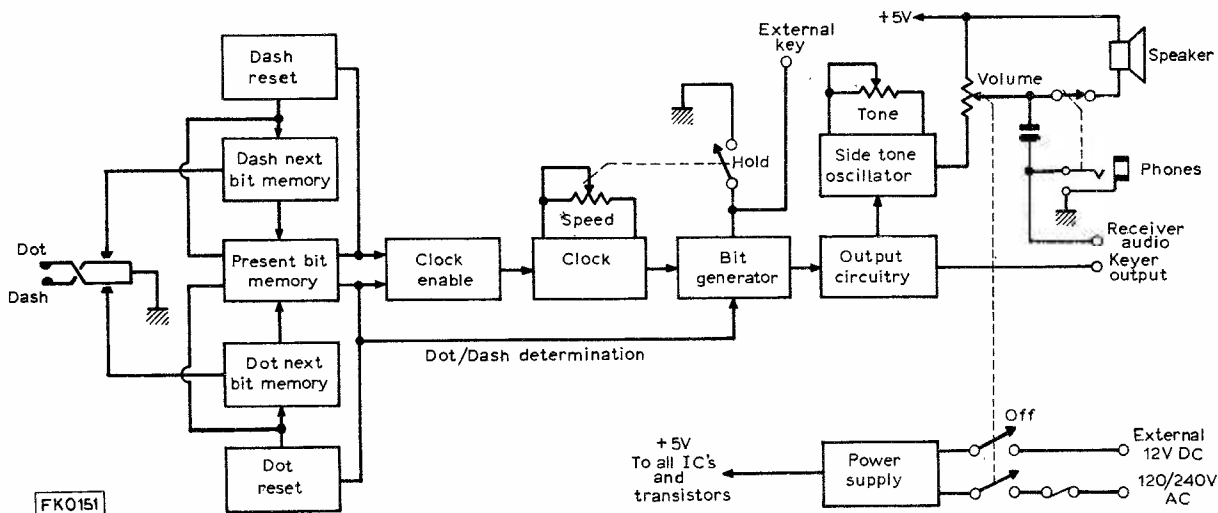
In case you feel a slight touch of inferiority complex coming on perhaps it should be explained that 'iambic' comes from the Greek 'iambus' or 'a foot of two syllables, a short followed by a long'—or dots and dashes to you!

Two independent paddles are used, one for continuous dots and the other for dashes. Each character is always correctly formed and is self-completing with the proper ratios being maintained at all times. A dash will come out



even if the dash paddle is tapped for a brief moment. The effect is quite uncanny when the keyer is set to a very low speed! The result is that Morse can be sent with an absolute minimum of wrist movement. For example, an A (· —) is sent by squeezing the paddles together ensuring that the dot one makes slightly before the dash paddle. For an N (— ·) the dash paddle is made first and if the action is held a C (— · — ·) will emerge.

If one is accustomed to the mechanical bug key it is possible to use the same action on the squeeze keyer, producing good Morse, but the number of movements made



Block diagram summarising the functions of the various stages in the keyer.

SPECIFICATION	
SPEED	Variable from less than 10wpm to 60wpm or, alternatively, 10 to 35wpm.
KEYER OUTPUT	Positive line to earth with max. open circuit voltage of 300V, max. current of 200mA. Negative line to earth with max. open circuit voltage of 200V, max. current of 10mA.
AUDIO	Sidetone adjustable from 500Hz to 1kHz fed to internal speaker or headphone jack, min 500Ω.
CONTROLS	Volume/On-Off. Speed/Pull-to-hold (Internal: Sidetone frequency-paddle tension-paddle travel).
REAR PANEL	Keyer output. Headphones. External key. External DC supply. Receiver audio.
POWER SUPPLY	120/240V 50/60Hz 3-5W. 10 to 14.5V DC 150mA (negative earth).
DIMENSIONS	127mm wide, 76mm high and 190mm deep (5 x 3 x 7½ in. deep)
WEIGHT	1.25kg (2.75lbs) includes lead weight bolted to bottom of case.

There are 11 diodes, 8 transistors and 5 integrated circuits in the keyer.

will be greatly in excess of those required using the proper squeeze technique. This is covered in detail in the handbook and it does not take very long to get the hang of it but it is still a matter of wonder as to how so much Morse can come out with so few movements!

THE CIRCUIT

The block diagram shows the various stages in the keyer. When a paddle is operated the 'present bit memory' commands the clock enable circuit to start a bit and ensures that the present bit is completed before another starts. The 'next bit memories' retain the information of which bit is next, a dot or a dash, if a dot or a dash was keyed before the present bit is completed. After the present bit is completed the 're-sets' load the 'present bit memory' with the information that is in the 'next bit memories'. Each dot and dash and off time is uniform because of the clock which produces uniformly spaced pulses.

The bit generator then responds to the clock pulses and the dot-dash determining line to produce a dot, or a dash which is three times as long as a dot, and on off time. The output circuitry drives the keyer output and sidetone circuitry.

The power supply is a normal series regulated bridge circuit that supplies 5V for the keyer. A diode protects the power supply against reversed polarity when an external battery is used to operate the keyer.

CONSTRUCTION

The instructions in the handbook were followed implicitly and it took 12 hours on a Sunday from start to finish including time off for meals, coffee-breaks and 'Upstairs, Downstairs'! It is important in such projects not to spend too long at a stretch or interest flags and mistakes can occur.

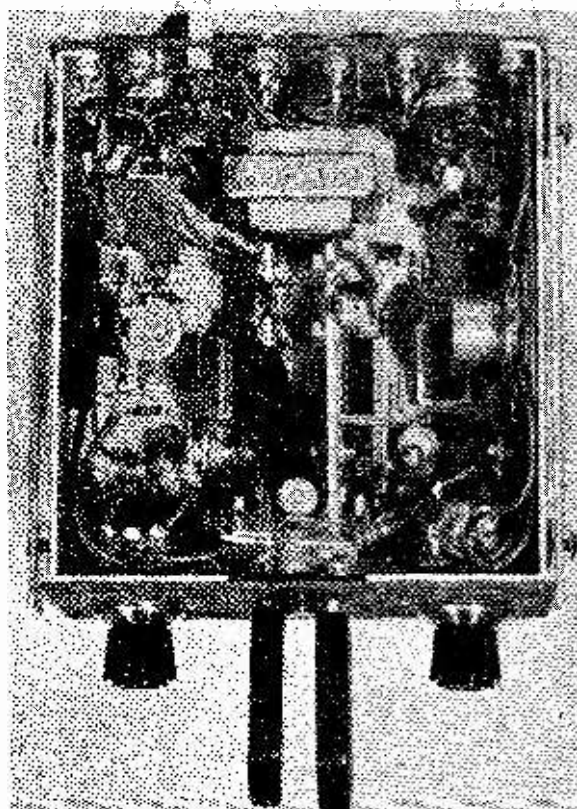
The Heathkit manual is impeccable, as usual, and the amount of detailed instruction incredible. The 10 to 35wpm option was selected as the alternative maximum of 60wpm was thought to be a bit high for contest work! Another interesting option is left or right hand operation of the paddles.

The solder supplied (American, presumably) was used but after a couple of joints it was abandoned in favour of the usual Multicore, which was noticeably superior. The mains transformer was wired for 240V input, of course, so the '1/16' ampere fuse supplied for 120V operation was redundant but was in fact used anyway! One day the correct '1/32' fuse will be fitted.

After carefully checking all the soldering on the PCB it was assembled into the casework and the various controls wired in, everything going according to plan. Following instructions, resistance tests were carried out with a multi-meter and proved frightening until the test leads were reversed! All was in order and the keyer worked the first time it was plugged in. The side-tone frequency was adjusted to about 1kHz and the paddle contacts adjusted for above-average gaps until experience of the keyer had been gained. The gaps are adjusted simultaneously by a common lever. The keyer was used on a 10W transmitter on the 160m amateur band keying the negative bias line (—45V) to the PA.

FACILITIES

Some keyers using solid-state devices end up with a mechanical relay which, by its very nature, imposes restrictions on keying at high speeds so it is good to see that the HD1410 is solid-state throughout, including the transmitter keying circuits. No adjustments are required whatever polarity of keying line is encountered in a transmitter. An

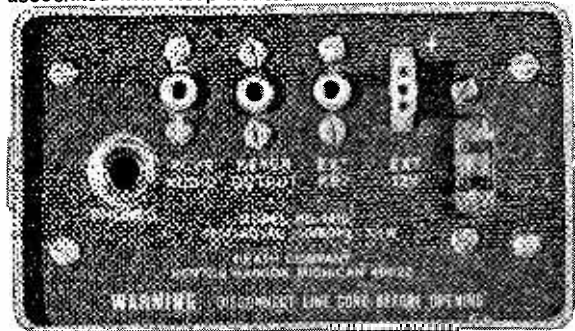


Looking into the top of the keyer the PCB is in the bottom, the mains transformer at the centre rear. The lever over the paddle assembly adjusts the gaps of the paddles simultaneously. The internal speaker is mounted on the right side of the cabinet. A piece of sheet lead is fastened to the bottom of the case to prevent movement of the keyer on the operating desk.

external key can be plugged in which will operate the keyer and the sidetone.

The audio output of a receiver can be fed into the keyer so that signals can be heard plus the sidetone of the keyer on transmit, a very useful feature indeed. Of course this arrangement can be done using external leads on any transmitter/receiver set-up but it is nice to realise that somebody thought of incorporating it into the keyer. For field days or portable work the keyer can be operated from a 12V battery and a lead is supplied for that purpose.

The keying waveform is very sharp as one would expect so the usual waveform shaping components in the transmitter are essential to avoid the radiation of objectionable clicks associated with steep-fronted waveforms.



The rear panel of the keyer has phono sockets for the various facilities including the feedthrough of signals from the receiver to the headphones in the keyer.

The keyer is a joy to use for the operator and surely must make the task of copying the code at the other end that much easier, especially under conditions of bad interference. Needless to say, the virtually perfect code excites a lot of favourable comment. Unfortunately, sending fast invites a fast reply and the keyer cannot help there! But it is not long before one gets accustomed to keeping the speed down which is such a pity with this delightful keyer!

AED

Price of kit £39.90 inc. VAT and P/P from Heathkit (Gloucester) Ltd. Gloucester GL2 6EE

CMOS Crystal Calibrator—continued from page 972

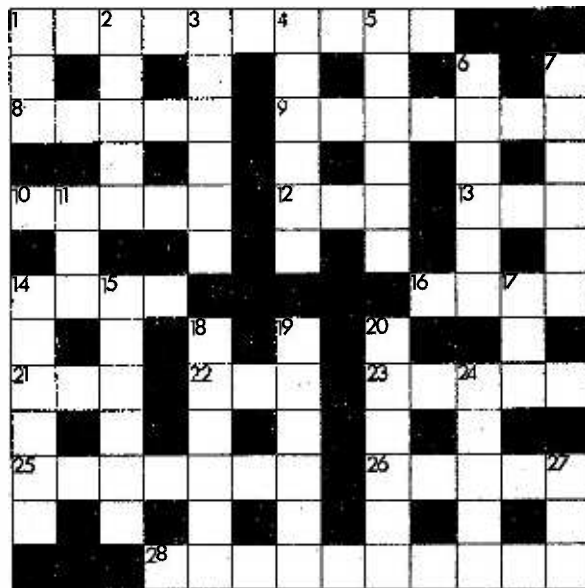
switched on, one frequency at a time should be selected, and the reading of the frequency meter observed. If the frequency meter is a digital one, the meter's clock oscillator should be adjusted until the meter reads correctly. If the frequency meter is of the analogue type, then usually a potentiometer may be adjusted in order to obtain the correct reading.

For calibrating a radio receiver the output collector should once again be connected to the calibrator's internal supply and a single wire connected to the calibrator output and placed in proximity to the receiver's aerial or aerial input. The 1MHz output of the calibrator should be selected and the receiver tuned until the signal is identified. If there is any confusion as to whether it is the calibrator signal or an external signal being received, the calibrator should be switched off, whereupon the signal should disappear. The point to which the receiver is now tuned is a multiple of 1MHz. Next, with the 1MHz signal still selected, the 100kHz switch should be closed, providing additional markers at 100kHz intervals. This process can be continued to provide 10kHz markers by closing the 10kHz switch.

To use the calibrator as a signal source for logic circuits under construction or under test, the output collector should not be connected to the calibrator supply but instead to the supply voltage of the circuit being driven.

Practical Wireless, March 1976

PW TECHNICAL PUZZLE No.12



ACROSS

- 1 Jammed part of USA with such electronics? (5, 4)
- 8 Use a bug? Has no option about it! (5)
- 9 Maths symbols make oscillating nice, Sid? (7)
- 10 Vessel transformer prohibition is back in? (5)
- 12 Owing three components of decouplers? (3)
- 13 Sheep sound without distortion by you? (3)
- 14 They used to be wired on a frame system (4)
- 16 He's involved in most antennae? (4)
- 21 Small resistance unit for Pam's rectifier? (3)
- 22 Eggs into valves! (3)
- 23 Distant little notice means unit of capacity? (5)
- 25 Colin is rebuilding such a transistor? (7)
- 26 His output resistance was unavailing! (5)
- 28 Flog your clothes to get such equipment! (10)

DOWN

- 1 Nothing in the vessel for a distress call? (3)
- 2 Aerial components with a reel set-up? (5)
- 3 Application of drugs to diode impurity process? (6)
- 4 Valve junction in Brazil of French design (6)
- 5 Not out of order with this rectifier? (6)
- 6 Local interference with standard English? (6)
- 7 One serious hook-up puts the navy behind? (9)
- 11 Relayed about half a nautical affirmative? (3)
- 14 Military band-pass with such sound? (6)
- 15 Basic aerial may be lucky with Spanish call (6)
- 17 Girl in the extra damping section? (3)
- 18 It makes a low sound childish! (3-3)
- 19 The attraction of inductance? (6)
- 20 Once more put on the air a new tune? (6)
- 24 German flower in her picture distortion (5)
- 27 Drum-type receiver (3)

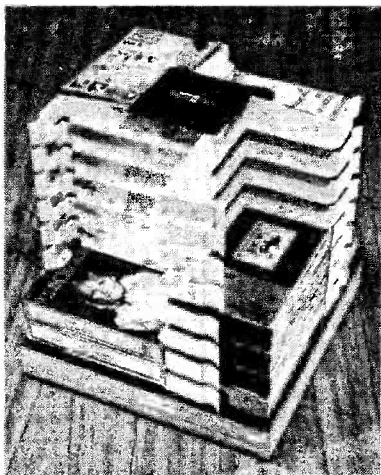
FOR AMUSEMENT ONLY
ANSWERS NEXT MONTH

PRODUCTION LINES

colin riches

CASSETTE STORAGE

Plastic Engineers Limited of Glamorgan have introduced a de-luxe version of their Tape-Rax unit for the storage of cassettes. (Mentioned in Production Lines last year.)



The base of the Super Tape-Rax is finished in a simulated woodgrain effect and the actual cassette clip-type holders come in an attractive ivory finish.

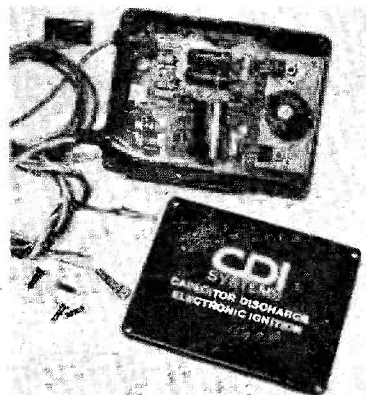
The excellent design of this unit enables it to be extended to hold additional cassettes. The Super Tape-Rax holds 32 cassettes in eight levels but the manufacturers can supply add-on units—each holding a further 16 cassettes on four levels. The unit, which is manufactured from virtually unbreakable plastic, revolves for easy cassette selection.

The recommended retail price of the Super Tape-Rax is £4.65—pretty good value for money and you should be able to obtain units from normal retail outlets. If however there is any problem, for a price of £4.97 inc. VAT, postage and packing, the manufacturers will supply direct. The add-on unit costs £1.60 inc. VAT, post and packing. Plastic Engineers Limited (Dept. P.W.), Treforest Industrial Estate, Pontypridd, Glamorgan, CF37 5TP.

ELECTRONIC IGNITION

C.D.I. Systems Limited of Beckenham, Kent market capacitor discharge electronic ignition systems. Capacitor discharge, as the name implies, is an electronic ignition which discharges a charged-up capacitor through the primary side of the coil. This is then stepped up by the transformer action of the coil to about 30kV. The speed and energy of the spark thus created start an engine—even if the sparking plugs are very dirty.

The company markets two types of unit—System 1 (£18.80 including VAT/postage) for high-revving or tuned cars, employs a reflective disc/sensor and this is used in place of the contact breaker points. The disc is simply slipped over the cam and secured by four screws. The sensor contains an infra-red LED which sends a narrow beam of light onto the



disc. This is then reflected back onto a photocell, a slot edge giving the firing 'signal'.

System 2 is a basic unit. The existing contact breaker points are still used, so fitting is very simple. Minimal point wear takes place however due to the low current passing through them. Price of the System 2 is £12.80 including VAT and postage. Both units also come in kit form: System 1 (£16.80) and System 2 (£10.80).

Further gen may be obtained from C.D.I. Systems Limited, (Dept. P.W.) 112 Beckenham Road, Beckenham, Kent. Telephone 01-650-0723. (S.A.E. please). Mail order address is 275 Vale Road, Ash Vale, Aldershot. Telephone 0252-29316.

ELECTROVALUE CATALOGUE

The Electrovalue Component Catalogue is produced annually with usually two following amended editions to keep information up-to-date. Catalogue No. 8—the latest—is bigger than ever, running to 144 pages. The Catalogue is available for 40p, post paid and includes a refund voucher for 40p available for spending on mail orders to the value of £5.00 or more.—Electrovalue Limited, (Dept. P.W.) 28 St. Judes Road, Englefield Green, Egham, Surrey, TW20 0HB.

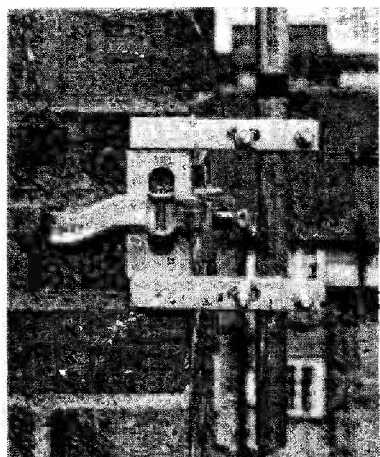
joints of brickwork and locked by a single bolt.

Ideal for the majority of domestic aerial installations, the Rawlplug SSB1 has a recommended retail price of £2.21 plus VAT at 8%. The Rawlplug Company Limited, (Dept. P.W.) Rawlplug House, 147 London Road, Kingston-upon-Thames, Surrey, KT2 6NR. Telephone 01-546-2191.

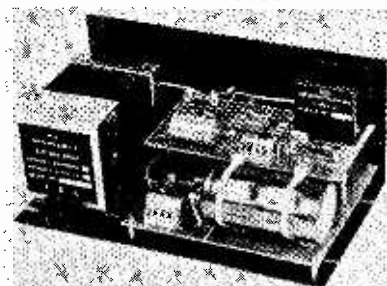
AERIAL MAST FIXING

The Rawlplug Company Limited have just released an ingenious new fixing for television and radio aerial masts. Called the Rawlplug SSB1, the new self-supporting bracket outdates the traditional and time-consuming lashing kit. With the SSB1, aerial rigs can be safely and strongly fixed in less than two minutes.

The SSB1 comes ready assembled and features two adjustable arms which are clipped into the mortar



TTL AND CMOS P.S.U.



Hybrid systems incorporating TTL and CMOS logic may be simplified by the inclusion of a new Weir composite power supply.

The 5V5A in its basic form produces an output of 5 volts at 5 amps and by the addition of an auxiliary card, designated 5-18V, a

TUAC MODULES

We recently had a chance to examine three of Tuac's modules—Four Channel Sound to Light Sequencer 4LSM1 is 1kW per channel unit having a switched master control for sound operation from 0.5W to 125W. A speed control sets a fixed rate sequence from 8 per minute to 50 per second. It will flash four sets of lights (each set up to 1kW) and it can also be used in a sound triggered mode whereby a music input is switched in and the lights flash in time with the music. Price is £22.

Sequence Dimmer type 3SDM1, has a control for varying the speed from 3 per minute to 10 per second and it is designed specifically for addition to the Tuac S1LMB light modulator. Price is £9.50.

The third item (S1LMB4) was the 3-Channel Light Modulator. Features are: R.C.A. 8A Triacs used, 1kW per channel; master control to operate from 1W to 100W; full wave control; 12 easy connections. Price is £15.50. A single-channel version (1500W) is available at £7.25. For further gen on these and other Tuac equipment write to *Tuac Limited*, (Dept. P.W.) 119/121 Charlmont Road, London, S.W.17.

second output, variable from 5 to 18 volts at 250mA is facilitated. Several units may be connected in parallel to increase the available output current.

The 5V5A is fused, re-entrant current limited and optionally crowbar protected. Regulation is less than 0.05% variation for a $\pm 10\%$ load change. Output resistance is less than 1 m Ω at DC, whilst impedance is typically under 200 m Ω and 100kHz. Price of the 5V5A is £24.50 for 1 off. Price of the 5-18V is £7.50 for 1 off. *Weir Instrumentation Limited*, (Dept. P.W.) Durban Road, Bognor Regis, Sussex.

CHINON HI-FI EQUIPMENT

A completely new range of hi-fi equipment has been launched by Dixons under their exclusive Chinon brand name. This new equipment is also available in Wallace Heaton shops—part of the Dixons Group.

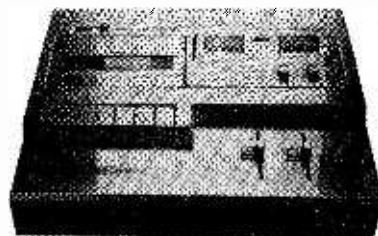
The range consists of three receivers, two cassette decks and a record deck.

The AR6000 at £99.50, is the lowest priced of the receivers.

The AR7000 receiver, priced at £139.50 has a greater output—25 watts (8 ohms) RMS per channel, (both channels driven). Besides an FM tuning meter, there is also an AM/FM signal strength meter and this model has FM muting and hi filter switches.

Two switchable inputs are provided for magnetic cartridges and the auxiliary input can be utilised for crystal and ceramic cartridges. Also, two tape inputs are provided and these, used with tape monitor switches, enable tape-to-tape dubbing to be undertaken.

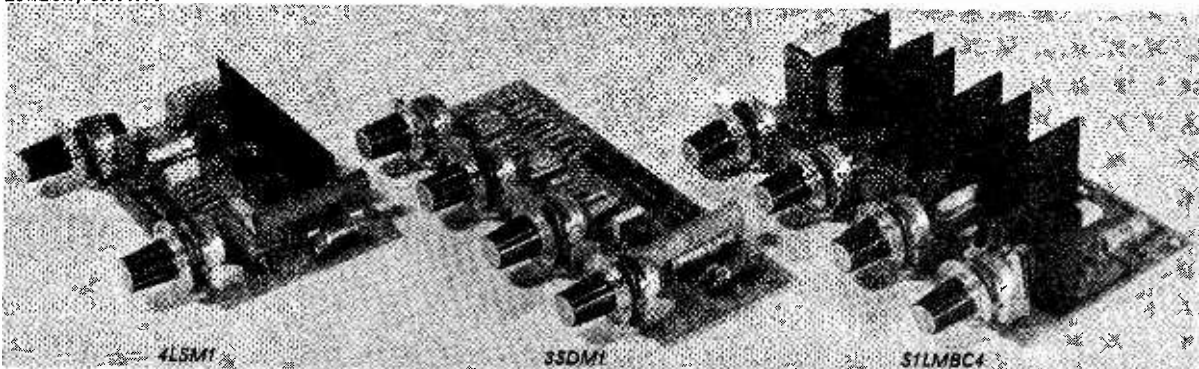
The AR8000 receiver (price £159.50) incorporates a sensitive AM/FM tuner section and an amplifier rated at 40 watts (8 ohms) RMS per channel (both channels driven).



