

PRACTICAL WIRELESS

JANUARY
1977
40p

The PW
electronic
POLYPHON

CUT YOUR OWN DISC

PART 1



also:
PW 'ICEPERT'
OSCILLOSCOPE CALIBRATOR



TRIUMPH ELECTRONICS LTD

58-60 GROVE RD,
WINDSOR, BERKS.
SL4 1HS.
TEL, 54525.
TELEX 27950, REF 1617.

ADD 8% VAT TO PRICES MARKED *
ADD 12 1/2% TO ALL OTHER PRICES,
OR AS CURRENT VAT LEGISLATION
SEND C.W.O. (EXCEPT GOV'T DEPT)
POST & PACKING 20p FOR THE UK.
BARCLAYCARD & ACCESS BY POST
OR £5 MIN ON TELEPHONE ORDERS.
CATALOGUE LIST FREE SEND SAE
MONEY BACK IF NOT SATISFIED.

A SEMICONDUCTOR POWERHOUSE

FAST SERVICE

NORMALLY 24 HOURS
ON EX STOCK ITEMS.

QUALITY PRODUCT



ADD VAT
TO PRICES

OPTO-ELECTRONICS



DISPLAYS
DL707 0.3" £1*
DL704 0.3" £1*
DL747 0.6" £1.25*
DL727 2x1" £1.99*
3015F or G £2*

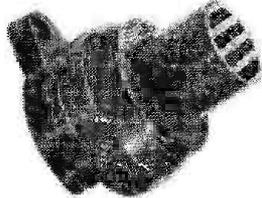
ZENON STROBE TUBES
DISCO/FLASH GUN
TE606 TUBE £7*
605 SMALL £4*

RED POLARISE FILTER 6"x1" £1.50*

RED LEDS 10P.

RED LEDS 209 STYLE 0.125" DIA.
OR 0.2" DIA. NO CLIP ONLY 10p.*

TIL209 RED LED & CLIP 12p*
BIG 0.2" RED LED & CLIP 14p*
GREEN LED LARGE OR SMALL 29p*
ORANGE LED LARGE OR SMALL 29p*
ORP12 60p* 2N5777 39p* TECL2 £1*



AUDIBLE WARNING BLEEPER
12VOLT 35mA, SPARKLESS £1*

Technology Toy

ELECTRONIC CONSTRUCTION KITS.
4 in 1 £3.50, 10 in 1 £6.
Subject to availability.
Send S.A.E. for details.

0-365pf Tuner 99p

SHORT/MED WAVE AIRSPACED
0-365 pf CAPACITOR 99p.
3 DIGIT & RESET TAPE COUNTER 99p.
SET 3 455KHZ IF CANS 7 or 10 mm £1

DALOPEN 75p

ETCH RESIST PEN & 2 TIPS 75p*
PEC ETCH PAK 500gm £1.
6"x4" BOARD, NYLON £1, SRBP 50p*
PCB KIT: 3 ITEMS £2.
DECON DESOLDER BRAID REEL 60p*

vero

VERO 0.1" PITCH COPPERCLAD
2 1/2"x5" 40p* 3 1/2"x5" 45p*
2 1/2"x3 1/2" 38p* 3 1/2"x3 1/2" 40p*
3 1/2"x1 1/2" £2*FACE CUTTER 65p*
DIL BREADBOARD 6"x4" £2.25*
VERO PINS: 36 30p, 200 £1.16*
5 MIN CLEAR EPOXY GLUE 75p*

TRADE SUPPLIED

IC's LOW PRICES

703 RF/IF	29p	LM381 2xpreA	£2
709 T099	25p*	LM1808 radio	£3
709 DIL 14	29p*	LM3900 4xOPA	60p*
710 DIL 14	35p*	MC1303 2x Pre	£2*
723 Regulator	49p*	MC1310 stereo	£2*
741 DIL 8 PIN	22p*	MC1312 SQ	£2**
741 DIL 14	35p*	MC1318	£2.50*
741 T099	33p*	MC1330	75p*
747 Dual 741	69p*	MC1338 2xPre.	£2
748 DIL 8 PIN	33p*	MC1350 1/2	£1*
4195 15-0-15	£3*	MC1486/1469	£4*
7805 5V 1A+	£1.50*	MFC4000 4W AF	75p*
7812 or 15	£1.69*	NE536 FET OPA	£2*
7905/12 & 15	£3*	NE540 Buffer	£2*
76013 6W AF	£1	NE550 2V ref	£2**
CA3046	65p	NE555 TIMER	35p*
CA3048	£2.20	NE556 Dual 555	99p*
CA3054	£2.20	NE560 PhaseLL	£4*
CA3130 OPA	84p*	NE561 PLLoop	£4*
ICL8038 Sigen	£3*	NE562 PLLoop	£4*
LM300 OPA	£1.50*	NE565	£3*
LM301 OPA	38p*	NE567	£3*
LM304 0-40V	£3*	SN72741 as 741	
LM308 H1 Bo	£1*	SN76660 IF	£1
LM309X 5V Reg.	£2*	SN76611 IP	£1
LM318 70Vus	£3*	TBA 800 AF	80p
LM372 IF	£2	TBA 810 AF 7W	95p
LM377 2x2W AF	£3	TBA 820 AF	80p
LM380(60745)	89p	ZN414 Radio	£1.20

TRANSISTORS FULL SPEC. DEVICES

PRICE EACH:-

AC127/8 176	20p