Like the receivers, the cassette decks feature brushed silver and teak finishes. The TC4000 is priced at £79.95, whilst the TC5000D, which incorporates a Dolby circuit is £99.95.



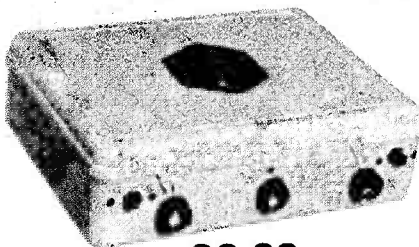
The Chinon PL25 2-speed record deck is £57.95. It is belt-driven by a 4-pole synchronous motor. At the end of the record play the arm returns to rest position automatically and the turntable motor power supply is cut off. The S-shaped arm has a calibrated stylus pressure weight and is fitted with a factory balanced anti-skate device. Fitting a cartridge is made simple with the head shell which attaches to the pick-up arm with a locking collar. Speed selection is by twin buttons and the cue lever is conveniently positioned at the front of the deck. The teak finish plinth is fitted with a tinted, hinged dust cover. *Dixons Photographic Limited*, (Dept. P.W.) 64 New Bond Street, London, W1Y 9DF. Telephone: 01-499 1707.



RADIO EXCHANGE LTD.

**ALL PRICES
INCLUDE VAT**

NEW EDU-KIT MAJOR



Total Building Costs **£9.99**

P & P 65p

Completely Solderless Electronic Construction Kit. Build these projects without soldering iron or solder

- ★ 4 Transistor Earpiece Radio.
- ★ Signal Tracer.
- ★ Signal Injector.
- ★ Transistor Tester NPN-PNP.
- ★ 4 Transistor Push Pull Amplifier.
- ★ 5 Transistor Push Pull Amplifier.
- ★ 7 Transistor Loudspeaker Radio MW/LW.
- ★ 5 Transistor Short Wave Radio.
- ★ Electronic Metronome.
- ★ Electronic Noise Generator.
- ★ Batteryless Crystal Radio.
- ★ One Transistor Radio.
- ★ 2 Transistor Regenerative Radio.
- ★ 3 Transistor Regenerative Radio.
- ★ Audible Continuity Tester.
- ★ Sensitive Pre-Amplifier.

Components Include: 24 Resistors ● 21 Capacitors ● 10 Transistors ● 3 1/2" Loudspeaker ● Earpiece ● Mica Baseboard ● 3 12-way connectors ● 2 Volume controls ● 2 Slider Switches ● 1 Tuning Condenser ● 3 Knobs ● Ready Wound MW/LW/SW Coils ● Ferrite Rod ● 6 1/2 yards of wire ● 1 Yard of sleeving etc. ● Complete kit of parts including construction plans.

ELECTRONIC CONSTRUCTION KITS

ECK 2 Self Contained Multi-Band V.H.F. Receiver Kit.

8 Transistors and 3 Diodes. Push/Pull output. 3" Loudspeaker, Gain Control. Superb 9 section swivel ratchet and retractable chrome plated telescopic aerial. V.H.F. Tuning Capacitor, Resistors, Capacitors, Transistors, etc. Will receive (subject to local reception conditions) T.V. Sound, Public Service Band, Aircraft, V.H.F. Local Stations, etc. Operates from a 9 Volt P.P.7 Battery (not supplied with kit)

Complete kit of parts including construction plans **£7.95** P.P. and Ins. 55p.



ECK 4

7 Transistors, 6 tuneable wavebands, MW, LW, Trawler Band, 3 Short Wave Bands. Receiver Kit. With 5" x 3" Loudspeaker. Push/Pull output stage, Gain Control, and Rotary Switch. 7 Transistors and 4 Diodes. 6 section chrome-plated telescopic aerial. 8" Sensitive Ready Wound Ferrite Rod Aerial. Tuning Capacitor, Resistors, Capacitors, etc. Operates from a 9 Volt P.P. 7 Battery (not supplied with kit). Complete kit of parts including construction plans **£7.25** P.P. and Ins. 55p.

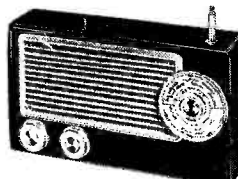


TRANS EIGHT

8 Transistors and 3 Diodes, 6 Tuneable Wavebands: MW, LW, SW1, SW2, SW3 and Trawler Band. Sensitive Ferrite rod aerial for MW and LW. Telescopic aerial for Short Waves. 3in Speaker 8 improved type transistors plus 3 diodes. Attractive case in black with red grille, dial and black knobs with polished metal inserts. Size 9 x 5 1/2 x 2 1/2 in approx. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Complete kit of parts including construction plans. (Overseas Seamail P. & P. £2.50)

Total Building Costs **£6.99**

P.P. & Ins. 55p



"EDU-KIT"
Build Radios, Amplifiers, etc.

Components include:
Tuner Condenser: 2 Volume Controls: 2 Slider Switches: Fine Tone 3" Moving Coil Speaker: Terminal Strip: Ferrite Rod Aerial: Battery Clips: 4 Tax Boards: 10 Transistors: 4 Diodes: Resistors: Capacitors: Three 1" Knobs. Units once constructed are detachable from Master Unit, enabling them to be stored for future use. Ideal for Schools, Educational Authorities and all those interested in radio construction.

Complete kit of parts including construction plans. P.P. & Ins. 55p. (Overseas Seamail P. & P. £3.40)

Total Building Costs **£6.99**

NEW EVERYDAY 6

6 Transistors and 3 diodes. Powered by 9 volt battery. Ferrite rod aerial 3" loudspeaker, etc., MW/LW coverage. Push Pull output. Complete kit of parts including construction plans.

Total Building Costs **£5.50**

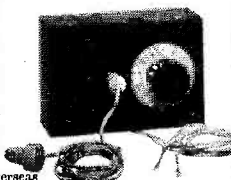
P.P. & Ins. 50p. (Overseas Seamail P. & P. £2.30)

NEW JIFFY TESTER

Easy to build and operate, fits in the pocket, A quick checker for continuity of resistors, chokes, diodes, transistors, circuit wiring (not mains) and loudspeakers. Complete with earpiece, jack plug and socket resistors, capacitors, components, etc. Complete kit of parts including construction plans.

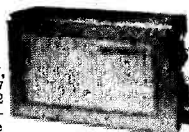
Total Building Costs **£3.15**

P.P. & Ins. 30p. (Overseas Seamail P. & P. £1.70)



POCKET FIVE

NOW WITH 3" LOUDSPEAKER
3 Tuneable wavebands, MW, LW and Trawler Band 7 stages, 5 transistors and 2 diodes, super-sensitive ferrite rod aerial attractive black and gold case. Size 5 1/2" x 1 1/2" x 3 1/2" approx. Complete kit of parts including construction plans. (Overseas Seamail P. & P. £2.30)



Total Building Costs **£3.99**
P.P. & Ins. 50p

VHF AIR CONVERTOR KIT

Build this Converter Kit and receive the Aircraft Band by placing it by the side of a radio tuned to Medium Wave or the Long Wave Band and operating as shown in the instructions supplied free with all parts. Uses a retractable chrome plated telescopic aerial, Gain Control, V. H. F. Tuning Capacitor, Transistor, etc.

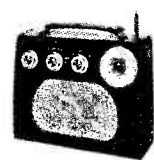


All Parts including Case and Plans. **£4.35** P.P. and Ins. 40p

ROAMER TEN MARK 2

With VHF including aircraft

Now with free earpiece and switched socket. 10 Transistors. Latest 5" x 3" Loudspeaker. 9 Tuneable Wavebands, MW1, MW2, LW, SW1, SW2, SW3, Trawler Band, VHF and Local Stations also Aircraft Band. Built in Ferrite Rod Aerial for MW/LW. Chrome plated 6 section Telescopic Aerial, can be angled and rotated for peak short wave and VHF listening. Push/Pull output using 600mW Transistors. Car Aerial Socket 10 Transistors plus 3 Diodes. Ganged Tuning Condenser with VHF section. Separate coil for Aircraft Band. Volume on/off. Wave Change and Tone Controls. Attractive Case in rich Chestnut shade with gold blocking. Size 9" x 7" x 4". Easy to follow instructions and diagrams.



Total Building Costs **£11.87** P.P. and Ins. 65p

RADIO EXCHANGE LTD.

TO RADIO EXCHANGE LTD., 61A HIGH STREET, BEDFORD MK40 1SA. Tel: 0234 52367, REG NO. 788372

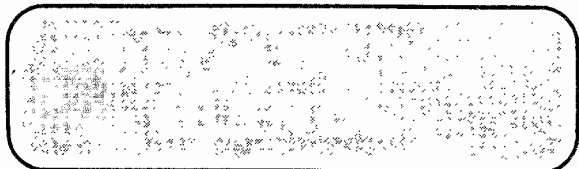
* Callers side entrance "Lavells" Shop.
* Open 10-11, 2.30-4.30. Mon-Fri. 9-12 Sat.

I enclose £..... for

Name

Address

PW 3



MEDIUM WAVE DX

by CHARLES MOLLOY

FA. Ainsley of Hartlepool has sent in an excellent log of DX from the Caribbean. Using a medium wave loop aerial, differential amplifier and homemade receiver he picked up Georgetown, Guyana on 760kHz, Radio Belize on 834kHz and Martinique on 1310kHz, so obviously medium wave broadcasts from the Caribbean are capable of being logged in the UK at this time of the year. Listen for WKAQ in San Juan, Puerto Rico on 680kHz, Radio Progreso, Havana, Cuba on 690kHz (in Spanish); Paramaribo, Surinam on 720kHz (in Dutch); PJB in Bonaire on 800kHz with multilingual Trans World Radio broadcasts from a 500kW transmitter; Radio Caribbean on St. Lucia on 840kHz, Radio Barbados on 900kHz, ZDK St. John's, Antigua on 1100kHz and Radio Paradise in St. Kitts on 1265kHz. Each of these stations has been heard in Europe this winter.

DXers are sometimes advised to operate their receivers with the AGC switched to the ON position, the RF gain control set to maximum and the signal level adjusted with the audio gain control. This method is suitable for general short wave listening when the main interest is with strong signals. The automatic gain control operates on strong signals and automatically adjusts the gain of the RF and IF stages in sympathy with the level of the incoming signal, thus when the signal strength is high the receiver gain is low and when the signal fades the receiver gain increases. So the AGC is very useful for countering the effects of fading.

Unfortunately, this technique is unsuitable for DXing on the medium waves and is probably the main reason for the lack of success experienced by newcomers to the band. Much of the MW DX heard in Europe consists of signals which are subject to slow cyclic fading and often separated by only a few kHz from a strong local station. If the AGC is switched ON and an attempt is made to listen to a weak signal which is close to a strong one then the AGC will respond to the strong signal, the receiver gain will be reduced and the weak signal will be missed.

Always switch OFF the AGC when DXing on the medium waves. Set the AF gain to give a comfortable

volume at the headphones or loudspeaker and use the RF gain control to adjust the receiver sensitivity. Overloading will occur when a strong station is tuned in so the RF gain will have to be low but when searching for DX turn up the RF gain until the noise level appears. The receiver will now be in its most sensitive state. Fading, which is usually slow, is countered by manual adjustment of the AF gain and the DX can be followed right down to the level of static and receiver noise during the trough of the fading cycle. The DXer who tunes rapidly across the band with his AGC switched on will miss much of the DX. Tune slowly. Be patient, the signal may have faded temporarily and make sure the AGC is off.

Some of the best North American DX for several years has been heard in the UK this winter. During the month of October several broadcasters on the west coast of Canada and the United States were logged including KOMO in Seattle on 1000kHz; CKDA in Victoria, British Colombia on 1220kHz; CHQM in Vancouver on 1320kHz and KFBK in Sacramento, California on 1530kHz. Other rarities reported recently are WCCO in Minneapolis on 830kHz; WWL New Orleans on 870kHz; WHO Des Moines on 1040kHz; KMOX St. Louis on 1120kHz and KSL in Salt Lake City, Utah on 1160kHz. These loggings are a further indication of the improved conditions on the lower frequencies, now that we are approaching the minimum of the current sunspot cycle. If you have never heard North America on the medium waves, now is the time to try. At this time of the year the best time to listen is around midnight. When conditions are favourable a number of the high power outlets on the east coast of Canada and the United States should be audible, even with quite simple receivers. The most consistent one is CJON in St. John's in Newfoundland on 930kHz. It is easy to identify as its callsign is used frequently and local time in Newfoundland is three and a half hours behind GMT.

Harold Emblem reports again from Mirfield, in Yorkshire. He logged Nouakchott in the African Republic of Mauretania on 1349kHz recently and the station verified with a QSL card. Congratulations on a fine achievement Harold. DXers are not always content when they have logged a distant station and many wish to obtain a letter or card from the station, confirming their reception. International broadcasters are of course very pleased to hear from their audience and willing to send out QSL cards, programme schedules, pennants and other mementos of the occasion.

Although the majority of medium wave stations will verify, it is sometimes an achievement in itself to obtain a QSL from a distant station. The DXer



is located well outside the service area of his quarry and although the station staff (usually the Chief Engineer) may be surprised and pleased to learn that they have been heard at a great distance, the DXer should remember that he really has the status of an eaves-dropper and he is relying on goodwill for a reply.

A reception report to a medium wave station should contain enough programme detail, including the date and time in GMT, to enable the station to confirm that it was indeed their transmission that was heard. The report should be sent off as soon as possible and should request a verification of reception. It should always be accompanied by return postage. Foreign stamps are available from stamp dealers but more conveniently an International Reply Coupon can be bought at main post offices. An IRC is exchangeable in most parts of the world for stamps that will cover the cost of a letter to any part of the world by surface mail.

AMATEUR BANDS

by Eric Dowdeswell G4AR

IT is very satisfying to get a number of letters each month from really raw recruits to our hobby. Some have no equipment at all while others have bought a set and then wonder where to go from there! Unfortunately, the set is not always suitable for our work. The main point is that these newcomers are the licensed amateurs of the future and it is very important that they be given every assistance and guided along the right lines from the outset. Some are "eavesdroppers" from the aircraft and public service bands, an activity which I strongly deprecate, so they usually get a firm and polite reply from me pointing out the virtues of the amateur and broadcast bands. They are often surprised to learn that there is an amateur band from 144 to 146MHz on VHF!

Finally, I direct the newcomer's attention to the Radio Society of Great Britain and send a copy of their list of publications. It is at this point that the system breaks down! On joining the RSGB the newcomer, if under 18 years of age and unlicensed, gets his Associate number (A1234 for example) and eagerly scans his first copy of the monthly magazine Radio Communication. What does he find of interest to the beginner? Next to nothing! It's not surprising that I seem to get more mail from the 'A' fraternity than the RSGB on the subject of the amateur bands!

Andrew Swiffin A8603 (Cheadle) comments on the improved conditions on Top Band but regrets that he

has not been able to devote much time to the bands owing to important exams. Quite right OM, they do come first. Steve Cottis A8961 (Harrogate) took time off to improve his aerial system, a 66ft end-fed being modified to a Windom. I would suggest that this be modified again to a VS1AA aerial which will perform well on several bands.

Paul Barker BRS34898 (Grangetown) reported an uneventful month but did manage to catch an interesting one in KC4AAA located at the geographical South Pole and Paul got it on to tape. Paul Turner (Bishops Stortford) has taken to the amateur bands with a Trio QR666 with a Microwaves module for the 2m band fed from a five-element yagi. On the HF bands he has a 100ft wire. Jeremy Hinton A8962 (Newcastle, Staffs) awaits the result of the December RAE with some trepidation. He has a B44 transceiver in the process of conversion to the 4m band so looks like he is going straight for his G4+3!

Peter Allen (Taunton) now has a shack in the garden so he can spread himself a bit. He's not been able to find any DX on the bands in the evenings which surprises me in view of all the other reports of activity, especially on 80m. He enjoyed himself going portable with G8IZE into the Quantock Hills where they worked into Germany and Switzerland on 2m.

Tim Charles (Colchester) was well pleased with his effort in the RAE so let's hope his optimism is borne out even though it means losing a contributor to this column! He had the excitement of hearing W2ACS/MM send out a Mayday call when the MV Scorpion was in trouble. DA1EK answered the call and the appropriate authorities alerted. Tim wisely looks at the CW end of the bands, often finding much of interest when there is little activity on SSB.

Old friend Alan Rae, now GM4ENN, got thrown in at the deep end. Buying a Swan 350 transceiver he promptly entered the CQ World Wide competition using a TA33Jr and 18AVQ aerials, and managed to keep going for about 20 hours. As he says, "it's much more difficult to work them than to just hear them!"

Log extracts

Alan Rae:— Worked 40m PJ8YFQ EP2TW 4X4QG 20m XJ2UN (Olympic Games call, Montreal) ZL4AP 15m ZB2BL SV1GA WA0HFW/P4

T. Charles:— 80m CR9AK JA4FHE VP2ABC 9M2DW 40m CP5KYS JA6AXH VK3XI ZL2ANT 20m CE4EV VP9L 8R1X 15m FG7XA FY7AK VP5AH 7X3OM 2m GI3JLA GM3YOR and GM4BVD all via auroral propagation

P. Allen:— 80m FP8DH 20m ZL1BD 15m C5AJ ZS1XG FY7BHI ZP5CD JH6PHQ 2m OJ0JEA SM7FJE OH5FF

P. Turner:— 20m KV4IJ VP6AH 2m DK8SYP OE1WWA UB5EC UK2RIL

P. Barker:— 20m C9MAF KC4AAA 9J2AB 20m SSTV EA1AX

S. Cottis:— 20m KR6BT SV0WKK (Crete) VE7TL VP2VBG

A. Swiffin:— 15m TR8SS VK5MS YN1RWG 3B8DN



SHORT WAVE BROADCASTS

by Derek Bell

MATELOTS and ex-matelots are asked for advice by **Dr. H. S. Brodribb** of St. Leonards-on-Sea. The good doctor has come into contact with an ex-WD short wave set that has set him a puzzle regarding its age. This set tunes from 15 to 1500 kHz and 1500 to 20000 kHz. The ranges are tuned by four "huge plug in coils" and the set weighs in at 62lbs. It is marked "Admiralty Pattern 1309K, Serial number MF24, Tuner Amplifier B13". Dr. Brodribb would be grateful if any members could identify this set and give him the date of manufacture.

Another mystery set is owned by **J. R. Curtis** of Beaminster who paid ten shillings for it (remember the ten bob note?). While it has no maker's name on, it is in a home-made cabinet and many of the components are marked, including valves VP4B and MHD4. Using this rig Mr. Curtis pulled in Radio Australia at 1600 on 9745 and is a little suspicious that this was a rebroadcast of the R.A. signal. I think you will find that it was the 250kW station at Brisbane and for that time of the evening, while not rare DX, was not unusual, the signals following the night path over Asia and Europe.

It is always a pleasure to hear from readers overseas and this time a letter from Tanzania, from **James Lyamba** of POB25344 Dar-es-Salaam. James has been having problems with a mixer circuit on his home-made set that has gone "up the spout". Having no local DX club or friendly local amateur or even corner radio shop to turn to he would like any DXer, who is so minded, to drop him a line and perhaps correspond regularly. So if any one wants to extend a helping hand please write to the above address.

Radio Berlin International dropped me a line recently to say that they have stopped temporarily the 1730 transmissions on 7260 and 1511 and if anyone has problems in finding them please drop down to the medium waves. For some strange reason Polish Radio from Warsaw has not yet adopted the usual method of frequency notation. Recently they sent me their schedule for November 1975 to May 1976. The announced times are between 0630 and 2300 on the 31, 41, 49 and 75m bands. For the student of languages this station is quite a boon since they do programmes in French, German and Italian and also in Esperanto, slotted between the regular languages at 0500, 0530, 1530, 1600, 2130 and 2200. Another unusual feature of this station is that their scheds. include airtime for what are called "Polish

Seamen". This amounts to six hours a day on six frequencies so one wonders how many Polish seamen there are to merit such a service, when the BBC World Service has only one Merchant Navy record prog!

There is a questionnaire being sent out by Polskie Radio at the moment that offers a free ten day trip to Poland to the lucky "contestant" whose form is drawn out of a hat. I must confess that this sort of scheme is a sore point with me since the questions seem to be a little too personal. They want to know not only the obvious "what is reception like in your area" but "what sort of education did you get", "what is your job" and "Do you find the manner in which we present international affairs convincing?" This latter question I think gives the clue to the whole purpose of the exercise!

This column recently mentioned receivers, including the short wave bands, costing around £50. From Ross-on-Wye, the QTH of **K. H. Smith**, comes word of a set, sold by a namesake bookselling firm, costing £16.75 with 1.6 to 26MHz plus long, medium and VHF bands, although K. H. says that an additional aerial is essential though this addition produces "gremlins". K. H. has managed to log WYFR Scituate, Mass on 17865 at 2000 and Kol, Israel on 9625 at 2000 to 2100.

This set would seem to be the answer to the beginner's prayer, although I have not heard of it or seen any review, so until that time I will content myself with just mentioning its existence.

Simon Knott, from Cambridge, winds up our innings this month with a selection of his best that are worth looking for. He runs a Trio 9R59DS hanging from the end of a 30m long wire and bids us try for the following:— IBRA Radio Sines on 9670 at 2050, Radio Pakistan on 6235 at 2100 and All-Asian Service, Sri Lanka on 9720 at 0200.

With that last little bit of night owling I must wish you and yours 73s and draw this month's effort to a close.

BROADCAST BANDS

Short Wave reports by the 15th of the month to **Derek Bell** c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

Medium Wave Logs to **Charles Molloy**, 132 Segars Lane, Southport, PR8 3JG.

AMATEUR BANDS

Logs covering any Amateur band/s in band/ alphabetical order by the 25th of the month to **Eric Dowdeswell** G4AR, Silver Firs, Leatherhead Road, Ashted, Surrey, KT21 2TW.

AVAILABLE NOW! REPRINT OF PW's TELE-TENNIS SERIES

July-November 74

Send 75p + 10p (post & packing) to: Chief Cashier (PW Tele-Tennis), IPC Magazines, Tower House, Southampton St., London, WC2E 9QX.

TELEVISION

MARCH 1976

TV RECEIVING AERIALS

It is surprising how often the aerial is overlooked, since the results obtained from a receiver depend on the quality of the signal at its aerial socket. In the past there has been rather a lot of confusion about aerial performance and what exactly is required. Pat Hawker goes into the subject from an essentially practical viewpoint, describing what you can expect from the various types of aerial in use, and the requirements of different types of receiver in different geographical situations.

UP-DATING WITH A TRIPLER

Many older colour sets with a GY501/PD500 e.h.t. arrangement give trouble due to ageing in this part of the receiver. A simple solution is to use a tripler instead, dispensing with the line output transformer overwinding and thus increasing the reliability of the stage. Hugh Cocke explains how to go about this.

COLOUR FAULTS

John Coombes deals with the Z584 decoder panel used in the Rank AB23AV colour chassis, explaining common faults and how to tackle them.

In addition he describes his experiences to date with the Mitsubishi CT2000 colour receiver.

WHAT SCOPE?

In the second instalment of his series on test equipment E. Trundle considers what the TV serviceman requires of an oscilloscope and reviews six suitable instruments.

PLUS ALL THE REGULAR FEATURES

TO
(Name of Newspaper)

Please reserve/deliver the MARCH issue of
TELEVISION and continue every month until
further notice.

NAME

ADDRESS



"I MADE IT MYSELF"

Imagine the thrill you'll feel! Imagine how impressed people will be when they're hearing a programme on a modern radio you made yourself.

Now! Learn the secrets of radio and electronics by building your own modern transistor radio!

Practical lessons teach you sooner than you would dream possible.

What a wonderful way to learn—and pave the way to a new, better-paid career! No dreary ploughing through page after page of dull facts and figures. With this fascinating Technatron Course, you learn by building!

You build a modern Transistor Radio . . . a Burglar Alarm. You learn Radio and Electronics by doing actual projects you enjoy—making things with your own hands that you'll be proud to own! No wonder it's so fast and easy to learn this way. Because learning becomes a hobby! And what a profitable hobby. Because opportunities in the field of Radio and Electronics are growing faster than they can find people to fill the jobs!

No soldering—yet you learn faster than you ever dreamed possible.

Yes! Faster than you can imagine, you pick up the technical know how you need. Specially prepared step-by-step lessons show you how to: read circuits—assemble components—build things—experiment. You enjoy every minute of it!

You get everything you need. Tools. Components. Even a versatile Multimeter that we teach you how to use. All included in the course. **AT NO EXTRA CHARGE!** And this is a course anyone can afford. (You can even pay for it by easy instalments).

So fast, so easy, this personalised course will teach you even if you don't know a thing today!

No matter how little you know now, no matter what your background or education, we'll teach you. Step by step, in simple easy-to-understand language, you pick up the secrets of radio and electronics.

You become somebody who makes things, not just another of the millions, who don't understand. And you could pave the way to a great new career, to add to the thrill and pride you receive when you look at what you have achieved. Within weeks you could hold in your hand your own transistor radio. And after the course you can go on to acquire highpowered technical qualifications, because our famous courses go right up to City & Guilds levels.

Send now for FREE 76 page book—see how easy it is—read what others say!

Find out more now! This is the gateway to a thrilling new career, or a wonderful hobby you'll enjoy for years. Send the coupon now. There's no obligation.

POST TODAY FOR FREE BOOK

To: ALDERMASTON COLLEGE
DEPT. CPW 15, READING RG7 4PF

CPW15

Also at our London Advisory Office, 4 Fore Street Avenue, Moorgate, London, EC2Y 5EJ Tel: 01-425 2721

Yes, I'd like to know more about your course. Please send me free details—plus your big, 76-page book that tells about all your courses.

Name

Address

POST CODE



HOME OF BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY



WILMSLOW AUDIO

THE Firm for speakers!

SPEAKERS

Baker Group 25, 3, 8 or 15 ohms
Baker Group 35, 3, 8 or 15 ohms
Baker Group 50/12 8 or 15 ohms
Baker Group 50/15 8 or 15 ohms
Baker Deluxe 12" 8 or 15 ohms
Baker Major 3, 8 or 15 ohms
Baker Superb 8 or 15 ohms
Baker Regent 12" 8 or 15 ohms
Baker Auditorium 12" 8 or 15 ohms
Baker Auditorium 15" 8 or 15 ohms
Celestion G12M 8 or 15 ohms
Celestion G12H 8 or 15 ohms
Celestion G12/50TC 8 or 15 ohms
Celestion G15C 8 or 15 ohms
Celestion G18C 8 or 15 ohms
Celestion HF1300 8 or 15 ohms
Celestion HF2000 8 ohms
Celestion MH1000 8 or 15 ohms
Celestion CO3K
Decca London ribbon horn
Decca DK30 ribbon horn
Decca CO1/18 Xover (DK30)
EMI 14 x 9 Bass 8 ohms 14A770
EMI 8 x 5, 10 watt, d/cone, roll surr.
EMI 61" d/cone, roll surr. 8 ohms
EMI 8" roll surr. bass
EMI 5" mid range
Elae 59RM102 (15) 59RM114 (8)
Elae 61" d/cone, roll surr. 8 ohms
Elae 10" 10RM239 8 ohms
Eagle Crossover 3000hz 3, 8 or 15 ohm
Eagle FR4
Eagle FR65
Eagle FR8
Eagle FR10
Eagle HT15
Eagle HT21
Eagle MHT10
Eagle FF28 multicell. horn
Fane Pop 15, 8 or 16 ohm
Fane Pop 25T, 8 or 16 ohm
Fane Pop 33T, 8 or 16 ohm
Fane Pop 50, 8 or 16 ohm
Fane Pop 55, 8 or 16 ohm
Fane Pop 60, 8 or 16 ohm
Fane Pop 70, 8 or 16 ohm
Fane Pop 100, 8 or 16 ohm
Fane Crescendo 12A, 8 or 16 ohms
Fane Crescendo 12BL, 8 or 16 ohms
Fane Crescendo 15/100A, 8 or 16 ohms
Fane Crescendo 15/125, 8 or 16 ohms
Fane Crescendo 18, 8 or 16 ohms
Fane 910 Mk II horn
Fane 920 Mk II horn
Fane HPX1 crossover 200 watt
Fane 13 x 8, 15 watt dual cone
Fane 801T 8" d/c, roll surr.
Goodmans Axent 100
Goodmans Audiom 100 15 ohm
Goodmans Audiom 200 8 ohm
Goodmans Axlom 402 8 or 15 ohm
Goodmans Twinaxiom 10, 8 or 15 ohm
Goodmans 8P 8 or 15 ohm
Goodmans 10P 8 or 15 ohm
Goodmans 12P 8 or 15 ohm
Goodmans 12PG 8 or 15 ohm
Goodmans 12PD 8 or 15 ohm

SPEAKERS

£28-64
£10-25
£14-00
£18-62
£13-75
£11-87
£18-12
£10-00
£15-25
£21-56
£12-95
£15-95
£18-00
£26-95
£34-50
£7-75
£29-50
£13-50
£4-95
£32-00
£7-50
£19-06
£5-00
£13-25
£3-95
£4-37
£6-37
£3-50
£3-44
£4-06
£3-95
£1-75
£6-12
£9-62
£12-31
£15-02
£4-40
£6-81
£4-44
£9-00
£5-25
£7-50
£8-75
£12-00
£13-95
£17-25
£18-75
£25-95
£34-50
£36-50
£47-50
£57-95
£82-95
£14-95
£33-95
£2-50
£5-90
£9-95
£28-44
£13-90
£13-90
£28-00
£10-14
£10-75
£5-50
£5-80
£13-95
£15-95
£16-95
Goodmans 12AX 8 or 15 ohm
Goodmans 15AX 8 or 15 ohm
Goodmans 15P 8 or 15 ohm
Goodmans 18P 8 or 15 ohm
Goodmans Hifax 750P
Goodmans 8" midrange 8 ohm
Gauss 12" 200 watt
Gauss 15" 200 watt
Gauss 18" 200 watt
Jordan Watts Module 4, 8 or 15 ohm
Kef T27
Kef T15
Kef B110
Kef B200
Kef B139
Kef DN8
Kef DN12
Kef DN13 SP1015 or SP1017
Lowther PM6
Lowther PM6 Mk 1
Lowther PM7
Peerless KO10DT 4 or 8 ohms
Peerless DT10HFC 8 ohms
Peerless KO40MRF 8 ohms
Peerless MT225HFC 8 ohms
Richard Allan CA12 12" bass
Richard Allan HP88
Richard Allan LP8B
Richard Allan DT20
Richard Allan CN8280
Richard Allan CN820
Richard Allan Super disco 60W 12"
Richard Allen CG15 15" bass
Richard Allen Super Disco 10" 50 watt
Richard Allen Super Disco 8" 50 watt
Radford BD25
Radford MD9
Radford MD6 dome mid range
Radford TD 3
Radford FN11
Radford FN 12a or b
BD25 Mk II
STC 4001G
Tannoy 10" HPD
Tannoy 12" HPD
Tannoy 15" HPD
Wharfedale Super 10 RS/DD 8 ohms
Castle 8 RS/DD

SPEAKER KITS

£36-50
£40-25
£21-00
£36-00
£16-00
£4-50
£73-00
£83-00
£110-00
£17-06
£6-06
£6-94
£9-50
£16-95
£2-31
£5-99
£4-50
£27-00
£29-95
£48-00
£8-06
£9-18
£10-31
£2-12
£22-00
£13-25
£9-25
£8-75
£18-00
£4-00
£15-95
£39-50
£13-25
£12-95
£12-44
£11-50
£12-50
£8-06
£14-25
£12-95
£29-95
£6-56
£27-75
£72-50
£92-95
£15-00
£10-31
Peerless 1120
Richard Allan Twin assembly
Richard Allan Triple 8
Richard Allan Triple 12
Richard Allan Super Triple
Richard Allan RA8 Kit
Richard Allan RA82 Kit
Richard Allan RA82L Kit
Wharfedale Linton II kit
Wharfedale Glendale III kit
Wharfedale Glendale 3XP kit
Wharfedale Dovedale III kit

HI-FI

ON DEMONSTRATION in our showrooms

Akai, Armstrong, Bowers & Wilkins,
Castle, Celestion, Dual, Goodmans,
Kef, Leak, Pioneer, Radford, Richard
Allan, Rotel, Tandberg, Trio, Videotone
Wharfedale etc.—Ask for our HiFi
price list!

Complete RADFORD range in stock,
Amplifiers, Preamps, power amps,
low distortion oscillator, distortion
measuring set etc.

All items guaranteed new and perfect.
Prompt despatch.

PRICES INCLUDE V.A.T. & ARE
CORRECT AT 30.12.75

Carriage: 50p per speaker. (12" and over 75p each)
Tweeters, crossovers 30p each
Kits 80p each (£1-60 pair)

Send stamp for free booklet "Choosing a speaker".

SPEAKER KITS

£13-44
£14-75
£47-19
£15-00
£19-00
£24-00
£35-00
£56-00
£53-00
£48-00
£17-44
£24-38
£26-56
£40-50
£17-19
£56-00
£46-00
Baker Major Module 3, 8 or 15 ohms
Goodmans DIN 20 4 or 8 ohms
Goodmans Mezzo Twin Kit
Helme XLK 20
Helme XLK 30
Helme XLK 35
Helme XLK 40
Helme XLK 50
KEF kit I
KEF kit III
Peerless 20-2
Peerless 30-2
Peerless 20-3
Peerless 50-4
Peerless 3-15
Peerless 1060
Peerless 1070

COMPLETE KITS IN STOCK FOR RADFORD STUDIO 90,
MONITOR 180, STUDIO 270, STUDIO 360, HIFI ANSWERS
MONITOR, HIFI NEWS NO-COMPROMISE, WIRELESS
WORLD TRANSMISSION LINE, PRACTICAL HIFI AND
AUDIO (GILES) MONITOR ETC.

Construction leaflets for Radford, Kef, Jordan Watts, Tannoy etc. free on
request.

P.A. Amplifiers, microphones etc. by Linear, Shure, Eagle,
Beyer, AKG etc.

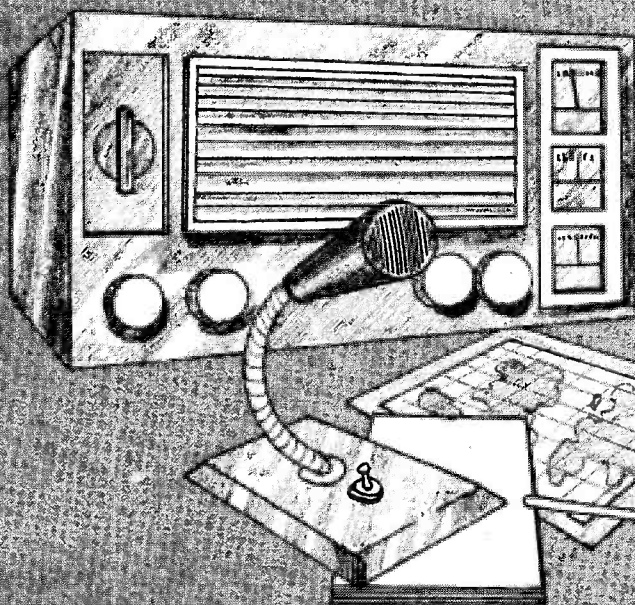
FREE with orders over £10—"HIFI Loudspeakers Enclosures" Book

WILMSLOW AUDIO

Dept. PW

Loudspeakers: Swan Works, Bank
Square, Wilmslow, Cheshire P.A.,
HiFi etc: 10 Swan St. Wilmslow.

HiFi, Radio etc: Swift of Wilmslow, 5 Swan
St. Wilmslow. Telephone Wilmslow 29599
(speakers) 26213 (HiFi etc)



Become a radio amateur.

Learn how to become a radio amateur in contact with the whole world. We give skilled preparation for the G.P.O. licence.

Free!

Brochure, without obligation to:

To: **BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, Dept. WB36**
P.O. Box 156, Jersey, Channel Islands.

NAME _____

ADDRESS _____

Block caps please

SOUTHERN VALVE COMPANY

P.O. Box 144, BARNET, Herts.

Telephone: 01-440 8641. Mail order only. Most leading makes.

ALL NEW & BOXED VALVES

(subject to availability)

AZ81	72p	EZ40/1	50p	PD500	22.50	UL84	48p
DY96/7	40p	EZ90	35p	PL200	31p	UV85	37p
DY802	40p	EZ81	35p	PL36	67p	U25	80p
EB91	21p	GY501	£1.50	PL81	55p	U26	78p
ECC81	38p	GZ30	40p	PL81A	60p	U191	80p
ECC82	37p	PC86	70p	PL82	42p	6/30L2	80p
ECC83	37p	PC88	70p	PL83	51p	6BW7	75p
ECC85	44p	PC97	44p	PL84	51p	6R23	80p
ECC88	52p	PC900	54p	PL500	83p	6F28	75p
ECH42	80p	PCC84	44p	PL504	83p	6V6	52p
ECH81	40p	PCC85	45p	PL508	£1.10	10F1	75p
ECH83	90p	PCC88	60p	PL509	£1.75	20L1	92p
ECH84	57p	PCC89	55p	PL519	£2.10	20P4	95p
ECL80	57p	PCC189	55p	PL802	£2.25	30C1	44p
ECL82	51p	PCF80	44p	PY33	67p	30C15	86p
ECL83	75p	PCF82	55p	PY81/3	45p	30C17	88p
ECL86	46p	PCF86	64p	PY88	45p	30C18	£1.35
EF80	38p	PCF200	£1.05	PY800	45p	30F5	86p
EF85	41p	PCF801	55p	PY801	45p	30FL1	£1.08
EF86	57p	PCF802	60p	PY800	£1.10	30FL2	£1.08
EF89	36p	PCF805	£1.35	PY500A	44p	30L1	44p
EF183	41p	PCF806	60p	UBF99	44p	30L15	86p
EF184	41p	PCF808	£1.25	UCC85	51p	30L17	£1.10
EH90	62p	PCH200	80p	UCH42	80p	30P12	86p
EL34	90p	PCL82	41p	UCH81	46p	30P19	£1.00
EL41	64p	PCL83	55p	UCL82	46p	30PL1	£1.50
EL54	35p	PCL84	55p	UCL83	64p	30PL13	87p
EL90/1	45p	PCL85	65p	UF41	75p	30PL14	£1.30
EM84	48p	PCL805	70p	UF89	46p	30PL15	£1.30
EY51	58p	PCL86	55p	UL41	80p	30P4MR	99p
EY86/7	40p	PCL200	£1.30				

We offer return of post service. Post free over £10.00.
Many other types available.

Items in stock at time of going to press but subject to possible market fluctuations if unavoidable.

TRADE. Representative will call West Country & S. Wales.

Enquiries s.a.e.

DISCOUNT PRICES, CWO only.

One valve post 7p, each extra valve 6p (maximum 50p) LISTS
s.a.e. please.

ELECTROVALUE

The good components service

In relatively few years, Electrovalue has risen to a position of pre-eminence as mail-order (and industrial) suppliers of semi-conductors, components, accessories, etc. There are wide ranges and large stocks to choose from as well as many worthwhile advantages to enjoy when you order from Electrovalue.

CATALOGUE 8 AWAITS YOU!

Enlarged to 144 pages. New items. Opto-electronics. Diagrams of components, applications, i.c. circuits, etc. Better than even No. 7. Post free 40p, including voucher for 40p for spending on order over £5 list value.

DISCOUNTS

On all C.W.O. mail orders, except for some items marked NETT,
5% on orders list value 10% on orders list value
5% on £10 or more 10% on £15 or more

FREE POST & PACKING

On all C.W.O. mail orders in U.K. over £2 list value. If under, add 15p handling charge.

PRICE STABILIZATION POLICY

Prices are held and then reviewed over minimum periods of 3 months—Next price review due April 1st 1975.

QUALITY GUARANTEE

On everything in our Catalogue—No manufacturer's rejects, seconds or sub-standards merchandise.

ELECTROVALUE LTD

All communications to Section 311, 28, ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY TW20 0HS. Telephone Egham 3603, Telex 284475. Shop hours 9-5.30 daily, 9-1 pm Sats.

NORTHERN BRANCH: 660, Burnage Lane, Burnage, Manchester M19 1NA. Telephone (061) 432 4945. Shop hours Daily 9-5.30 pm; 9-1pm Sats.

barclay

TECHNOLOGICAL PRECISION PRODUCTS

ELECTRONICS

ROCKWELL 63R—Rechargeable EXTRA LARGE 12-POSITION DISPLAY WITH SCIENTIFIC NOTATION

- 8-digit mantissa, 2-digit exponent and 2 positions for negative mantissa and exponent sign
- 4 functions (+, -, x, ÷)
- Fully addressable memory
- Algebraic logic (enter 5 - 3 =, display answer, 2)
- Floating decimal
- Enter exponent key for working in scientific notation
- Two levels of parenthetical operations
- Degree/radian conversion
- Trig functions in either degrees or radians
- Inverse functions in either degrees or radians
- Logarithmic functions (common and natural)
- Antilogs (10^x and 10^y)
- π key for raising positive numbers to power
- Factorial
- Square root
- Reciprocal
- Register exchange
- Sign change
- Constant π
- Automatic constant for all four functions
- Indicator for improper operations
- Indicator for non-zero memory
- Automatic overflow/underflow
- Operates on rechargeable batteries or A.C.
- Deluxe carrying wallet

**ONLY £32.50 + 8%
INCLUDING RECHARGER**

SPECIAL OFFERS

ONE OF THE MOST
ADVANCED CALCULATORS



Texas SR50A

The SR-50 is the full function portable slide rule calculator. Complex scientific calculations are solved as easily as simple arithmetic problems. The SR-50 features an algebraic keyboard with single function keys for easy problem solving.

- 10 digits + 2 exponents
- Deg/Rad Switch
- π Key
- \sqrt{x} Square Root Key
- $1/x$ Reciprocal Key
- $x!$ Factorial Key
- EE Enter Exponent
- +/- Change Sign Key
- CE Clear Entry Key
- C Clear Key
- hyp Hyperbolic Function Key
- DJR Angle Change Key
- log Common Logarithm Key
- ln Natural Logarithm Key
- 10^x to the xth Power Key
- 10^y to the yth Power Key
- x^y The xth Root of y Key
- x/y Exchange Key
- STO Store Key
- RCL Recall Key
- = Sum and Store Key

£42.90

Key ● $x!$ Factorial Key ● EE Enter Exponent Trigonometric Key ● EE Enter Exponent Key ● +/- Change Sign Key ● CE Clear Entry Key ● C Clear Key ● hyp Hyperbolic Function Key ● DJR Angle Change Key ● log Common Logarithm Key ● ln Natural Logarithm Key ● 10^x to the xth Power Key ● 10^y to the yth Power Key ● x^y The xth Root of y Key ● x/y Exchange Key ● STO Store Key ● RCL Recall Key ● = Sum and Store Key

TEXAS SR51A

All the functions of the SR-50A plus many more are features of this powerful scientific calculator.

- Additional functions include linear regression, mean, variance, standard deviation, permutation, random number generator and 20 basic conversions (and their Inverses).
- Three independent user accessible memories.
- Fixed or floating decimal option.

£62.90

● Both calculators complete with rechargeable batteries, adapter/charger, carry case and Owners Manual.

NOVOUS 4515

100 Step Programmable

The New 100 Step Programmable Scientific Calculator. Saves time and effort with complicated problems.

This is truly an unbeatable machine

- 8 digit
- Common and natural logs and anti log
- Sine, Cos, Tan and their inverse
- Reciprocals
- x^2
- 3 level stack
- Register exchange
- Sign change
- Memory
- Memory + x^2
- Degree radian conversion
- Rechargeable (Recharger included in price)
- Vynyl case (full instruction manual).

**OUR PRICE
£45.50**

+ 8% VAT price

If you need scientific notation, then the NOVOUS 4524 is your answer. 8 digit + 2 exponent 100 step programmable + roll stack and everything else the 4515 has.

ONLY £59.90 + 8% VAT

Full one year manufacturer's guarantee. Please add 8% V.A.T. to all prices except Clock/Radio.



**BEST
BUY**

SCIENTIFIC

ALGEBRAIC	£
CBM SR148 12-digit + 2 exp.	39.95
CBM SR120 10-digit + 2 exp.	31.95
TEXAS SR16 8-digit + 2 exp.	31.50
TEXAS 50A 10-digit + 2 exp.	43.50
TEXAS 51A 10-digit + 2 exp.	63.50
ROCKWELL 51R 8-digit conversion	23.95
ROCKWELL 63R 8-digit + 2 exp.	29.95
ROCKWELL 61R 8-digit	27.50
SINCLAIR OXFORD 300 5-digit + 2 exp.	21.95
CASIO FX101 8-digit + 2 exp.	26.90
CASIO FX15 6-digit + 2 exp.	24.03
CASIO FX10 6-digit + 2 exp.	19.95
The NEW Green VATMAN SCIENTIFIC 8-digit + 2 exp.	27.90
REVERSE POLISH LOGIC SINCLAIR SCIENTIFIC 5-digit + 2 exp.	11.50
NOVOUS 4510 8-digit mathematic	19.50
NOVOUS 4515 8-digit mathematic	39.50
100 step programmable NOVOUS 4520 8-digit 2 exp.	45.50
4 roll stack NOVOUS 4525 8-digit 2 exp.	59.90
100 step programmable NOVOUS 6010 8-digit conversion	21.50
NOVOUS 6025 8-digit financial	33.50
100 step programmable NOVOUS 6030 8-digit financial	59.90
NOVOUS 6035 8-digit statistical	38.00
100 step programmable	59.90

CBM SR7919D

- 8 digit or 5 digit + 2 exponent
- Sine, Tan, Cos and their Inverse
- Natural Logs, Common Logs, Anti Logs
- Square Root
- Reciprocals
- x^2
- Register Exchange
- Memory plus
- Store Recall
- Sign Change
- Algebraic Logic

ONLY £12.50 + 8% VAT

1 year Manufacturer's Guarantee. CBM mains adaptor. Please add £2.50 to total.

All goods fully guaranteed. If not satisfied—money refunded if returned undamaged within 7 days



NEW!

DECIMO DIGITAL CLOCK/RADIO AS ON T.V.

Recommended Price £50

**OUR PRICE
£35.50**

incl VAT plus £1 p/p

What is unique about this beautiful Clock/Radio? Besides being a first class AM/FM radio, its its unique 1 1/2" computer type display. You don't have to fret about the irritating blip or pulsating glare of other types of clock/radios—this has a soft, restful and silent orange glow with a dimmer to adjust its brightness to suit your taste.

JUST LOOK AT THESE SUPERB FEATURES

- Unique light emitting 1 1/2" computer-type orange numerals are large, clear and easy to read from across the room and can be seen from any angle.
- Wake-to-music or Wake-to-alarm system.
- Touch 'N' drowse—to give you extra minutes to sleep without re-setting the buzzer alarm.
- Sleep switch shuts off radio automatically. Adjustable up to 30 mins. Lets you go to sleep and wake up to music.
- Dimmer switch for time display brightness control.
- Radio has green-glow log scale.
- Sliding volume & tone control.
- This beautiful VHF and MW radio clock is finished in high impact resistant polystyrene teak finish.
- Charcoal grey high-impact resistant styrene cabinet with Teak finish and silver front.
- Dimensions 4" H. 12 1/2" W. 6 1/2" D. Power source A.C. 240 volts. 50Hz.

and many more wonderful features
PLEASE ADD 8% VAT TO ALL PRICES EXCEPT CLOCK/RADIO

U.S.A. 5-FUNCTION DIGITAL WATCHES

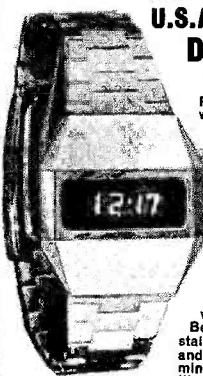
FROM ONLY £29.50

Presentation-packed, one of the finest digital watches available at this low, low price. Full 5-functions showing hours, mins, secs & date. Limited supplies. **only £29.50 + VAT**

ARNEX QUARTZ As above but with Gold plated, fully flexible interwoven type bracelet and case. Water resistant. Large round face. 2-button operation. Also available in steel. **£35.50 + VAT**

MICROSONIC Full 5-functions. Attractive oblong face with body-matching flexible bracelet. Gold plated or available in stainless steel. **Our Price only £43.50 + VAT**

TELON One of the finest and slimmest watches we have yet offered. **FULL 7-FUNCTIONS.** Beautifully styled flexible bracelet and case in satin stainless steel. Bright L.E.D. display with 3 sec hold and fadeout—hours, mins, secs (secs displayed with mins) month and date. Single-button operation. Illustrated. **Our Price £45.70 + VAT**



ORDER FORM

All these watches have automatic computerisation for 28 30 and 31 day months and arrive in beautiful presentation boxes

PHONE CALLS AND PERSONAL CALLERS WELCOME MONS-THURS BETWEEN 2 and 5 p.m. 01-458 4755.

To: BARCLAY ELECTRONICS Dept. 4PW STANLEY HOUSE, 1115 FINCHLEY ROAD, LONDON N.W.11

Please send me with/without optional mains adaptor. I enclose cheque/money order total value £ Including 55p to cover packing

NAME

ADDRESS

barclay

ELECTRONICS



CODAR[®]

AERIAL
TUNER UNIT

★ R.Q.80

This new CODAR A.T.U. tunes 1.5-30MHz and is designed to match random length single wire aerials from a few feet of indoor aerial to long outdoor wires to the receiver.

Hi-Q low loss air spaced CODARCOIL Inductor with no less than 10 position tapping switch and tuned by two air spaced variable capacitors, gives exceptionally wide range of matching to all types of receivers. Compact size, handsome low slim line cabinet 9" x 5" x 2 1/2". Ready for use. Price £10.00 (carr. free) + £2.50 VAT.

★ P.R.40

R.F. PRESELECTION

Will substantially improve receiver performance over 1.5/35 MHz. Three switched bands, Codar-coil low-loss airspaced inductor with F.E.T. and wide band R.F. amplifier gives outstanding performance. A must for the keen S.W.L. Price £11.00 (carr. free) + £2.75 VAT.

★ CODAR COIL-PACK

Complete unit, 550 KHz-30 MHz in 4 switched bands. With Aerial trimmer. Aligned, tested, ready for use. Suitable for valve or F.E.T. Mixer/Osc. As used in the CR70A. Full instructions included. Price £7 (carr. free) + £1.75 VAT.



ILLUSTRATED LEAFLETS FREE ON REQUEST
(STAMP APPRECIATED)

EXPORT—FREE QUOTES ON REQUEST
WORLD WIDE MAIL ORDER.

CODAR[®] TELECOM LTD.

TELECOMMUNICATIONS AND
ELECTRONIC EQUIPMENT
MANUFACTURERS

★ C.R.70A COMMUNICATION RECEIVER

£39.00 (carr. free) + £9.75 VAT.

General coverage communication receiver. Ideal for the keen S.W.L. Tunes 550 KHz-30 MHz with no gaps, in four switched bands. For 200-240 A.C. it only requires an aerial and 2 1/8 ohm speaker to bring the world right into your home. Please note: This set is hand built to order and due to the very large number of orders delivery is now approx. 10 weeks. Royal National Life-boat Institution "our 4 CR70A receivers have proved very satisfactory"

★ NEW MINI CLIPPER T.R.F. SHORT WAVE KIT

Tunes 550 KHz-30 MHz complete coverage with 4 miniature plug-in coils. Receives AM/CW/SSB. Electrical bandspread. Output for low impedance headphones or any 2 1/8 ohm speaker (optional extras). Full step by step pictorial instructions, simple to build, Printed circuit board. A quality Codar-Kit, 12 month guarantee. The ideal low cost starter Kit for the beginner S.W.L. to enjoy the fascinating hobby of long distance listening and collection of colourful Q.S.L. cards from all parts of the world! (Size and appearance similar to the RQ80). Price complete (less PP6 battery) £10.80 (carr. free) + £2.70 VAT.

★ MULTIBAND-6 T.R.F. SHORT WAVE KIT

Tunes 550KHz-30MHz complete coverage with 4 miniature plug-in coils. Receives AM/CW/SSB. Separate electrical bandspread. Main tuning calibrated, vernier slow motion drive. Output for any external 2 1/8 ohm loud-speaker. Headphone jack. World-wide reception. Handsome styling, metal cabinet. Full pictorial instructions, easy to build, printed circuit board. Price complete (less PP6 battery) £16.56 (carr. free) + £4.14 VAT.

CODAR AERIAL-KIT

50' stranded copper Aerial wire, plus 25' insulated lead-in wire, 4 insulators, leaflet hints and tips on types of aerial. Price £2.40 (post free) + 60p VAT.

Special discounts for Senior Citizens, Disabled, Educational. Send for details. S.A.E.



Pay by ACCESS/BARCLAYCARD.
Quote No. clearly on Order.

UNIT 2 - BURRELL BUILDINGS TEL: 090-63-61901
CHURCHILL INDUSTRIAL ESTATE - LANCING - SUSSEX

LYNX ELECTRONICS (LONDON) LTD

Transistors			
AC126 15p	BC183 10p*	BF257 30p	C106F 35p
AC127 16p	BC183L 10p*	BF258 35p	CRS1-05 25p
AC128 13p	BC184 11p*	BF337 32p	CRS1-10 25p
AC128K 25p	BC207B 12p*	BF450 17p*	CRS1-20 35p
AC141 18p	BC212 11p*	BF459 20p*	CRS1-40 40p
AC141K 28p	BC212L 11p*	BF484 23p	CRS1-60 65p
AC142 18p	BC213 12p*	BF485 25p	CRS3-05 34p
AC142K 28p	BC213L 12p*	BF486 26p	CRS3-10 45p
AC176 16p	BC242 14p*	BF500 20p	CRS3-20 50p
AC176K 25p	BC242L 14p*	BF501 20p	CRS3-40 50p
AC187 18p	BC237 16p*	BF521 19p	CRS3-60 85p
AC187K 25p	BC238 16p*	BF522 19p	MJ480 80p
AC188 18p	BC300 34p	BF523 19p	MJ481 81.05
AC188K 25p	BC301 32p	BF524 19p	MJ490 90p
AD140 50p	BC323 60p	BR100 20p	MJ491 91.15
AD142 50p	BC327 16p*	BR100 20p	MJE340 40p*
AD143 46p	BC328 16p*	BSX19 16p	MJE371 60p
AD149 45p	BC337 17p*	BSX20 18p	MJE520 45p
AD181 35p	BC338 17p*	BSX21 20p	MJE521 55p
AD182 35p	BC339 17p*	BSY95A 12p	OA5 50p*
AL102 95p	BD107 12p	BT106 £1.60	OA90 8p
AL103 93p	BD115 55p	BT107 £1.60	OA91 8p
AF114 20p	BD131 36p	BT108 £1.60	OC41 15p
AF115 20p	BD132 36p	BT109 £1.00	OC42 15p
AF116 20p	BD133 36p	BT116 £1.00	OC44 12p
AF117 20p	BD135 36p	BV105 £1.80*	OC45 10p
AF118 50p	BD136 36p	BY105 12p	OC70 10p
AF139 33p	BD137 40p	BY106 12p	OC71 10p
AF239 37p	BD138 40p	BY126 £1.60*	OC72 22p
BC107 14p	BD139 3p	BY206 15p*	OC84 14p
BC107B 16p	BD181 85p	BY207 20p*	OC84 14p
BC108 13p	BD182 82p	BY36-300 12p*	SC40A 73p
BC109 14p	BD183 87p	BY36-600 12p*	SC40B 73p
BC109C 16p	BD184 £1.20	BY36-900 15p*	SC40F 65p
BC117 19p*	BD230 00p	BY36-1200 18p*	SC41B 70p
BC125 18p*	BD231 00p	BY36-1200 21p*	SC41D 60p
BC126 20p*	BD232 00p	BY36-1200 21p*	SC41F 60p
BC141 28p	BD233 00p	BY36-1200 21p*	ST2 20p
BC142 23p	BD234 00p	BY36-1200 21p*	TIP29A 44p
BC143 23p	BD235 00p	BY36-1200 21p*	TIP30A 52p*
BC144 30p	BD236 00p	BY36-1200 21p*	TIP31A 54p
BC147 9p*	BDY20 80p	BY36-1200 21p*	TIP32A 64p
BC148 9p*	BDY38 80p	BY36-1200 21p*	TIP33A 65p
BC149 9p*	BDY60 80p	BY36-1200 21p*	TIP41A 68p
BC152 25p*	BDY61 85p	BY36-1200 21p*	TIP42A 72p
BC153 18p*	BF177 12p*	BY36-1200 21p*	IN069 14p
BC157 9p*	BF178 28p	BY36-1200 21p*	IN2070 16p*
BC158 9p*	BF179 30p	BY36-1200 21p*	IN4001 4p*
BC159 9p*	BF194 10p*	BY36-1200 21p*	IN4002 5p*
BC160 32p	BF195 10p*	BY36-1200 21p*	IN4003 6p*
BC181 38p	BF196 12p*	BY36-1200 21p*	IN4004 7p*
BC182 11p*	BF242 17p*	BY36-1200 21p*	IN4005 8p*
BC182L 11p*	BF244 17p*	BY36-1200 21p*	IN4006 9p*
		BY36-1200 21p*	IN4007 10p*

DIGITAL DISPLAYS & LED's

DL704 99p	DL747 1.75	2 RED LED ONLY 13p
DL707 99p	DL750 1.75	GREEN CLEAR 15p

THYRISTORS

	1A (TO92)	3A (C106 type)	6A (TO220)	8A (TO220)	10A (TO220)
50	20	25	35	41	42
100	25	35	45	51	54
200	27	35	45	58	68
400	30	40	50	67	88
600		65	70	1.09	1.26

TRIACS (PLASTIC TO-220 PKG, ISOLATED TAB)

	4A (a)	6.5A (b)	8.5A (a)	10A (b)	15A (b)
100 V	0.60	0.70	0.78	0.83	1.01
200 V	0.64	0.75	0.87	0.87	1.17
400 V	0.77	0.80	0.83	0.87	1.13
600 V	0.98	0.99	0.87	1.01	1.26

N.B. Triacs without internal trigger diac are priced under column (a). Triacs with internal trigger diac are priced under column (b). When ordering please indicate clearly the type required.

74 TTL mixed prices

	1-24	25-99	100+		1-24	25-99	100+		1-24	25-99	100+
7400	14p	12p	10p	7445	85p	71p	57p	7492	57p	48p	36p
7401	14p	12p	10p	7447	81p	75p	55p	7493	45p	40p	32p
7402	14p	12p	10p	7448	75p	62p	50p	7495	67p	55p	45p
7403	15p	12p	10p	7447A	85p	83p	67p	74100	£1.08	89p	72p
7404	16p	13p	11p	7470	30p	25p	20p	74107	35p	28p	22p
7408	16p	13p	11p	7472	25p	21p	17p	74121	34p	28p	23p
7409	16p	13p	11p	7473	30p	25p	20p	74122	47p	38p	31p
7410	16p	13p	11p	7474	32p	26p	21p	74141	78p	63p	53p
7413	20p	24p	20p	7475	47p	39p	31p	74145	68p	58p	48p
7417	27p	22p	20p	7476	32p	26p	21p	74154	£1.62	£1.48	88p
7420	16p	13p	11p	7482	75p	62p	50p	74174	£1.00	83p	67p
7427	27p	22p	18p	7485	£1.30	£1.09	77p	74180	£1.06	88p	71p
7430	16p	13p	11p	7486	32p	26p	21p	74181	£3.20	£2.30	£1.90
7432	27p	22p	18p	7489	£2.92	£2.80	£2.10	74192	£1.35	£1.14	90p
7437	27p	22p	18p	7490	49p	40p	32p	74193	£1.35	£1.14	90p
7441	75p	62p	50p	7491	65p	55p	45p	74196	£1.64	£1.34	99p

LINEAR IC's

301A 8 pin DIL 35p	3900 14 pin DIL 70p	565 14 pin DIL £2.00*
307 8 pin DIL 55p	709 8/14 pin DIL 35p	568 8 pin DIL £1.50*
309K 1.60	741 8/14 pin DIL 25p	567 8 pin DIL £2.00*
380 14 pin DIL 90p	748 8 pin DIL 35p	CA3046 14 pin DIL 50p
381 14 pin DIL 1.60	555 8 pin DIL 45p	

Matching charge 20p per pair. P & P 20p—Overseas 80p. SEND SAE FOR COMPLETE LIST.

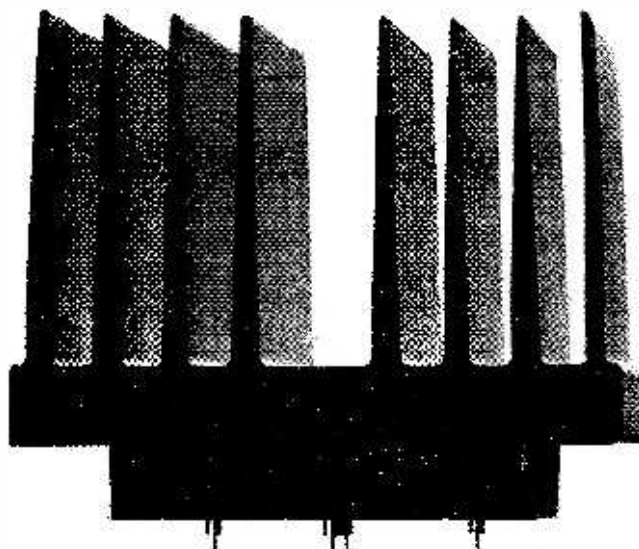
JAN. PRACTICAL WIRELESS—MUSIC BOX—KIT EXCLUDING CABINET, BATTERY, PROBE & PCB £4.95 INC. VAT.

HIGHAM MEAD, CHESHAM, BUCKS. Tel. (02405) 75154

VAT—Please add 8% except items marked * which are 25%

100 WATTS!

HY200



The HY200 is a 100 watt amplifier of hybrid construction with an integral heatsink. Internally the HY200 features open and short circuit protection with the added feature of thermal shutdown when the heatsink rises above a predetermined temperature, with these features the HY200 can be installed into any equipment with the confidence that it is virtually indestructible under any operating conditions. The low distortion and high signal to noise ratio together with wide band width makes the HY200 an amplifier of true Hi-Fi performance and these factors coupled with its robustness make it suitable for Hi-Fi, Group, Disco, PA, etc.

Specification

Output power 100 watts into 8Ω. Input sensitivity 500mV R.M.S. Input impedance 100kΩ. Signal/noise ratio 96dB at 100 watts. Power bandwidth 10Hz-45kHz -3dB. Distortion 0.05% typical. Weight 1kg (2.2lb).

£21.20

plus £5.30 VAT. P. & P. free

Power supply PSU90 for one HY200 output 45-0-45V d.c. at 2 amps.

£10.56

plus £2.64 VAT. P. & P. free

TWO YEARS' GUARANTEE ON ALL OUR PRODUCTS

I.L.P. Electronics Ltd.
Crossland House,
Nackington, Canterbury
Kent CT4 7AD

Tel (0227) 63218

Please supply

Total Purchase price

I Enclose: Cheque ☐ Postal Orders ☐ Money Order ☐

Please debit my Access account ☐ Barclaycard account ☐

Account number

Name and Address

Signature.....

**ALL PRICES
INCLUDE
V.A.T.**



**PERSONAL CALLERS
ARE WELCOME!**

all items subject to manufacturers
increase and availability



High Quality
Construction
Kits, stocked
at all branches
Send for
catalogue!

AMPLIFIERS P&P 95p Ins. £1
Sansui AU2200 £63.70
AU4400 £97.50
Pioneer SA5300 £63.00

RECORD DECKS P&P 85p Ins. 50p
Garrard SP25 Mk. IV £23.00
Garrard SP25 Mk. IV/G800 £36.85
Plinth & Cover
BSR MP60 £17.00
Connaisseur BD1 Kit £16.56
BD2 Chassis/SAU2 £42.68
SAU2 Pick-up Arm £17.81
SCU1 Cartridge £27.43
Pioneer PL12D £38.25
Plinth-cover for Garrard, BSR £5.31

SPEAKERS P&P 45p
EMI 13" x 8", 3, 8 ohm plain £3.75
with co-axial tweeter
8 ohm only £3.25
with Tweeter & Crossover
15 ohm only £4.75
13" x 8" Bass unit, 15 watt £7.25
6 1/2" 8 ohm, 10 watt £2.06
8" 8 ohm, 10 watt £5.93
8" x 5" C. Mag. 5 watt 3, 8
or 15 ohm £2.62
8" x 5" Dualcone 8 ohm, £4.12
10 watt £3.06
Elac 8" 8 ohm Dualcone £3.37
Baker Group 25 12", 8 or 15 ohm £15.00
Aadstra 10" 10 watt, 15 ohm £4.68
Goodmans 8" x 5" 8 ohm £2.12
Global 8 ohm 5 watt (pair) £9.93

**WHARFEDALE
SPEAKER BARGAINS**
P&P 85p Ins. 50p
Chevin (pair) £31.87
Denton 2 (pair) £40.00
Linton 3 (pair) £59.50
Linton 2 (kits) £26.18
Glendale 3 (kits) £44.93

KIT FORM CABINETS
Teak Veneer P&P 85p Ins. 50p
12" x 8" x 4 1/2" (8 x 5 or 7 x 4 cutout) £3.34
12" x 12" x 7 1/2" (10", 8 x 5, 8", 6 1/2" and 3 1/2") £4.75
18" x 11" x 7 1/2" (8" x 3 1/2" or 13 x 8) £5.94
22" x 14" x 7 1/2" (12" x 3 1/2" or 13 x 8) £7.18

TWEETERS & CROSSOVERS
P&P 25p
Cone Tweeter 8 or 15 ohm.
10 watt £3.68
Cone Tweeter 8 ohm, 3 watt £1.93
Dome Tweeter 8 ohm, 20 watt £3.72
Dome Tweeter 8 ohm, 30 watt £7.18
Crossovers CN23 (3 ohm) CN28
(8 ohm), CN126 (16 ohm) £1.75

CARTRIDGES & STYLII
P&P 25p Cart. D.D. Stylie
Acos GP61/25C or £1.60 £1.20
32C (ster. comp)
GP93/1 or 95/1
ster. cryst £1.60 £1.20
GP94/1 or 96/1
ster. ceram. £2.00 £1.20
GP101 cryst. comp. £1.00 —
GP104 ster. ceram. £2.15 £1.20
BSR X5M or H.C.
cryst. comp. £1.65 £1.20
SX6M or SX6H
cryst. ster. £2.25 £1.20

SCSM ster. ceram. £2.75 £1.20
Sonotone
9TAHC or 9TAHC G
(Diam) £2.00 £1.20
3508 ster. ceram. £2.25 £1.20
Audio Technica AT55 £2.25 —
Empire 990 REX £2.95 —
Goldring G850 £3.50 £1.75
G800 £5.25 £1.75
G800H £5.25 £1.75
G800E £9.06 £3.50
Shure Carts & Styli
M44G £6.18 £4.93
M55E £7.18 £5.18
M75ED Type 2 £14.68 £10.31
M75EJ Type 2 £12.18 £7.81

MICROPHONES P&P 25p
CM70 Planet stick metal, switch
crystal £2.12
MD160 Dynamic omni-dir. ball
metal £6.18
UD13050K 600 ohm, uni-dir, ball
metal £7.31
CONDENSER MIKE 600 ohm,
uni-dir £10.62
Cassette STICK MIKE with R/
Control on/off switch (2.5 &
3.5 mm) J/PLY £1.56
Cassette STICK MIKE with R/
Control (Philips Type) £1.97

BATTERY ELIMINATORS
P&P 25p
240v input 6, 7.5 or 9 volt output £2.75
12v d.c. input (specify output
6, 7.5 or 9 d.c.) at 300mA £4.62

CASSETTES P&P 25p
Type Low noise Philips Memor-
C60 37p 59p 81p
C90 48p 81p £1.18
C120 59p £1.18 £1.67

CASSETTE CASES £0.13
Cassette Head Cleaner £0.48
BIB Stereo Test Cassette £2.32
AMPEX Head Cleaner Demag £1.99

TAPES P&P 25p
Std. LP DP Cases
5" 59p 70p £1.08 32p
5 1/2" 79p 92p 36p
7" 92p £1.19 £1.99 43p

SINCLAIR PROJECT 80 P&P 25p
Stereo Pre-amp £16.18
Active Filter Unit £9.95
Z40 15 watt Amp. £7.18
Z60 25 watt Amp. £9.06
P25 Power Supply for 240 £6.81
P25 Power Supply for 240 £10.58
P25 Power Supply for 260 £10.31
FM Tuner £16.18
Stereo Decoder £10.58
Q16 Speaker £9.31
IC20 stereo amp. kit £9.37
P220 Power kit £6.56

Send 25p for complete catalogue.

PLEASE BRING THIS ADVERTISEMENT
TO OBTAIN THE BENEFIT
OF THESE SPECIAL PRICES

ALL MERCHANDISE FULLY GUARANTEED

**NEWMART
ELECTRONICS**

Mail Order Dept PW3
Belmont St, Monton,
Eccles, Manchester.
Tel: 061-789 5268

Manchester
30-32 Shudehill. tel 061-832 7710
Leeds
4 New Market St tel 0532 42708
Liverpool
15 Whitechapel tel 051-236 0738

ULTRON COMPONENTS

35 PARK AVENUE, POTTERS BAR, HERTS. 01-882 4355

MAIL ORDER ONLY

**CASH WITH ORDER,
OR PHONE US**

DISCOUNTS: 15% off for 12 + 20% off for 50 + 25% off for 100 + of one type

**COMPARE THESE PRICES—
ALL INCLUSIVE OF V.A.T.**

**Add 25p p & p for
orders under £5.00**

ALL TOP BRANDED MAKES, AND GUARANTEED

AC126	18p	BC182	10p	MJE3055	65p	2N2928	8p	R.C.A.	30p
AC127	18p	BC184	12p	MJE102	14p	2N3053	19p	40309	30p
AC128	18p	BCY42	27p	2N697	14p	2N3054	42p	40310	45p
AC154	18p	BCY43	25p	2N698	28p	2N3055	44p	40311	32p
AC187	12p	BCY58	10p	2N699	30p	2N3056	35p	40312	32p
AC188	12p	BCY59	10p	2N706A	11p	2N3525	80p	40314	32p
ACY17	28p	BF154	18p	2N708	13p	2N3614	60p	40315	32p
ACY20	18p	BF177	27p	2N914	15p	2N3615	68p	40316	45p
ACY21	20p	BF182	33p	2N918	30p	2N3659	12p	40317	32p
ACY22	15p	BF183	33p	2N920	45p	2N3702	10p	40319	32p
ACY40	21p	BF185	30p	2N929	15p	2N3703	10p	40320	32p
ACY41	25p	BF195	20p	2N961	55p	2N3704	11p	TIP33C	90p
ACY44	36p	BF200	31p	2N1131	20p	2N3705	10p	TIP35	22.00
AD149	40p	BF274	18p	2N1132	20p	2N3707	10p	TIP36C	32.80
AD161	38p	BFW58	19p	2N1302	16p	2N3708	6p		
AD162	35p	BFW89	18p	2N1303	16p	2N3709	7p	Diodes	
AF114	18p	BFW91	17p	2N1304	18p	2N3710	11p	6A stud	28p
AF117	18p	BFX29	25p	2N1305	28p	2N3711	11p	15A stud	45p
AF125	24p	BFX38	30p	2N1306	28p	2N3730	90p	1N4005	6p
AF139	32p	BFX87	23p	2N1307	28p	2N3771	11.10	1N4145	5p
AF178	40p	BFY82	21p	2N1308	27p	2N3773	22.28		
BC107	10p	BFY11	20p	2N1309	27p	2N3791	23.25	Bridge	
BC107B	10p	BFY18	47p	2N1671	90p	2N3819	25p	Rectifiers	
BC108	10p	BFY19	54p	2N1671A	95p	2N3866	70p	1A 600V	28p
BC109	10p	BFY50	18p	2N1671B	1.00	2N3903	14p	2A 600V	45p
BC109B	11p	BFY51	19p	2N2217	21p	2N3904	14p		
BC112	10p	BFY54	20p	2N2218	20p	2N3905	15p	S.C.R.s	
BC114	14p	BFY90	72p	2N2220	17p	2N3906	15p	1/05	30p
BC115	18p	BSW70	15p	2N2297	27p	2N4061	12p	1/10	25p
BC116	18p	BSX26	22p	2N2303	75p	2N4548	27p	1/20	40p
BC116A	14p	BSX67	26p	2N2369	13p	OA81	15p	16/400	80p
BC117	18p	BY127	11p	2N2369A	15p	OC20	1.00	16/600	1.20
BC118	10p	BY108	22.25	2N4111	60p	OC28	50p		
BC119	28p	MEF103	35p	2N2646	44p	OC29	50p	Triacs	
BC134	12p	MJ480	75p	2N2846	70p	OC35	48p	8C40D	1.05
BC136	16p	MJ481	95p	2N2894	35p	OC36	50p	8C45D	1.30
BC137	10p	MJ490	85p	2N2904A	45p	OC71	30p	8C45E	1.45
BC138	16p	MJE371	60p	2N2905	22p	OC83	20p	8C50D	1.50
BC163	17p	MJE2801		2N2906	14p	OCPT71	75p		
BC164	17p		£1.15	2N2906A	15p	ZEX107	8p	I.C.s	
BC165	12p	MJE2955		2N2907A	26p	ZTX108	8p	741	25p
BC167B	12p		£1.00	2N2925	14p	PL4005	10p	1310	22.00

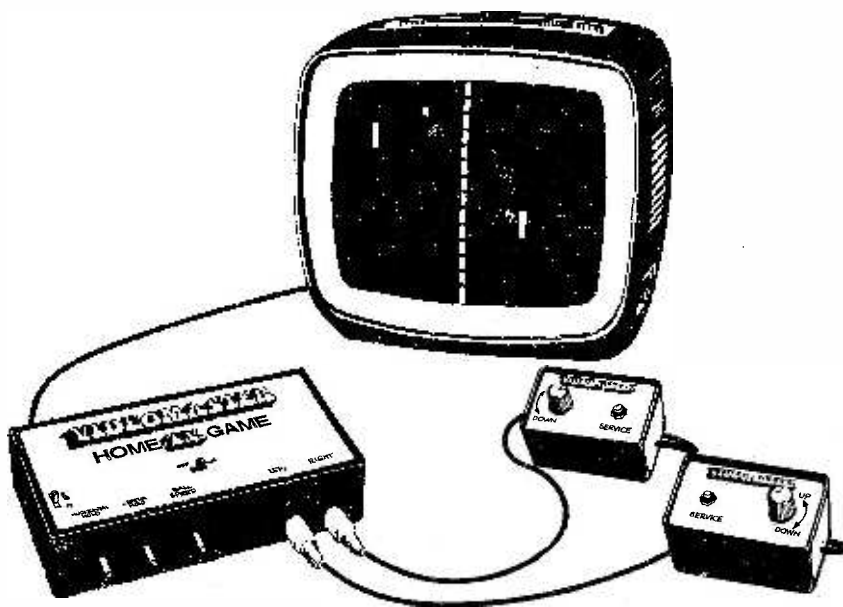
Mullard Hi-Stab 1/2 watt resistors, 21p each

J. BIRKETT

Radio Component Suppliers
25 The Strait, Lincoln, LN2 1JF

Telephone: 20767

6 ASSORTED TOKO I.F.'s etc. for 50p.
20 TUNING VARIATOR DIODES, Assorted Unmarked @ 45p.
OCTAL PLUG-IN MODULES with 2 300 PIV 1 Amp DIODES @ 12p.
MULLARD SEMI-AIRSPACED TRIMMERS 60pf @ 3p each.
TAPE RECORDER MECHANICAL DIGITAL COUNTERS @ 20p.
25 BC 107-4-3 METAL TO BE TRANSISTORS Untested @ 57p.
50 ASSORTED TRANSISTOR ELECTROLYTIC CAPACITORS @ 57p.
12VOLT 1 Amp TRANSFORMER 240 Volt AC input @ 85p.
1000uf 40v.w. ELECTROLYTIC CAPACITORS size 1 1/2" x 1", 3 for 35p.
60 ASSORTED WIRE-WOUND RESISTORS 1 to 10 Watt @ 57p.
35 ASSORTED PRE-SETS and SLIDERS @ 57p.
5 WAY + 2 EARTH TAG STRIPS 20 for 35p.
10 SILICON 10 Amp SUB-MINIATURE BRIDGES Untested for £1.25.
STEREO GANGED POTENTIOMETERS 22K Lin, 22K Log, 100K Lin, 1 Meg Log. All 30p each.
SILICON NPN PHOTO TRANSISTORS 6 for 50p.
SILICON NPN PHOTO DARLINGTON TRANSISTORS 6 for £1.
SMALL SILICON SOLAR CELLS No information. 4 for £1.
UNMARKED GOOD 2N 706 TRANSISTORS 12 for 57p.
200 BRANDED ASSORTED 250mW ZENERS for 75p.
BRANDED ITT 25 Amp THYRISTORS Assorted may be up to 200 Volt. 8 for £1.
20 BRANDED 750mA SILICON DIODES Assorted for 57p.
ITT SPECIAL NPN 300 MHz TRANSISTOR TYPE TM11 With Data Sheet @ 12 for 57p.
200 ASSORTED TUBULAR CERAMIC CAPACITORS for 57p.
VHF DUAL GATE MOS FET's Like 40673 33p each. 4 for £1.10.
ERIE TUBULAR TRIMMERS 1 to 120pf @ 5p. MULLARD TUBULAR TRIMMERS 1 to 4pf @ 3p each.
PLASTIC POWER TRANSISTORS 30 Watt NPN. 22p each. PNP @ 25p each or 38p pair.
RF AMPLIFIER TRANSISTORS BF 332 NPN 230 MHz. 8 for 50p.
FET's similar to 2N 3819 @ 6 for £1.
400 PIV 1 Amp TRIACS Unmarked @ 3 for 57p.
F.M. I.C.'s similar to TAA 570 Untested with data @ 5 for 57p.
50 PLASTIC SILICON NPN TRANSISTORS 85% Good @ 57p.
50 PLASTIC SILICON PNP TRANSISTORS 85% Good @ 57p.
200pF SOLID DIELECTRIC VARIABLE CAPACITORS @ 33p each.
UHF TRANSISTOR TV TUNER Brand New @ £1.10.
200 ASSORTED DISC CERAMICS @ 57p.
6 OP-AMPS in 8 Lead TOs Can Untested with data @ 57p.
PL 504-509 CERAMIC VALVE BASES @ 15p each.
7 ASSORTED JAPANESE and CONTINENTAL VOLUME CONTROLS for £1.
100 ASSORTED SILVER MICA CAPACITORS @ 57p.
500 yd Reel of PVC CABLE 14 Strand .0048 @ £3 Reel.
Please add 15p post & packing for orders under £1.50.



Videomaster urge all good electronics enthusiasts to play the game

The best thing about the Videomaster Home T.V. Game Mk. III is that the sheer pleasure of building it is immediately followed by the excitement of playing three fascinating games.

The famous Videomaster is now available for you to make. It plugs into any standard UHF 625 line TV set, and it shouldn't take you longer than a few hours to build.

In detail . . . The Videomaster Mk. III has eleven integrated circuits . . . four transistors . . . eleven diodes . . . is easy to build . . . with no alignment necessary because with ready-built and tested transistorized UHF modulator, is complete with all parts . . . including fully drilled and prepared p.c.b. . . handsome plastic box . . . control leads . . . complete step by step assembly instructions . . . Runs on a PP7 9 volt battery . . . and has logic and analogue "state of the art" circuitry all with National Semiconductors CMOS devices . . . with full specification.

The cost? Only **£19.95** (+ VAT)

POST TODAY TO:

Videomaster Ltd

119/120 Chancery Lane, London WC2A 1QU

Please send me (insert no.) Videomaster Mk. III kits at £21.55 ea. inc. VAT. P & P

I enclose my cheque/money order for £.

Tick if VHF Modulator required ☐ -£1 extra

NAME

ADDRESS

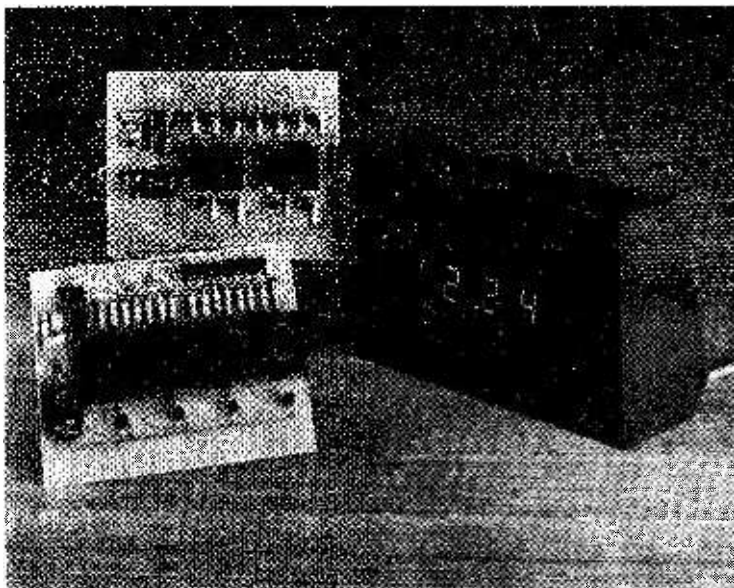
ALLOW 14 DAYS FOR DELIVERY



PW 3

Reg. No. 1115532

Greenbank Electronics Established 1970



DIGITAL CLOCK P.C.B. KITS FROM

£9.29 (plus 10p post
and VAT @ 8%)

Features:—

- ★ High quality fibreglass P.C.B. 112 × 89mm (both types), a suitable case is available as illustrated, or you can make your own.
- ★ Components mount on one side of the board for neatness and simple construction.
- ★ AY-5-1224 chip and L.E.D.s 'plug-in' for easy assembly and servicing.
- ★ Uses L.E.D. display (believed to have the longest life time of all electronic display types known at present).
- ★ A single 12V, 500mA, 50 Hz supply is the only input required (e.g. our 2 × 6V Min. Tr., see below).
- ★ Full eight page instructions provided, and back up assistance if you need it—success guaranteed! Suitable for even the absolute beginner.
- ★ Easily converted to give additional 4 range 'stop-watch' facility, for e.g. darkroom timer.
- ★ All parts available individually at no increase in price—buy only what you need.

The illustration shows the two P.C.B. kits already assembled, one has 8mm high digits, the other has 16mm high digits. Also shown is an example of a completed clock.
Free on request: Data on AY-5-1224 and MK50253 clock chips, 4 and 6 digit alarm clock suggested circuits, quartz crystal timebase, and L.E.D. displays, (If you can send an S.A.E., it makes things a little easier for us).

CLOCK/'STOPWATCH' P.C.B.s

Type 1224-704E/PCB for 8mm high display 95p. Type 1224-747E/PCB for 16mm high display 95p.

COMPONENT KITS

Include: P.C.B., AY-5-1224 Chip, 4 L.E.D. digits, transistors, diodes, resistors, capacitors, mounting socket pins, fuse and holder, full instructions.
Ref: 1224-704E/II/Kit (8mm high digits) £9.29
Also, as above but using 16mm high digits (P.C.B. is same size). Ref: 1224-747E/II/Kit £12.53
(Either P.C.B. kit can be supplied assembled and tested for an additional 75p)

CLOCK CHIPS

AY-5-1224 4 digit £3.50 MK 50253 4/6 digit alarm £5.50

L.E.D.s (Please check availability)

DL-Series 7 seg. displays, common anode and common cathode types: 0.3" single digits, 'Economy' 70p, 'Prime' £1.48; 0.5" double digits, 'Economy' £1.80, 'Prime' £3.75; 0.6" single digits, 'Economy' £1.50, 'Prime' £2.45, 0.2" single red L.E.D. indicator 12p

MINIATURE TRANSFORMERS

6VA Types with 240V primary, approximate dimensions W.45mm H.38mm D.40mm, fixing centres 53.5. Secondary voltages available: 2 × 4½V, 2 × 6V, 2 × 12V, 2 × 15V, 2 × 20V, all same price £1.52.

CMOS

Popular types 4001, 4011 gates 15p (Range is being extended—send for list.) New CA 3130 R.C.A. COS/MOS op-amp 75p.

ANTEX SOLDERING IRONS

C.240 15 watt miniature type £2.45. X.25/240 25 watt £2.45.

Terms: C.W.O. Add VAT to all prices at 8%. Post etc., U.K. 10p per order, export 75p (no VAT). All orders processed on day of receipt

GREENBANK ELECTRONICS (Dept. W3P)

94 New Chester Road, New Ferry, Wirral, Merseyside, L62 5AG, England. Tel:—051-645 3391

INTER-LOCKING PLASTIC STORAGE DRAWERS

DISCOUNT PRICES

Newest, neatest system ever devised for storing small parts and components: resistors, capacitors, diodes, transistors, etc. Rigid plastic units, interlock together in vertical and horizontal combinations. Transparent plastic drawers have label slots. 1D have space dividers. Build up any size cabinet for wall, bench or table top.

SINGLE UNITS (5" × 2½" × 2½") £2.00 Dozen
DOUBLE UNITS £3.50 Dozen. **TREBLE (3D)** £3.50 for 8
DOUBLE TREBLE £4.90 for 8.

EXTRA LARGE SIZE (6D1) £4.50 for 8.
 Carriage 75p. Orders over £10 please add 10% carr.
QUANTITY DISCOUNTS! 5% in £1 for orders over £20
 7½% for orders over £60. Quotations for large quantities.
PLEASE ADD 8% VAT TO TOTAL REMITTANCE.

FLAIRLINE SUPPLIES (Dept. PW3), 124 CRICKLEWOOD
 BROADWAY, LONDON N.W.2 01-450 4844

poly-planar

20-Watt Full Range Speaker

Completely replaces the conventional cone speaker
Super-thin construction permits new installation ideas.

Power capability: 40 watts peak. **Frequency range:** 40 Hz-20 KHz
Sensitivity: 85 dB/M for 1 watt electrical input. **Input impedance:** 8 ohms. **Operating temperature range:** -20°F to +175°F. **Size (WxDxL):** 1-7/16" × 11-3/4" × 14-11/16". **Weight:** 19 ounces.

£8.50 each Stereo pair £16.50
INCLUSIVE OF VAT AND POSTAGE

web europa
 P.O. Box 9, Ruthin Clwyd

HIGH POWER BATTERY MOTOR
8/12v operated strong enough to power a motor mower go-cart or similar. Speed easily variable. Series wound so virtually impossible to stop, very heavy duty. Snip at £2.50. VAT & Postage 85p.
Less Powerful 12 volt motor suitable for fan or Heater £2.00. VAT & Postage 65p.

PERMEABILITY TUNERS
M.W. tune stage ideal for use with ZN414 or similar circuit. Price 15p each + post and VAT 15p.

MAINS TRANSISTOR PACK
Designed to operate transistor sets and amplifiers. Adjustable output 6v., 9v., 12 volts for up to 500mA (class B working). Takes the place of any of the following batteries: PP1, PF8, PP4, PF6, PP7, PF9 and others. Kit comprises: main transformer rectifier, smoothing and load resistor, condensers and instructions. Real snip at only £1.50. VAT & postage 60p.

NUMICATOR TUBES
For digital instruments, counters, timers, clocks, etc. Hi-vac XNII. Price £1.25 each, 20p Post and VAT.

DC HIGH CURRENT PANEL METERS
3 1/2" wound wide angle 240 movement meters, flush mounting fitted with external shunts, made by Crompton Parkinson, brand new, still in maker's cartons. These are a real bargain at £5.50 each. Reasonable quantities available in the following ranges 0-10 amps, 0-20 amps, 0-30 amps, 0-40 amps, 0-50 amps. Post and VAT 80p each.

TAPE DECK
In metal case with carrying handle, heavy flywheel and capstan drive. Tape speed 3 1/2. Mains operated on metal platform with tape head and guide. Not new but guaranteed good working order. Price £1.50 plus VAT and Postage £1.50.

SOUND TO LIGHT UNIT
Add colour or white light to your amplifier. Will operate 1, 2 or 3 lamps (maximum 450w). Unit in box all ready to work. £7.95 plus 95 VAT and postage.

TELESCOPIC AERIALS
For portable, car radio or transmitter. Chrome plated—six sections, extends from 7 1/2 to 47in. 50p + 15p. Post & VAT.
KNUCKLED MODEL FOR F.M. 80p + 17p Post & VAT.

OVEN THERMOSTAT
Made by the famous Diamond H Company, this has a sensor joined by a capillary to a variable control and when fitted with a knob is ideal for many ovens or processes, 50p each + post and VAT 15p

MAINS TRANSFORMERS
All standard 230-250 volt primaries

1v.....	1 amp	1.75
2-4v.....	5 amp	.85
6-3v.....	2 amp	1.25
6-3v.....	3 amp	1.75
9v.....	1 amp	.85
9v.....	8-5 amp	2.50
12v.....	1 amp	1.50
12v.....	1 amp	1.50
6-5v-0-8-5v.....	1 amp	1.50
18v.....	1 amp	1.50
24v.....	2 amp	2.25
24v.....	3 amp	3.00
12-0-12v.....	50mA	1.20
6-0-6v.....	50mA	1.20
8-0-8v.....	1 amp	1.50
18-0-18v.....	2 amp	3.50
25v.....	1 1/2 amp	1.95
50v 2 amp & 8v.....	1 amp	4.50
90v 5 amp & 8v.....	1 amp	4.50
27v.....	8 amp	4.50
30v.....	37 amp	22.00
80v tapped 75v & 70v.....	4 amp	5.50
230v-50mA & 6-3v.....	1-5 amp	1.75
275-0-275v at 90mA & 804v.....	3 amp	2.25
EHT Transformer 5000v 52mA.....	(intermittent)	5.50

Charger Transformers

6v and 12v.....	2 amp	1.50
6v and 12v.....	3 amp	2.25
6v and 12v.....	5 amp	3.50

Add 20p per piece to cover postage and VAT 26%

HONEYWELL PROGRAMMER
This is a drum timing device, the drum being calibrated to equal divisions for switch-setting purposes with trips which are infinitely adjustable for position. They are also arranged to allow 2 operations per switch per rotation. There are 15 changeover micro switches each of 10 amp type operated by the trips, thus 15 circuits may be changed per revolution. Drive motor is mains operated 5 revs per min. Some of the many uses of this timer are Machinery control. Boiler firing. Dispensing and Vending machines. Display lighting animated and signs. Signalling, etc. Price from makers probably over £20 each. Special snip price £9.95. £1.00 Post and VAT. Don't miss this terrific bargain.

BREAK-DOWN UNIT
Contains hundreds of useful parts some of which are as follows—66 silicon diodes equivalent OA91, 68 resistors, mostly 1 watt 5% covering a wide range of values 4 x 1 mfd 400v mfd condensers, 15 x .01 mfd 100v condensers, 2 RF chokes 8 x B9 valve holders, 1 x 4H choke, 1 x 115v transformer, 1 boxed unit containing 4 delay lines also tag panels, trimmer condensers, suppressors, etc., on a useful chassis sized approx 9" x 5" x 7". Only 75p (the 66 diodes would cost at least 10 times this amount). This is a snip not to be missed. Post and VAT 75p.

HORSTMANN 24-HOUR TIME SWITCH
With 6 position programmer. When fitted to hot water systems this could programme as follows:

Programme	Hot Water	Central Heating
0	Off	Off
1	Twice Daily	Off
2	All Day	Off
3	Twice Daily	Twice Daily
4	All Day	All Day
5	Continuously	Continuously

Suitable, of course, to programme other than central heating and hot water, for instance, programme upstairs and downstairs electric heating or heating and cooling or taped music and radio. In fact, there is no limit to the versatility of this Programmer. Mains operated. Size 3 1/2 x 5 1/2 x 2 1/2 in deep. Price £5.50. 80p Post and VAT. as illustrated but less case.

THIS MONTH'S SNIP
MULLARD UNILEX
A mains Rated 4 + 4 stereo system. Rated one of the finest performers in the stereo field this would make a wonderful gift for almost anyone in easy-to-assemble modular form and complete with a pair of Goodmans speakers this should sell at about £30—but due to a special bulk buy and as an incentive for you to buy this month we offer the system complete at only £15.50 including VAT and postage.

GPO PUSH BUTTON DIALLING UNIT
Will take the place of the normal rotating dial has 10 numbered keys, so suitable for other digital systems. A desk mounting unit with rubber feet, this is a very intricate and expensive piece of apparatus. New and unused—our price only £9 each + £1.36 post and VAT.

TWIN OUTPUT POWER PACKS
These have two separately R.C. smoothed outputs so can operate two battery radios on a stereo amp without cross modulation (they will of course operate one radio-tape-cassette-calculator in fact any battery appliance and will save their cost in a few months). Specs: Full wave rectification, double insulated mains transformer—total enclosed in a hard P.V.C. case—three core mains lead—terminal output—when ordering please state output voltage 41v, 6v, 71v, 9v, 12v or 24v.
Price £3.95. Post and VAT included.

ONLY £1.50 FOR SEVEN ELECTRIC MOTORS
7 powerful batt. motors as used in racing cars and power models. Output and types vary for use in hundreds of projects—Tools, toys, models, etc. All brand new reversible and for 1 1/2-12v batts. Wiring diag. inc. VAT P Post 40p. FREE plan for min. power station.

BLACK LIGHT
As used in discotheques and for stage effects etc. Virtually no white light appears until the rays impinge on luminous paint or white shirts, etc. We offer 9' 6w tubes complete with starter, choke, lamp holders and starter-holder. Price £2.75 + 30p post. Tubes only £2. Post & VAT 50p.
170 Watt model £6.50 + 92p Post and VAT.

EXTRACTOR FAN
Cleans the air at the rate of 10,000 cubic feet per hour. Suitable for kitchens, bathrooms, factories, changing rooms, etc. It's so quiet it can hardly be heard. Compact, 5 1/2" casing comprises motor, fan blades sheet steel casing, pull switch, mains connector and fixing brackets £4.25 VAT & Postage £1.50.

Monthly list available free; send long stamped envelope.

TERMS: Where order is under £5 please add 30p surcharge to offset packing expenses.

J. BULL (ELECTRICAL) LTD.
(Dept. P.W.), 103 TAMWORTH ROAD, CROYDON CRO IX.

YOU MAY BE IN TIME
For a valve volt-meter at £7.50—a signal generator at £8.50, an oscilloscope at £12.50—a frequency standard at £19.50 as these and many other good buys were offered in our December Advanced Advertising News. Send S.A.E. for a copy today. Subscribers received this list at least a month ago chances are best buys will have been snapped up so whilst writing why not send £1.25 and receive the next 12 issues in advance.

NOTE: PLUS SIGN AFTER THE PRICES INDICATES VAT.

Ferrite pot core (Vinkh made by Mullard, maker's ref. No. LA 14107409K, circuit size approx. 1 1/2" x 1 1/2", a size which is the same as the one specified for the Scorpco car ignition system. Price only 50p + 4p per pair. Post 15p + 1p.
12v DC motor made by Smiths, powerful, ideal for car blower; motor size 4" long x 3" diameter, 1" spindle, 1 1/2" long £2 + 12p. Post 40p + 5p.
Plinth and cover for BSR plinth is tank colour and cover is smoky. Special offer £4 + £1. Post £1 + 25p. Covers available separately price £2 + 50p. Post £1 + 25p.

Plinth and cover for SP25. This is a deeper, rather nicer plinth, unfortunately more expensive. Price £5.50 + £1.36 Post £1 + 25p.
Central heating controller, the Randall Mark 3, as fitted to Trianco and many other central heating systems. Has a two on/off per 24 hour clock switch and a 7 position selector switch. Price £2.50 + 52p. Postage 50p + 4p.

Light for growing. Putting back the clock makes us realise how short daylight is during the months of November, December, January and February. As plants cannot grow without light, short days represent a loss of growing time which can be supplemented by using fluorescent lighting, especially important now that heating represents such an expensive item. We can offer a very cheap form of fluorescent lighting, (we do not think any other firm can beat our price), 50' of fluorescent light £20 + £1.60 if you can collect, or £25 + £2.00 if we have to despatch by British Road Services. For this you get 10 x 5" tubes, 20 tube ends, 10 chokes, 10 starters and holders and 20 Terry clips for mounting the tubes. You only have to supply the wooden battens and wiring up wire. Do not miss this offer—only 50 parcels now remain.

Connecting wire. Suitable for joining up these fluorescent lights is available, price £5 + 40p per 100 metres. This is a good quality flat, twin with heavy duty insulation. Post £1 + 8p per reel.
70 stranded very heavy duty wire rated at 15 amps but will carry considerably more than this. 500 metre drums only £10 + 80p per drum. Carriage £2 + 15p.

Multi-range test meter. 11 ranges all selected by central switch, first-class two jewel movement, Japanese made. The right size to put in your pocket, always carry one with you to save your legs and earn your money. Ranges as follows: AC 10, 50, 250, 1,000; DC 10, 50, 250, 1,000. Resistance 0-150,000 ohms. Current 0-1 0-100. A big purchase of these enables us to offer at £4.55 + 38p (post 40p + 3p), which is very little more than we originally sold these for 6 years ago.
9v Battery operated record player motors, on plate with turntable and mat. Price £4 + £1. Post 50p + 13p.

Instrument motor, mains operated, makes 1 rev in 4 hours, made by the famous Smiths Company. Price £1.50 + 12p. Post 10p + 1p.
We have other cabinets including large stereo gram types from £2 upwards, depending on the type of cabinets for portable players and radios from 50p upwards.

Key chain radio (microsonic) Whilst clearing out our Park Street store we came across a box of these, brand new, just as they left the factory, some had suffered in transit and storage but we tested them all and quite a lot are in working order. You might know someone who would like one for Christmas. We have not got many but are offering at £2 each. Post 40p + 10p. Please note this is just for the radio in its zipped around carrying case. The re-chargable battery has been depreciated beyond reclaiming and so we are not including these.

Thermostat with capillary with sensor joined by approx. 1 metre of capillary covering the temperature range 0-170°C capable of switching 16 amps at 250v. Made by the famous Ranco Company with screwed thread and spindle rather like a volume control—has dozens of applications. Offered at only 75p + 6p. Post 12p + 1p.

Aerials. For medium and long wave, wound and fitted on ferrite rod, 6' long by 1" diameter. Price 60p + 15p. Post 10p + 5p.

Smoke, fire and gas alarm (SAGA Mark II) Winter is the worst time for fires because more heaters are used. Even all electric homes are now becoming an increasing fire risk. Colour television, blower heaters, electric blankets have all been the cause of tragic and disastrous fires, so the need for protection in the home becomes greater every day. Do not leave it until it is too late! The money invested in our SAGA Mark II spread over its useful life is negligible compared to the life of one of your dear ones. The SAGA will trigger off when the level of smoke, gas or heat exceeds normal. Price £15 + £1.20. Post 75p + 6p.

Blower/fan by Smiths, maker's ref FFB 0701-022. This is a mains operated blower, the special feature being that the motor is mounted inside the impeller, so making this very compact. Fan housing size approx. 7 1/2" x 9 1/2", outlet size 3" x 3 1/4". Price £5.75 + 46p. Post 80p + 6p.
Dial thermometer by Rototherm, indicates from 50°F to 250°F, dial size 3 1/4", chrome and glass front. 75p + 6p. Post 10p + 1p.
Rocker switch 13 amp 250v, white, small snapin fixing into oblong hole, size approx. 1 1/2" x 1 1/2" engraved "on/off". 25p + 2p Post 1p.

BENTLEY ACOUSTIC CORPORATION LTD.

7a GLOUCESTER ROAD, LITTLEHAMPTON, SUSSEX
All prices inclusive of V.A.T. at 25% Telephone 4743

OB2	-45	6BA6	-41	6K7G	-85	12E1	-81	35A3	-76	DF91	-80	ECH21	-24	EY83	-70	PCF2001	-100	Q8150/15	-190	VR105	-59	ACY22	-20	BY127	-23
OZ4	-55	6BC8	-90	6K8G	-58	12T7GT	-70	35C5	-85	DP96	-65	ECH35	-160	EY84	-92	PCF2011	-105	Q8150/15	-190	VR105	-59	ACY28	-23	BY210	-23
1A3	-85	6BE6	-41	6L1	-24	12K5	-117	35D5	-90	DK40	-88	ECH42	-80	EY86/7	-60	PCF801	-65	Q8150/15	-190	VR105	-59	AD140	-47	BY211	-23
1A5GT	-59	6BE6	-75	6L6GC	-85	12K7GT	-60	35L6GT	-88	DK92	-115	ECH83	-58	EY91	-80	PCF802	-55	Q8150/15	-190	VR105	-59	AD149	-64	BY212	-23
1A7GT	-60	6B16	-64	6L7	-85	12K9	-85	35W4	-80	DK96	-70	ECH84	-58	EY91	-80	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	BY213	-23
1B3GT	-59	6BK7A	-65	6L18	-44	12Q7GT	-50	35Z3	-88	DL96	-64	ECH85	-58	EZ41	-55	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1B5GT	-60	6BQ7A	-64	6L19	-200	12SC7	-60	35Z4GT	-82	DM70	-176	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1L4	-25	6BR7	-120	6LD20	-88	12SG7	-55	35Z5GT	-90	DM71	-176	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1N5GT	-76	6BR8	-125	6N7GT	-70	12SH7	-50	42	-100	DY87/8	-41	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1R6	-50	6BR7	-164	6Q7G	-50	12SH7	-50	42	-100	DY87/8	-41	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1R4	-39	6BW6	-100	6Q7GT	-80	12SH7	-50	42	-100	DY87/8	-41	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1U4	-70	6BW7	-55	6Q7(M)	-64	12SR7	-75	50C5	-70	E80F	-220	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
1U5	-88	6BZ6	-57	6R7G	-70	14H7	-60	50C6DG	-70	E88CC	-120	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
2D21	-60	6C4	-47	68A7	-55	1487	-110	50E5H	-88	E180F	-117	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
2GK5	-75	6C5G	-59	68C7GT	-50	19A55	-65	50E5H	-88	E180F	-117	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
2X2	-70	6C6	-47	68G7	-58	19G6	-70	50L6GT	-100	E182CC	-80	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3A4	-60	6C9	-200	68H7	-55	20D1	-80	85A2	-75	E145	-82	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3D6	-47	6C8A	-47	68J7	-64	20P2	-88	85A3	-75	E450	-40	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3Q4	-85	6C8G	-60	68K7GT	-58	20L1	-129	90A6	-298	E47	-140	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3Q5GT	-70	6C8A	-88	68Q7	-50	20P1	-100	90C1	-88	EAB8C0	-45	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3S4	-47	6CL6	-76	6V6G	-80	20P3	-84	90C2	-88	EAC91	-65	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
3V4	-82	6CL8A	-94	6V6GT	-68	20P4	-117	150B2	-100	EAF42	-88	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
4C86	-76	6CM7	-88	6X4	-47	20P5	-160	150B2	-100	EAF42	-88	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5C86	-76	6C8G	-59	6X5GT	-50	20A5G	-60	807	-117	E81	-85	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5R4G	-94	6C8A	-117	7B6	-88	281A6	-70	5702	-75	E81	-85	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5U4G	-50	6D3	-75	7B7	-88	285V6G	-60	5763	-78	EBC41	-85	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5V4G	-59	6D7	-88	7H7	-88	282A4	-60	6057	-100	EBC81	-45	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5Y3GT	-55	6DT6A	-88	7T7	-200	2525	-75	6050	-100	EBF80	-40	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5Z3	-88	6EW6	-88	7Y4	-80	282G	-60	6067	-100	EBF83	-60	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5Z4G	-55	6E5	-117	7Z4	-80	28D7	-200	7198	-88	EBF89	-40	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
5Z4GT	-55	6E1	-80	8D7	-70	30A5	-78	9002	-80	EBL21	-24	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6/30L2	-80	6P6G	-60	10C2	-76	30C15	-80	9006	-50	EC86	-90	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6A8G	-146	6F13	-90	10DE7	-88	30C17	-85	ACPEN1	-117	EC88	-90	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6A7	-60	6F14	-88	10F1	-88	30C18	-85	AC2/PEN/	-100	EC92	-95	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AG5	-85	6F16	-76	10F9	-78	30F5	-75	DD	-100	EC93	-200	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AH6	-80	6F18	-84	10F18	-60	30FL1	-110	AC6EN80	-60	EC98	-200	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6A75	-76	6F23	-80	10LD11	-58	30FL2	-110	AC/TH1	-60	EC94	-180	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AK5	-47	6F24	-100	10P13	-88	30FL13	-64	100	-100	EC91	-40	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AK6	-70	6F25	-117	10P14	-234	30FL14	-82	AL60	-117	EC92	-39	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AM8A	-70	6F28	-78	12A6	-76	30L15	-82	ATP4	-50	EC93	-39	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AN8	-82	6F32	-70	12AC6	-60	30L17	-76	AZ1	-50	EC94	-40	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AQ5	-53	6G6G	-80	12AD6	-90	30P4MR	-80	AZ21	-50	EC95	-47	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AR5	-60	6G8A	-88	12AD6	-90	30P4	-80	AZ41	-50	EC98	-180	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AS7	-117	6G85	-76	12A76	-78	30P12	-90	BL33	-284	EC98	-55	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AT6	-53	6G87	-88	12A76	-58	30P19	-80	CL33	-185	EC98	-55	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AU6	-40	6H6GT	-29	12AV6	-59	30P4	-88	CY10	-100	EC98	-55	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AV6	-53	6J6GT	-53	12BA6	-58	30PL1	-110	CY31	-70	ECF80	-60	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AW8A	-90	6J6	-35	12BE6	-59	30PL13	-120	DAF91	-60	ECF82	-60	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6AX4	-88	6J7G	-55	12BH7	-58	30PL14	-130	DAF96	-60	ECF86	-58	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29
6B5G	-35	6J8A	-85	12BY7	-55	30PL15	-90	DC90	-70	ECF84	-23	ECH85	-58	EZ81	-35	PCF806	-60	Q8150/15	-190	VR105	-59	AD182	-59	FSY11A	-29

VALVES ALSO REQUIRED TO PURCHASE. LOOSE OR BOXED, BUT MUST BE NEW. OFFERS MADE BY RETURN.
All goods are unused, tested, and guaranteed. Despatch charges:—25p on all orders below £10 in value. Orders over £10 post free. Orders despatched same day as received. Any parcel insured against damage in transit for 5p per parcel extra. Terms of business available on request. Many others in stock too numerous to list. Please enclose S.A.E. for reply to any correspondence.



FREE Brochure on New KITS

Whether professional, student, or amateur, the world of electronics can open up a new world for you.

CROFTON don't just sell kits, we offer you a technical back up service to ensure your success

The following is a selection of some of the more popular kits:-

- ★ Mullard CCTV Camera
- ★ P.E. CCTV Camera
- ★ PE Rondo Quadraphonic Four Channel Sound (Designer Approved)
- ★ Electronic Ignition
- ★ Sound Operated Flash
- ★ P.W. Tele-Tennis Game
- ★ U.H.F. Modulator
- ★ Bench Power Supply
- ★ Wobulator
- ★ All ETI Top Projects
- ★ Many of the Elektor Projects

NOTE: PCBs for most published projects available to order

CROFTON ELECTRONICS LTD
Dept 9, 124 Colne Road, Twickenham, Midx. 01 898 1569

MARION 0442 62757

MHI CLOCK KITS

Contents: Clock chip, driver chip, PC board.

MHI-5309 BCD & 7 seg. Reset to zero £7-35

MHI-5311 BCD output—TTL interfacing, printers £7-35

MHI-5314 7 segment output £6-60

MHI-5318 External digit selection £7-35

MHI-5378 Car/boat clock. Quartz crystal timing source £15-10

MHI-50250 7 seg. Alarm & snooze. 12Hr+60Hz/24Hr+50Hz £8-35

MHI-50253 7 seg. Alarm & snooze. 12Hr+50Hz/24Hr+60Hz £8-35

MHI-50204 Hrs, mins, secs & 1/10 secs. Stop, start reset £14-00

MHI-50395 Up/Down counter. 6 Decade £19-50

MHI-50396 Up/Down counter. HHMMSS £19-50

MHI-50397 Up/Down counter. MMSS.99 £19-50

MHI-7001 Time, date, alarm & sleep. 7 seg output £10-00

MHI DISPLAY KITS

Contents: Litronix LED displays & PC board.

MHI-707/4 (digit) 0-3" £6-60

MHI-707/6 0-3" £9-50

MHI-727/4 0-5" £8-50

MHI-727/6 0-5" £12-00

MHI-747/4 0-6" £9-80

MHI-747/6 0-6" £14-70

MHI case (Please include 25p p. & p.) £2-95

Economy LEDs: DL707E 70p, DL727E 180p, DL747E 150p.

NEW CATALOGUE NOW AVAILABLE

TERMS: C.W.O., Access, Barclaycard (simply quote your number and sign). Credit facilities to Accredited account holders.

BYWOOD

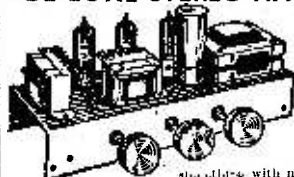
68 Ebbwens Road, V.A.T. All prices
Hemel Hempstead, exclude V.A.T.

SUPERSOUND 13 HI-FI MONO AMPLIFIER



A superb solid state audio amplifier. Brand new components throughout. 5 silicon transistors plus 2 power output transistors in push-pull. Full wave rectification. Output approx. 13 watts r.m.s. into 8 ohms. Frequency response 12Hz 30KHz \pm 3dB. Fully integrated pre-amplifier stage with separate Volume, Bass boost and Treble cut controls. Suitable for 8-15 ohm speakers. Input for ceramic or crystal cartridge. Approx. 40mV for full output. Supplied ready built and tested, with knobs, esoucheon panel, input and output plugs. Overall size 8" high \times 6" wide \times 7 1/2" deep. AC 200/250V. PRICE £15.00. P. & P. 85p.

DE LUXE STEREO AMPLIFIER



A.C. mains 200-240 v. Using heavy duty fully isolated mains transformer with full wave rectification giving adequate hum. Valve line up: 2 \times ECC83 Triode Pentodes, 1 \times E280 as 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 8 ohm speakers. Full negative feedback in a carefully calculated circuit, allows high volume levels to be used with negligible distortion. Supplied complete with knobs, chassis size 11" \times 4". Overall height including valves 7". Ready built & tested to a high standard. £18.50. P. & P. 95p.

ALL-PURPOSE POWER SUPPLY UNIT 200/240v. A.C. input. Four switched fully smoothed D.C. outputs giving 6v. and 7.5v. and 9v. and 12v. at 1 amp on load. Fitted insulated output terminals and pilot lamp indicator. Hammer finish metal case overall size 3" \times 3 1/2" \times 2 1/2". Ready built & tested. PRICE £6.35 P. & P. 85p.

VNAIR & REXINE SPEAKERS & CABINET FABRICS ap. 54 in. wide. Our price £1.50 yd. length. P. & P. 35p per yd. (min. 1 yd.). S.A.E. for samples.

HARVERSON'S SUPER MONO AMPLIFIER

A superb quality gram amplifier using a double wound fully isolated mains transformer, rectifier and ECC82 triode pentode valve as audio amplifier and power output stage. Impedance 3 ohms. Output approx. 3.5 watts. Volume and tone controls. Chassis size only 7in. wide \times 3in. deep \times 6in. high overall. A.C. mains 200/240v. Supplied absolutely Brand New completely wired and tested with good quality output transformer. P. & P. 85p. BARGAIN PRICE £5.00

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-10-20-240v. Secondary connections 0-5-10-15-20-25-30-35-40-50v. half wave at 1 amp, or 10-10-10, 20-0-20, 30-0-30v. at 2 amps full wave. Size 3in. long \times 3 1/2in. wide \times 3in. deep. Price £2.75 P. & P. 75p.

MAINS TRANSFORMER. For power supplies. Pri. 200/240v. Sec. 9-0-9 at 500 mA. £1.35. P. & P. 35p. Pri. 200/240v. Sec. 12-0-12 at 1 amp. £1.60. P. & P. 55p. Pri. 200/240v. Sec. 10-0-10 at 2 amp. £2.20. P. & P. 70p.

GENERAL PURPOSE HIGH STABILITY TRANSISTOR PRE-AMPLIFIER

For P.U. Tape, Mike, Guitar, etc. and suitable for use with valve or transistor equipment. 9-18v. battery or from H.T. line 200/300v. Frequency response 15Hz-20KHz. Gain 25dB. Solid encapsulation size 1 1/2" \times 1 1/2" \times 1". Brand new complete with instructions. Price £1.50. P. & P. 15p.

STEREO-DECODER

SIZE 2" \times 3" \times 1" ready built. Pre-aligned and tested. Sens. 20-500 mV for 9-18V neg. earth operation. Can be fitted to almost any Hi-Fi V.H.F. radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied. £8.25 plus 20p. P. & P. Stereo beacon light if required 45p extra.



QUALITY RECORD PLAYER AMPLIFIER MK. II A top quality record player amplifier employing heavy duty double wound mains transformer, ECC88, EL84, and rectifier. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 8 ohm speaker. Size 7in. wide \times 3in. deep \times 8in. high. Ready built and tested. PRICE £6.50. P. & P. 90p.

ALSO AVAILABLE mounted on board with output transformer and speaker. PRICE £7.75. P. & P. £1.

HARVERSON MAINS OPERATED SOLID STATE STEREO FM TUNER



Enjoy fabulous stereo radio at this low introductory price!

Designed and styled to match our 10 + 10 amplifier but will suit any other standard stereo amplifier. The design incorporates the very latest circuitry techniques with high-gain, low noise IF stages. Automatic frequency control to "lock-on" station and prevent drift. IC stereo decoder for maximum stereo separation. L.E.D. for stereo beacon indicator. Nominal output to tuner 100mV. Approximate size 12 1/2" wide \times 8" deep by 2 1/2" high. Supplied ready built, fully tested and fully guaranteed. A/C Mains 200/240V (not available in kit form).

SPECIAL OFFER for 1 month only £25 + £1.20 p. & p.

LATEST A008 GP91/180 mono compatible cartridge with t/o stylus for LP/EP/78. Universal mounting bracket. £1.75 P. & P. 18p.

CERAMIC STEREO CARTRIDGE. Universal Mounting brackets and turnover stylus. 70mV per channel output. ONLY £2.05 + 18p P. & P.

SONOTONE STAGH COMPATIBLE STEREO CARTRIDGE T/O stylus Diamond Stereo LP and Sapphire 78. ONLY £2.68 P. & P. 10p. Also available fitted with twin Diamond T/O stylus for Stereo LP. £3.18. P. & P. 18p.

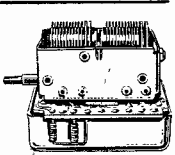
LATEST CRYSTAL T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78. £1.98 P. & P. 18p.

LATEST T/O MONO COMPATIBLE CARTRIDGE for playing EP/LP/78 mono or stereo records on mono equipment. Only £1.75. P. & P. 18p.

SPECIAL OFFERS

Mullard LI159 R.F.-I.F. Double Tuned Amplifier Module for nominal 470 KHz. Size approx. 2 1/2" \times 1 1/2" \times 1" 7-6 Volt \pm earth. Brand new pre-aligned. Full specification and connection details supplied. £2.50. P. & P. 12p

Pye VHF/FM Tuner Head covering 88-108 MHz. 10-7 M/Hz I.F. output 7-8 Volt \pm earth. Supplied pre-aligned, with full circuit diagram and connection details. Beautifully made with precision-gear FM and 323 P1 + 323P1 A.M. Tuning Gauge only £3.50 + P. & P. 35p.



PRECISION MADE

Push Button Switch bank. 8 Buttons giving 16 S/P C/O interlocked switches plus 1 Cancel Button Plus 3 d/p C/O. Overall size 5" \times 2 1/2" \times 1". Supplied complete with chrome finished switch buttons. £2 for £1.50 + 10p P. & P.

HI-FI LOUDSPEAKER SYSTEM MK II

Beautifully made, simulated teak finish enclosure with attractive slatted front. Size 16 1/2" high \times 10 1/2" wide \times 9" deep (approx.). Fitted with E.M.I. Ceramic Magnet 13" \times 8" bass unit, H.F. tweeter unit and crossover. AVAILABLE IN NOMINAL 4 Ohm, 8 Ohm or 16 Ohm impedance (state which).

OUR PRICE £12.50 each Carr. £1.60.

Cabinet Available Separately £7.50, Carr. £1.20.

Also available in 8 ohms with EMI 13" \times 8" bass speaker with parasitic tweeter £11.00, Carr. £1.60.

LOUDSPEAKER BARGAINS

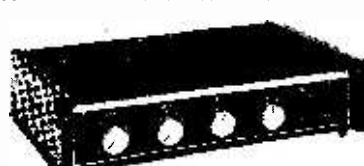
5in. 3 ohm £1.45. P. & P. 35p. 7 \times 4in. 3 ohm £1.69. P. & P. 45p. 10 \times 6in. 2 or 15 ohm £2.50. P. & P. 75p. E.M.I. 8 \times 5in. 3 ohm with high flux magnet £2.05. P. & P. 50p. E.M.I. 13 1/2" \times 8in. with high flux ceramic magnet with parasitic tweeter 3, 8 or 16 ohm £4.12. P. & P. 85p. E.M.I. 13 \times 8in. 3, 8 or 15 ohm with inbuilt tweeter and crossover network £5.50. P. & P. 95p. E.M.I. tweeter. Approx. 3 1/2". Available 3 or 8 or 15 ohms. £2.00 + 25p. P. & P.

"POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER

Size 11 1/2" \times 14 1/2" \times 1 1/2" deep. Weight 18oz. Power handling 20W r.m.s. (40W peak). Impedance 8 ohm only. Response 40Hz-20KHz. Can be mounted on ceilings, walls, doors, under tables, etc., and used with or without baffle. Send S.A.E. for full details. Only £7.68 each. P. & P. 70p.

Now also available 8", 19 watts, r.m.s. 20 watt peak 40 Hz-20,000 Hz. Overall depth 1 1/2". Ideal for Hi-Fi or for use in cars £2.18 + 40p p. & p.

HARVERSON SUPERSOUND 10 + 10 STEREO AMPLIFIER KIT



A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Silicon Transistors in the first five stages on each channel resulting in even lower noise, level with improved sensitivity. Integrated pre-amp with Bass, Treble and two Volume Controls. Suitable for use with Ceramic or Crystal cartridges. Very simple to modify to suit magnetic cartridge—instructions included. Output stage for any speakers from 2 to 15 ohms. Compact design, all parts supplied including drilled metalwork high quality ready drilled printed circuit board with component identification clearly marked, smooth brushed anodised aluminium front panel with matching 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; Power output: 14 watts r.m.s. per channel into 8 ohms. Frequency response \pm 3dB 12-30,000 Hz. Sensitivity: better than 30mV into 1MG. Full power bandwidth: \pm 3dB 12-15,000 Hz. Bass boost approx. to \pm 12dB. Treble cut approx. to -16dB. Negative feedback 18dB over main amp. Power requirements 35v. at 1-0 amp. Overall Size 12" \times 8" \times 2 1/2".

Fully detailed 7 page construction manual and parts list free with kit or send 25p plus large S.A.E.

AMPLIFIER KIT £15.00 P. & P. 55p

(Magnetic input components 33p extra)

POWER PACK KIT £5.35 P. & P. 85p

CABINET £5.35 P. & P. 75p

SPECIAL OFFER—only £24 if all 3 items ordered at one time including p. & p.

Full after sales service

Also available ready built and tested £32.50. P. & P. £1.

Note: The above amplifier is suitable for feeding two mono sources into inputs (e.g. mike, radio, twin record decks, etc. and will then provide mixing and fading facilities for medium powered Hi-Fi Discophone use, etc.



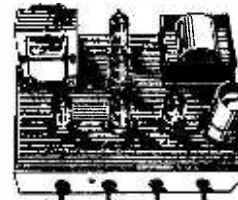
3-VALVE AUDIO AMPLIFIER HA34 MK II

Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis size 7 1/2" \times 4 1/2" \times 4 1/2". Incorporates ECC88, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 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 £7.75. P. & P. 85p.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc. £8.50 P. & P. 85p.

10/14 WATT HI-FI AMPLIFIER KIT

A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-16 Ohm speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet 25p + SAE (Free with parts) All parts sold separately. ONLY £12.95 P. & P. £1.25. Also available ready built and tested £16.50 P. & P. £1.20.



SPECIAL OFFER Limited number of the latest BSR C141R1 Auto/Manual changer de-luxe. Lightweight tubular arm, cueing lever bias compensator £14.00 + £1.10 p. & p.

Prices include VAT at Current Rate

(Please write clearly)

PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

HARVERSON SURPLUS CO. LTD.

(Dept. P.W.) 170 HIGH ST., MERTON, LONDON, S.W.19 Tel.: 01-540 3985

A few minutes from South Wimbledon Tube Station.

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

RTVC

FOR SPEAKERS AT FANTASTIC REDUCTIONS

ELIZABETHAN STEREO TUNER AMPLIFIER

This compact Tuner Amplifier gives you full medium wave and V.H.F. coverage and FM stereo. With inputs for your turntable and tape recorder. It has rotary tuning, Volume, Balance, Bass and Treble controls and push button selection switches for Phono/tape FM Stereo, FM mono, Medium wave and A.F.C. has built-in stereo beacon and switched headphone socket.

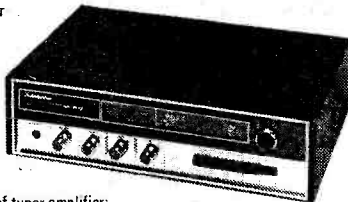
Technical Specifications

15 transistors, 11 diodes, integrated circuit.

Power output 8 watts. Size of tuner amplifier:

4" x 10" x 15 1/2" approx. Finished in selected rosewood

veneer with brushed aluminium front panel and matching controls.



£29.00

+ p & p £1.50

SPECIAL OFFER

As above but with a BSR C123 Turntable in matching teak veneered plinth and a pair of 'Compact' easy to build speakers (see opp. panel) **£39.00** + p & p £3.00

BSR DECKS WITH PLINTHS AT FANTASTIC REDUCTIONS



MP 60 Type (illustrated) £16.00

Less Cartridge p & p £1.50

C141 (not illustrated) £12.00

Auto. with Cue p & p £1.50

Fitted Stereo Cartridge

C123 (not illustrated) £10.00

Auto. with Stereo p & p £1.50

Crystal Cartridge

All plinths finished in matching Teak veneer.

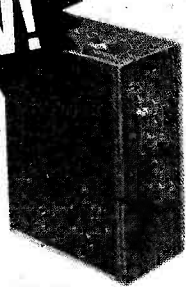
THE 'COMPACT'

EASY BUILD SPEAKER KIT

A compact bookshelf speaker system giving a high electro acoustic efficiency for the low powered amplifier.

The professional finish can be obtained with the minimum of tools, the infinite baffle type enclosures come ready mitred and professionally finished, simply apply glue, fold up around baffle board, and fix together with masking tape till glue dries.

The cabinet measures 12"x9"x5" deep approx finished in simulated teak, incorporating a quality 7"x4" elliptical speaker, power handling 4 watts, flux density 30,000 maxwells, impedance 8-15 ohms nominal, voice coil dia 3/4" magnet size 2 3/8" approx.



£6.00

pair inclusive. P & P £1.70

EASY TO BUILD SPEAKER KITS

These superb simulated teak-finished speaker kits have been specially designed by RT-VC for the cost-conscious hi-fi enthusiast who wants top quality speakers but doesn't want to spend the earth. Built to EMI's exacting specification, these new RT-VC speaker kits (350 type kit) incorporate 13" x 8" woofer, 3 1/4" tweeter and matching crossover.

Easily put together with just a few basic tools.

Specification (each speaker): Impedance 8 ohms. Power handling 15 watts RMS (30 watts peak). Response 20-20,000 Hz. Size 20" x 11" x 9 1/2" approx. Comparable built units (EMI LE3) sold elsewhere for over £45 pair.

£22.00 pair complete + £5.20 p & p.

Complete with crossover Components and circuit diagram



EMI 350 KIT

£7.25 + £1.20 p & p.

Complete with crossover Components and circuit diagram

System consists of a 13" x 8" approx. woofer with a 3" tweeter, crossover components and circuit diagram. Frequency response: 20 Hz to 20 KHz. Power handling 15 watts RMS into 8 ohms. (Peak 30 watts.)

RTVC *

VISCOUNT IV STEREO SYSTEM

System 1a. **£69.00**

The new 20+20 watt Stereo Amplifier incorporating the latest silicon transistor solid state circuitry, the RT-VC VISCOUNT IV gives you a powerful 20 watts RMS per channel into 8 ohms. Superb teak-finished cabinet, with anodised fascia to harmonise with any decor. Polished trim and knobs.

The VISCOUNT IV has a comprehensive range of controls - volume, bass, treble, balance, mono/stereo, mode selector, and scratch filter.

Front panel socket for stereo headphones. And a host of sockets at the rear - for left and right speakers, tape recorder, auxiliary, tuner, disc and microphone.

SPECIFICATION: 20 watts RMS per channel 40 watts peak. Suitable 8-15 ohms speakers. Total distortion @ 10 watts better than 0.2%. Six switched inputs: 1. Magnetic P.U. - 3 millivolts @ 47 K ohms (R.I.A.A.); 2. Crystal/ceramic P.U. - 50 millivolts @ 50 K ohms (R.I.A.A.); 3, 4, 6. Tape; Tuner/Aux. - 140 millivolts @ 50 K ohms (flat frequency response); 5. Microphone - 3 millivolts @ 50 K ohms (flat frequency response).

CONTROLS: Push button ON/OFF, stereo/mono, scratch filter. 6 position rotary selector. Individual rotary controls for treble, bass, balance and volume. Headphone socket, tape out socket. Aux. mains output. Frequency response: 25 Hz to 25 KHz @ full rated output. Signal to noise ratio: better than -50 dB on all inputs. Tone control range: Bass ± 15 dB @ 50 Hz; Treble ± 12 dB @ 10 KHz. Power requirements: 200-250V A.C. mains @ 60 watts. Approx. size: 15 1/2" x 3" x 10".

MP60 type deck with magnetic cartridge, de luxe plinth and cover.

Two Duo Type IIa matched speakers - Enclosure size approx. 19 1/4" x 10 3/4" x 7 3/4" in simulated

teak. Drive unit 13" x 8" with 3" tweeter. 15 watts handling. 30 watts peak.

Complete System with these speakers **£69.00** + £6.50 p & p.

System 2. **£85.00**

Viscount IV amplifier (As System 1a)

MP60 type deck (As System 1a)

Two Duo Type III matched speakers

- Enclosure size approx. 27" x 13"

x 11 1/2". Finished in teak simulate.

Drive units 13" x 8" bass driver, and

two 3" (approx.) tweeters. 20 watts

RMS, 8 ohms frequency range -

20 Hz to 18,000 Hz.

Complete System with these

speakers **£85.00** + £7.60 p & p.

PRICES: SYSTEM 1a

Viscount IV R103

amplifier £27.50 + £1.90 p & p.

2 Duo Type IIIa

speakers £30.00 + £6.50 p & p.

MP60 type deck with Mag. cartridge

de luxe plinth and cover £22.00 + £3.30 p & p.

Total if purchased

separately: £79.50

Available complete for only: **£69.00**

+ £6.50 p & p

PRICES: SYSTEM 2

Viscount IV R103

amplifier £27.50 + £1.90 p & p.

2 Duo Type IIIa

speakers £48.00 + £7.50 p & p.

MP60 type deck with Mag. cartridge

de luxe plinth and cover £22.00 + £3.30 p & p.

Total if purchased

separately: £95.50

Available complete for only: **£85.00**

+ £7.60 p & p.



20x20 SYSTEM

Scotland and the Orkneys P & P Surcharge
System 1a £1.75 System 2 £3.50

PUSH BUTTON CAR RADIO KIT- THE TOURIST TT*



NO SOLDERING REQUIRED

NOW BUILD YOUR OWN
PUSH BUTTON CAR RADIO +£1.05 p & p.
Easy to assemble construction kit comprising fully completed and tested printed circuit board on which no soldering is required. All connections are simple push fit type making for easy assembly. Fine tuning push button mechanism is fully built and tested to mate with printed circuit board.
TECHNICAL SPECIFICATION: (1) Output 4 watts RMS output. For 12 volt operation on negative or positive earth. (2) Integrated circuit output stage, pre-built three stage IF Module. Controls volume manual tuning and five push buttons for station selection, illuminated tuning scale covering full, medium and long wave bands. Size chassis 7" wide 2" high and 4½" deep approx.

Speaker including baffle and fixing strip £2.00 +45p p & p. Car Aerial Recommended - fully retractable £1.60+40p p & p.
The Tourist I Kit For the experienced constructor. If you can solder on a printed circuit board you can build this model. Same technical specification as Tourist TT. **Price £8.20+£1.05 p & p.**

SPECIAL OFFER

The Tourist I Kit, same specification as Tourist TT complete with speakers, fixing kit and fully retractable aerial **£10.50** + p & p £1.50

*STEREO 21 QUALITY SOUND FOR LESS THAN £24.00

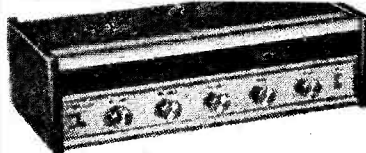


Stereo 21, easy to assemble audio system kit. No soldering required.
The unit is finished in white P.V.C. and the acrylic top presents an unusually interesting variation on the modern deck plinth.
Includes - BSR 3 speed deck, automatic, manual facilities together with stereo cartridge.
Two speakers with cabinets.
Amplifier module. Ready built with control panel, speaker leads and full, easy to follow assembly instructions.
Specifications - For the technically minded:
Input sensitivity 600mV. Aux. input sensitivity 120mV. Power output 2.7 watts per channel. Output impedance 8-15 ohms. Stereo headphone socket with automatic speaker cutout. Provision for auxiliary inputs - radio, tape, etc., and outputs for taping discs.
Overall Dimensions. Speakers approx 15½" x 8" x 4". Complete deck and cover in closed position approx. 15½" x 12" x 6".

Complete only £23.20 +£3.00 p & p.

Extras if required. Optional Diamond Stylus £1.60.
Specially selected pair of stereo headphones with individual level controls and padded earpieces to give optimum performance £5.80.

*DISCO AMPLIFIER



Reliant Mk IV Mono Amplifier, ideal for the small disco or house parties. Output 20 watts RMS into 8 ohms (suitable for 15 ohms).
Inputs *4 electrically mixed inputs. *3 individual mixing controls. *Separate bass and treble controls common to all 4 inputs. *Mixer employing F.E.T. (Field Effect Transistors). *Solid State circuitry.
*Attractive styling.

INPUT SENSITIVITIES - Input - 1). Crystal mic. guitar or moving coil mic, 2 and 10mV. (Selector switch for desired sensitivity.) - Inputs - 2). 3). 4). Medium output equipment - ceramic cartridge, tuner, tape recorder, organs, etc. - all 250mV sensitivity. AC Mains, 240V operation. Size approx: 12½" x 6" x 3½".

£20.00 +£1.35 p & p.

8 TRACK HOME CARTRIDGE PLAYER



Yours
for only

£16.20 +£1.70 p & p.

Elegant self selector push button player for use with your stereo system. Compatible with Viscount IV system. Unisound module and the Stereo 21 Technical specification Mains input, 240V, Output sensitivity 125mV

SPECIAL OFFER

As above but complete with build yourself Unisound Amplifier Kit (see opposite panel) + 2 'Compact' easy to build speaker kits (see opposite page) **£25.00** + p & p £2.00

BUILD YOUR OWN STEREO AMPLIFIER*

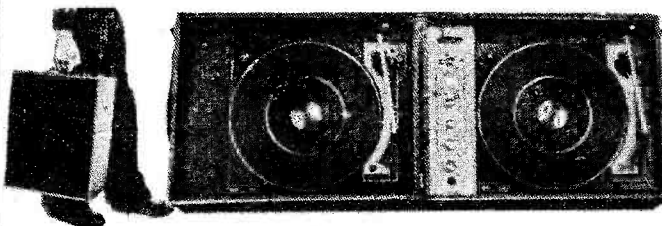


For the man who wants to design his own stereo - here's your chance to start, with Unisound - pre-amp, power amplifier and control panel. No soldering - just simply screw together. 4 watts per channel into 8 ohms. Inputs: 120mV (for ceramic cartridge). The heart of Unisound is very low distortion over the audio spectrum. 240V. AC only.

Also available with 2 speakers (7"x4") **£10** +£1.75 p & p. **£8.95** +£1.05 p & p.
Also available with the 'Compact' (see opposite page) easy build speaker kit **£13.50** +£2 p & p

INCORPORATES: Pre-Amp with full mixing facilities, including switched input for mic with volume control, switched input for auxiliary with volume control, bass and treble controls, volume control and blend control for turntables. Two B.S.R. MP60 type single play professional series decks, fitted with crystal cartridges.

PORTABLE DISCO CONSOLE*



All prices include VAT at current rates

TECHNICAL SPECIFICATION:
Pre-amp - Output - 200mV.
Auxiliary inputs - 200mV and 750mV into 1 meg. Mic input - 6mV into 100K. 240 volt operation.
Turntables capacity - 7", 10" or 12" records. Rumble, wow and flutter Rumble Better than -35dB. Wow Better than 0.2%. Flutter Better than 0.06% (Gaumont Kalee meter).
Finish - Satin black mainplate with black turntable mat inlaid with brushed aluminium trim. Tonearm and controls in black and brushed aluminium.

Console size -
Unit Closed - 17½" x 13½" x 8½" (app.)
Unit Open - 35½" x 13½" x 4½" (app.)
This disco console is ideally matched for the Reliant IV and Disco 50 or any other quality amplifier.
The unit is finished in black PVC with contrasting simulated teak edging, diamond spun control knobs with matching control panel.

Yours for only
£49.00 +£6.50 p & p.



DO NOT SEND CARD

Just write your order giving your credit card number

Mail orders to Acton. Terms C.W.O. All enquiries stamped addressed envelope. Goods not despatched outside U.K.
Leaflets available for all items listed thus * Send stamped addressed envelope. All items subject to availability. Prices correct at 1st Jan 1976 and subject to change without notice.

Minimum order on ACCESS/BARCLAYCARD - £11.

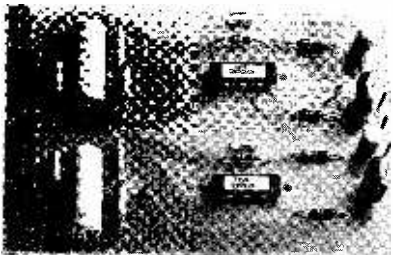
R T V C

21C HIGH STREET, ACTON, LONDON W3 6NG
323 EDGWARE ROAD, LONDON W2

Personal Shoppers EDGWARE RD: 9 a.m.-5.30p.m. Half day Thurs
ACTON: 9.30a.m.-5p.m. Closed all day Wed.

tecknowledgery in consumer ICs - and their applications.

SGS Audio ICs



The much heralded TDA2020 is here. And just to make sure that you don't go wrong, so is the SGS application test circuit PCB for a stereo 15 + 15 (RMS) Hi Fi amplifier.

Prices :	IC	AUDIO	DISCRETES
TBA810AS	+HS	1.09	ZTX107/8/9 14p
TCA940E	+HS	1.80	ZTX413(LN) 17p
TDA2020		2.99	ZTX212/3/4 16p
FM LINEAR			
MC1350		ICS	BD 535 npnp 7A/60v 52p
CA3089	+QC	1.94	BD536 npn 53p
TBA120	+QC	1.00	BD377 npnp 3A/50v 29p
			BD378 npnp 32p
			BD515 npnp 2A/45v 27p
MPX LINEAR			
MC1310P	+LED	2.20	BD516 npnp 30p
CA3090AQ	+LED	3.75	BD609 npnp 10A/90v 70p
			BD610 npnp 102p

We've moved

To accomodate expanded R & D facilities, AMBIT has moved sales and administration to 25 High St. Brentwood. The existing 37 High Street premises are retained for the engineering activities.

One of the first products of this move has been the development of a TV sound tuner, from an "off air" system, using its own varicap UHF TV tuner, with ICIF amplifiers and block filters by TOKO. And then one of our best ever circuits - an electronic touch tuner, with scanning mode, and facilities for 6 preset stations. The unit is suitable for use with FM, and now AM of course, and offers a complete tuner system without any moving parts. Selection is by means of touch tuning in all cases, with manual scan and preset switching automatically interlocked.

Our R&D facilities are available for general consultancy to OEMs: further details on application. Standard project estimation fee, including project evaluation comment data is £15.00 payable in advance.

Modules & Kits

New modules:

8011	Totally touch tuned varicap controller built £14.99.
8005	Larsholt tuner set accessory unit, with pilot tone filter and audio stages, rectifier, IC stabilizer, meter driver circuits. £4.99 (kit)
8001	55kHz low pass filter (mpx birdy filter) £2.35 built £1.75 (kit)
2001	Stereo scratch and rumble filter, with continuously variable operating frequencies. £5.80 (built) £4.60 (kit)
3000	Stereo control preamp - a wide dynamic range, low distortion AF preamp, with vol, bal, bass and treble controls. kit £5.78
2020k	The TDA2020 stereo amp kit photographed on the left. £7.85
7700	TV off air UHF sound tuner - built £26.00 (4 preset stations)

9000 kit	AM/FM mpx tuner chassis, with mech. tuner	£17.50
7004 kit	MW/LW varicap tuner module, inc. ferrite rod	£9.95
7252	HiFi MOSFET FM tuner module by Larsholt	£24.00
7253	HiFi FET FM tuner module inc decoder	£24.00
5600	Hi Q MOSFET varicap tunerhead by TOKO	£11.25
EC3302	FET tunerhead from TOKO	£5.00

Complete FM Tuner kits, inc case, for use with the above modules: details SAE please. Prices range from £40 - £60.

Amongst our various accessories for entertainment electronics is a range of FM tuning, frequency and sig. strength meters with 12v, 50mA bulb. £2.50 ea.



ambit international
25 high street, brentwood,
essex. cm14 4rh.
tel: (0277) 216029
tx: 995194

Free price list with an SAE, catalogue of modules and parts 40p., including postage and VAT.

General Terms: CWO please, official bodies and companies please note min. invoice £7.50. PP for CWO orders 22p per order. (UK and Eire). Overseas customers please include sufficient for postage. VAT is not included, and must be added at 25%. In stock orders despatched within 48 hours.

VALVE BARGAINS

Any 5 64p, 10 99p, 50 £4.
Your choice from the following list: ECH84, ECC82, ECL80, EF80, EF183, EF184, PC86, PC88, PCF80, PCF802, PCL82, PCL84, PCL85, PCL805, PCL86, PFL200, PL36, PL504, PY33, PY81, PY800, PY88, EH90, 30FL1, 30FL2, 30PL14. 6F28

Colour Valves 25p each
PL508 PL509, PY500/A

Press 4 Button Transistor UHF Tuners £2.50

BARGAIN PACKS

All Components in the Bargain Packs are unused and marked.

Pack 1—Polyester (C280) Axial Leads Capacitors— 250V/W & 400V/W, very good mixed selection from 0.01 UF to 2.2 UF. Price 100 £1.25, 1000 £10.00 (our choice).

Pack 2—Resistor Packs. Good mixed selection of Resistors from 33 ohm to above 1m-ohms, 1/2 watt to 2 watt. Price 100/80p, 1000/£6.50.

Small Plastic Boxes (white) made out of high impact plastic with flick on lids. Ideal for most projects. All three types one price. Prices 15p each. Ten £1.10 Size (approx.): Type 1—3 1/2 ins x 2 1/2 ins x 1 in deep. Type 2—3 1/2 ins x 2 1/2 ins x 2 ins deep. Type 3—3 1/2 ins x 3 1/2 ins x 1 1/2 ins deep.

Prices include V.A.T. P. & P. under £1/15p, £1 to £3/20p, above £3/30p. Overseas at cost. Money back guarantee on all orders.

ELECTRONIC MAILORDER LTD., 62 BRIDGE ST., RAMSBOTTOM, BURY, LANCS. Tel. Rams. 3036.

AERIAL BOOSTERS

We make three types of Aerial Boosters all for set top fitting, with Co-ax Plugs and Sockets.

B11—For Stereo and Standard VHF Radio
B12—For the older VHF Television, please state BBCI and ITV Channels.

B45—For mon. or colour this covers the complete UHF band.

All Boosters are complete with Battery and take only minutes to fit.

Price £3.90 each

All the Components below were originally made for Phillips Equipment
We offer them at unrepeatable prices

TOKO COILS

85 FNS 4399 P.O.
85 HNS 20030 P.O.
85 FCS 4402 SEJ
L 5662 P.O.
L 5663 S.W.S.
YRCS 3A 184 HM
YRES 3A 185 AM
YRES 30855 PRO
YRES 30856 SN
YHCS 30862 N
154 TES 7A 5075 AO
154 TES 7A 5076 N
154 TES 7A 5074 ABM
KACS 8449 SZ
YXRS 30859 N
RXOS 6A 5076 EK
YMO SZA 717 N
TKAC5 8448 PJQ
L 5687 N
YRCS 11098 AC2
85 4397 P.C.
All above at 20 for £1 + 25% VAT

Potentiometers

Double and Single and Slides some with switches mixed at 10 for £1 + 25% VAT

Capacitors and Resistors

Mixed Values app. 50% each at 500 for £2.50 + 25% VAT

Push Button Switches

Doubles, Singles, Fours and Sixes 5p ea., 10p ea., 15p ea., 20p ea. + 25% VAT + p.p.

Car Radio Push Button Sets

at 40p ea.
Min. ord. £1 + 25p p.p. + 25p VAT.

Knobs to suit Potentiometers and switches 2p ea. + 8% VAT
No P.P. if ordered with above.

Trimmers 3p each

Pre Set Skeleton 3p each
Min. order 50p + 25p p.p. + 25% VAT

NUTS, BOLTS, SCREWS and WASHERS

Mixed 1lb Pack at 50p + 30p p.p. 8% VAT

K.K.S. TRADING CO.
DEPT. R.C.
38 OAKDENE
CHESHUNT
HERTS

TERMS CASH WITH ORDER

Please Note Only Limited Amount.
Regret Mail Order Only.

Crescent Quality Components

BARGAIN CAPACITOR 2,000MFD at 50v. DC wkg. Size 2" x 1 1/4" diameter. Tag ended. All new and unused. Our price 35p. + 25%.

BARGAIN PROJECT BOX
A plastic box with moulded extrusion rails for PC or Chassis panels with metal front plate fitted with four screws (all supplied). An ideal box to give a small project a professional finish. SIZE: (internal) 81mm x 51mm x 38mm. OUR PRICE 40p. + 8%

JBIID STEREO JUNCTION BOX
The most popular stereo junction box. Facility for two pairs of headphones and two speakers. 3 position switch selects headphones, loudspeakers or both. A bargain at **£2.50** + 25%

DENCO I.F. TRANSFORMERS

IFT.11. Midget IF transformers suitable for use with valves 'NEOSID' Iron dust core tuning, complete with screening can 75p Size—2.5m.m. Square x 49m.m. Please State: 465K/c. 1.6M/c. or 10.7 M/c.

IFT.13. Miniature IF transformer wound on ferrite pot core with adjustable core tuning complete with screening can 70p Size—11m.m. square x 18m.m. 470K/c. Yellow: Interstage R.F. coil with enigma

IFT.14. Miniature last IF transformer as above. 70p

IFT.16. Miniature IF transformer SPEC as above but 1.6 M/c. 62p

IFT.17. Miniature last IF transformer as above. 64p

IFT.18. 465K/c. or 1.6M/c. Double tuned transformer complete with screening can. 82p Size—11m.m. square x 38m.m.

IFT.15. A 10.7M/c IF transformer, Double tuned complete with screening can. 75p + 25% VAT Size—21m.m. high x 11m.m. square.

DENCO TRANSISTOR TUNING COILS
Coils for Transistor Superhets and Converters suitable for chassis or B3A base mounting.

T. COILS
BLUE: Aerial coil with base input winding
YELLOW: Interstage R.F. coil with enigma
RED: Oscillator coil for 465K/c I.F.
WHITE: Oscillator coil for 1.6M/c I.F.

RANGE		1.T	2.T	
Mc/s		0.15-0.4	0.515-1.545	
METRES		2000-750	580-194	
RANGE		3.T	4.T	5.T
Mc/s		1.67-5.3	5-15	10.5-31.5
METRES		180-57	60-20	28-9.5

PRICE: BLUE: Range 1-80p; Ranges 2-5-74p
YELLOW: Range 1-86p; Ranges 2-5-74p
RED: Ranges 1-5-74p
WHITE: Ranges 1-5-74p + 25% VAT

Clock Chip + 8%

CT7001 MOS/LSI Digital Clock/Calendar
Chip plus full Circuits and Information leaflet **£5.95**

Circuits and Information Sheet **25p**

Lit 704 Led Display for above **£1.10**

Or 4 for **£4.20**

POTENTIOMETERS All types 1" and less diameter

Single	Dual
5K Log or	5K
10K Lin Less	10K
25K Switch	25K Less
50K 17p each	50K Switch
100K	100K 53p each
250K	250K + 25%
500K	500K
1M Switch	1M
2M 37p each	2M

MAINS TRANSFORMERS

Open Type Double Wound Continuously Rated, two hole fixing clamp with colour coded flying leads, varnish impregnated. Approx. size: 1 1/4" x 1 1/4" x 1 1/4" high

Fixing centres: 2 1/2".
TR1 20-0-20v 100 m/s All
TR2 12-0-12 v 100 m/s 240 Volt
TR3 9-0-9 v 100 m/s Primary
TR4 6-0-6 v 100 m/s
TR5 3-0-3 v 100 m/s
Our Price £1.23 each + 8%

ANTEX SOLDERING IRONS AND SPARES

X25 25 watt = £2.45
X25 Spare Element = £1.20
X25 Spare Bits No. 50, 51, 52 = 44p each
C240/2 15 watt = £2.55
C240/2 Spare Element = £1.10
C240/2 Spare Bits No. 2, 3, 6 = 32p each
ST3. Soldering Iron Stand Stable for all models—£1.10 + 8% VAT

LOW PRICE TRANSISTORS
BF303B = 15p TTP42A = 75p
AC142K = 25p OC75 = 22p
BC149B = 15p AA129 = 6p
+ 25% VAT

POWER SUPPLY UNITS + 8%
PP1 switched 3, 4, 6, 7, 9 and 12 volts at 500 m/s, with on/off switch and pilot light. Size: 130mm x 55mm x 76mm. ONLY £4.00

PP2 Switched 6-7-9 volt Battery Eliminator. Approx. size 2 1/4" x 2 1/4" x 3 1/4". Ideal for cassette recorders **£2.25**
PP3 Car converter. From 12v Pos. or Neg. to 6-7-9 volt. Easy to fit and transistor regulated **£2.00**

VEROBOARD + 8%
2 1/4" x 3 1/4" 15 Plain 15
2 1/4" x 5 38p 20p
3 1/4" x 3 1/4" 41p 20p
3 1/4" x 5 47p 24p
17" x 2 1/4" 1.24p 89p
17" x 3 1/4" 1.69p 1.32p 87p
17" x 5 2.16p 1.37p 81p
Pin insertion tool 59p
Spot face cutter 59p
Pkt 36 pins (state 1 or 15) 30p

LOUDSPEAKERS + 25%

2 1/4" 8 ohm 60p
2 1/4" 40 ohm 60p
2 1/4" 80 ohm 60p
5" 8 ohm ceramic £1.25
6 1/2" 8 ohm dual cone ceramic £2.50
10" 8 ohm dual cone ceramic £3.75
8" x 6" 8 ohm Fernan's Magnet £1.60

and Tone Controls. Approx. 3 watts into 8 ohm per channel needs a 9/12 volt DC supply and is complete on a 2 1/4" x 7 1/4" P/C board.
Ideal for domestic record players, etc. A Bargain at **£5** + 25% VAT.

10-INCH 8 OHM DUAL CONE
Manufactured by "ELAC" to a very high standard these loudspeakers are a real bargain. SPEC: Size=10" Dual Cone. Power=10 Watts. Frequency=40-12000Hz. + 25% Our Price = £2.75p each

MAINS KEYNECTOR

Keynector connects any Electrical Equipment to the mains supply in seconds. Ideal for bench, garage demonstrations, etc. Multi connections can be made (max. load 13A fused). **£2.25p. + 8%**

ALUMINIUM BOXES + 8%

Metal project boxes give your work a professional finish

	L	W	H
AB7	2 1/2	5 1/2	1 1/2
AB8	4	4 1/2	1 1/2
AB9	4	4 1/2	1 1/2
AB10	4	5 1/2	1 1/2
AB11	4	2 1/2	2
AB12	3	2 1/2	1
AB13	6	4	2
AB14	7	5	2 1/2
AB15	8	6	3
AB16	10	7	3
AB17	10	4 1/2	3
AB18	12	5	3
AB19	12	8	3

ABS PLASTIC BOXES + 8%

Handy boxes for construction projects. Moulded extrusion rails for P.C. or chassis panels. Fitted with 1mm front panel.

1005 = 105mm x 73mm x 45mm = 55p
1006 = 150mm x 75mm x 47mm = 72p
1007 = 184mm x 124mm x 60mm = £1.28
1021 = 105mm x 74mm x 45mm (sloping front) = 55p

TELESCOPIC AERIAL

Nine section fully swivelling telescopic aerial with 4B4 single bolt fixing or two hole fixing bracket. Fully extended = 45" Fully closed = 7" Our Price 50p + P/P + VAT @ 25%

LOW NOISE LOW PRICE CASSETTES + 8%

Good quality tape in well made screw type cassettes. Presented in single plastic cases. C60 = 31p C90 = 45p C120 = 53p 10% Discount on ten or more cassettes of one type

CLEAR PLASTIC PANEL METERS

Size 59mm x 46mm x 35mm these meters require a 38mm hole for mounting.

ME6 = 0 to 50 micro amp Full Scale
ME7 = 0 to 100 micro amp Full Scale
ME8 = 0 to 500 micro amp Full Scale
ME9 = 0 to 1 m/a Full Scale
ME10 = 0 to 5 m/a Full Scale
ME11 = 0 to 10 m/a Full Scale
ME12 = 0 to 50 m/a Full Scale
ME13 = 0 to 100 m/a Full Scale
ME14 = 0 to 500 m/a Full Scale
ME15 = 0 to 1 amp Full Scale
ME16 = 0 to 50 volts
ME17 = 0 to 300 volts A.C. Full Scale
ME18 = "8" Meter
ME19 = "VU" Meter



OUR PRICE £3.20 + 8%

WATER SWITCHES

1 Pole 12 Way
2 Pole 2 Way
2 Pole 3 Way
2 Pole 4 Way
2 Pole 6 Way
3 Pole 4 Way
4 Pole 3 Way



27p each + 8%

SCOOP PURCHASE

MW-LW-FM STEREO TUNER
We supply a MW-LW-FM-Stereo Tuner fully wired and aligned on a 6" x 4" x 1 1/4" printed board, plus the Ferrite Aerial and switch which you connect following our complete instructions. Now you only need a 9-15 volt D.C. supply and you can feed this tuner into any Stereo Amplifier.

FANTASTIC VALUE AT £7.00 + 25% VAT

MINIATURE RELAYS

Brand new range of British made Relays. Size 1 1/4" x 1" x 1". All two changeovers with 250v 1.5A contacts and suitable for fitting on 1mm Vero-board. Type Volts Cur. Ohms

27/A 12v 17mA 700
21/A 12v 25mA 430
12/A 6v 33mA 185

All £1.30 each -

IC EXTRACTION TOOL

Saves damage to Valuable IC's ONLY 40p + 8% VAT

TWO WAY STEREO ADAPTOR

Stereo jack plug to two stereo line sockets complete with 110 nm of cable. For plugging two stereo inputs into one. A Bargain at 65p. + 25%

CABLE LESS SOLDERING IRON WAHL "ISO-TIP"

★ Completely Portable
★ Heats in 5 seconds
★ Solders up to 150 joints or more per charge
★ Recharges automatically in its own stand
★ No AC leakage or induced current to damage delicate components
★ Heats to 700 deg. F
★ Fine Tip for delicate and general purpose soldering
★ Only 8" long and weighs just 8 ozs.
OUR PRICE £2.75 + 8% (spare bits are available)

FERRIC CHLORIDE

Anhydrous ferric chloride in double sealed one pound poly packs.
Our Price 55p + P/P + VAT @ 8% per lb.

3 KILOWATT PSYCHEDELIC LIGHT CONTROL UNIT

Three Channel Bass, Middle, Treble. Each channel has its own sensitivity control. Just connect the input of this unit to the loudspeaker terminals of an amplifier, and connect three 250v, up to 1000W lamps to the output terminals of the unit, and you produce a fascinating sound-light display. (All guaranteed). **£18.50** plus 75p P. & P. + 8%



BARGAIN TRANSFORMERS

12-0-12 volt 500m/a
240 volt primary transformer bargain. approx size = 60mm x 40mm x 50mm
fixing centres = 75mm
Our Price = £1.20 + 8%

P.C. ETCHING KIT

This kit contains all that the constructor will need to etch the circuits of his own design. Contents = Plastic etching dish. Sample copper clad board. Laminating Cutter. 1 lb Ferric Chloride. Large Plastic Spoon. Etch Resist Pen. Full Etching Instructions. Complete and Big Kit Value at £3.75p + 8%

VAT—All prices are excluding VAT. Please add to each item the VAT rate indicated.

CRESCENT RADIO LTD. P.W.
All mail to No. 1 ST. MICHAELS TERRACE
WOOD GREEN, LONDON N22 4SJ.
Phone: 01-885 4474

U.K. POSTAGE 50p UNLESS OTHERWISE STATED

Callers Welcome at 15 Mayes Road & 13 South Mall, Edmonton N9.

AERIALS — ARE — AERIALS

AS FAR AS THEY GO — BUT THE **PARTRIDGE VFA**

WENT FURTHER AND WON A — **'GOLD' WORLD RECORD!**

DISCOVER WHAT YOUR EQUIPMENT CAN REALLY DO!!

SYSTEM 'A' for Communications Rcvrs. £32.96; **SYSTEM 'J'** for TXs/TXVRs £41.03; **SYSTEM 'RC'** for Poor and impossible locations, TV interference, etc.

Please write for details enclosing 8½p stamp stating your problem

(Each **SYSTEM** consists of the elegant gold stove enamelled 7' 6" VFA and a matching finish **JOYMATCH A.T.U.** despatched direct by parcel post—our risk). (All prices delivered—our risk).
COMMUNICATIONS HEADPHONES 8 OHMS £4.92; R.F. Field Strength meter (Jap) £2.13 9R59DS-DE, replacement valves incl. OA2 £6.23; A.G.T.U. Art. earth 72p plus radials 75p each. Prices subject to alteration without notice.

PARTRIDGE SUPER PACKAGE

COMPLETE RADIO STATION FOR ANY LOCATION. Comprising: Trio QR666 Gen. Cov. RX, Headphones VFA., System 'A', all connecting cables, del. (our risk) (A CASH SAVING OF £14.05!)

£206.93

Send stamp for details and expert advice.



Phone 0843 62535
 or 62839
 (after office hours)
 G3CED G3VFA



NEW 1976 OFFER

IN4148 SWITCHING DIODES

10 For 30p 50 for £1.25

100 For £1.50 1000 for £10

LIMITED OFFER

BC107 — BC108 — BC109 9p each

100 for £7.50

POPULAR BRANDED TRANSISTORS

BC147 — BC148 — BC149 — BC157 — BC158 — BC159 — BF194 — BF195 — BF196 — BF197
 8p each. 100 for £6.50. Type numbers may be mixed for quantity discount.

8 PIN DIL 741's NEW LOW PRICES

1+ 25p 10+ 22p 25+ 20p 100+ 18p

1 Amp diodes IN4001 IN4002 IN4003 4p each 30 for £1

IN4004 IN4005 IN4006 6p each 30 for £1.50

ZENER DIODES BZY88 400 MW 3.3V to 33 VOLTS 7p each 100 for £6.00

MULLARD FERRITE CORES LA3 100 to 500 kHz 54p

LA5 30 to 100 kHz 81p, LA7 L 10kHz 81p

LA13 for W.W. OSCILLOSCOPE £1.50

ASSORTED RESISTORS CARBON AND CARBON FILM TYPES ½ WATT to 3 WATTS (25 DIFFERENT VALUES)
 300 for only £1.50

WIRE-ENDED GLASS NEONS 20 FOR £1

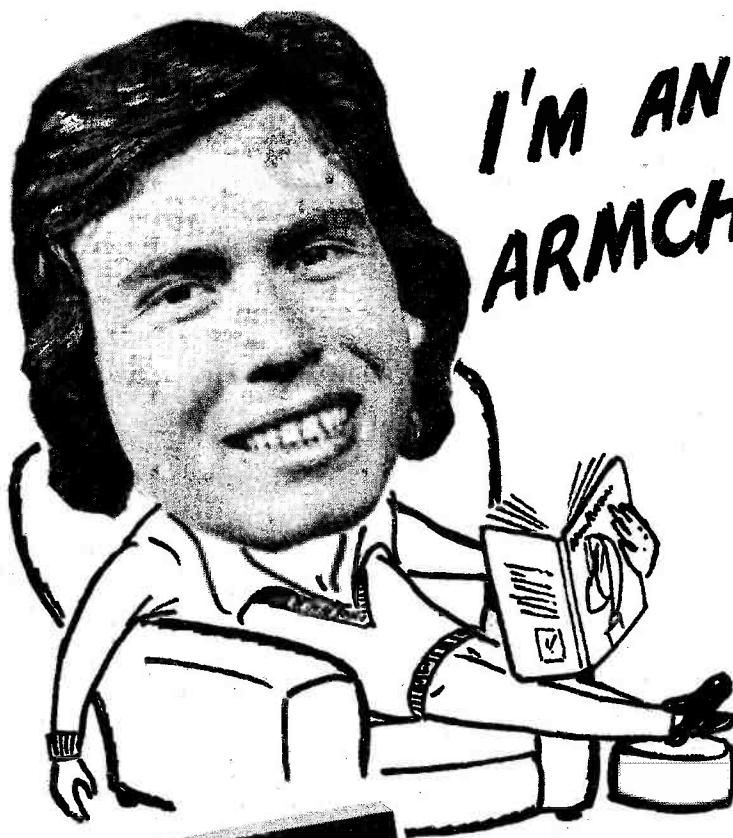
PLESSEY/T.C.C. CAPACITORS WIRE-ENDED .02/300V, .02/350V, .03/350V, .05/350V, .25/250V. 100 OF ANY VALUE
 £2.00 OR 100 OF YOUR OWN CHOICE.

PLEASE NOTE THAT ALL PRICES INCLUDE POSTAGE AND V.A.T. AT 8 OR 25% AS APPROPRIATE

MAIL ORDER ONLY

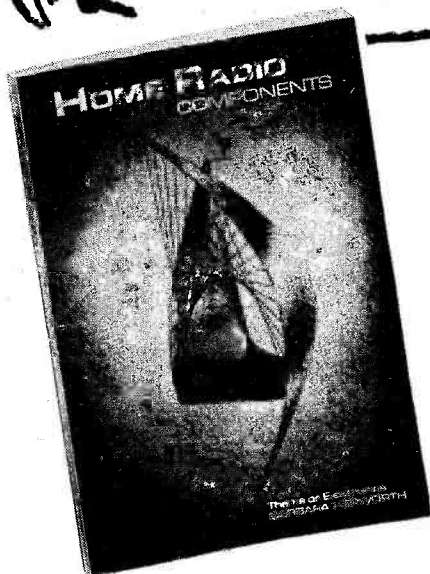
XEROZA RADIO

1, EAST STREET, BISHOPS TAWTON, BARNSTAPLE, DEVON



I'M AN ARMCHAIR SHOPPER!

On a cold dark winter's evening, with the rain lashing down and the wind howling around, there's nothing I like better than to curl up in front of a fire, with tea and toasted scones at my side . . . and my catalogue on my lap. I then start choosing the bits and pieces for my next project. Home Radio Components had sent me one of their special order packs, so I had six order forms and six pre-paid addressed envelopes to simplify my job. I've now gone even one better. When I've written out my order, I pick up the phone and order direct. This was another thoughtful idea of Home Radio. They've made it easy for anyone to open a Credit Account without the delay and formality of references and all that fiddle faddle. Once you have an account, you can order anything, any time during the 24 hours! Just think what a boon that is, if you run out of wire or solder late at night.



HOW ABOUT YOU?

I expect by now you're itching to know how to get in on this. It's really quite easy; but for a start you need the fabulous Home Radio Components Catalogue. It costs 85 pence, plus 45p post and packing; but with the catalogue you get 14 vouchers, each worth 5 pence when used as directed, so you can recover 70 pence of your investment. Why hesitate any longer? *Post off the coupon below today, with your cheque or PO for £1.30, and join the merry band of Armchair Shoppers!*

Today's finest Components
Catalogue **85p** plus 45p POST & PACKING

POST THIS COUPON
with cheque or PO for **£1.30**

The price of £1.30 applies only to customers in the U.K. and to BFPO Addresses.

Please write your Name and Address in block capitals

NAME

ADDRESS



HOME RADIO (Components) LTD., Dept. PW,
234-240 London Road, Mitcham, Surrey CR4 3HD

(Regn. No.
London 912966)

HOME RADIO (Components) LTD, Dept. PW, 234-240 London Road, Mitcham, CR4 3HD. Phone 01-648 8422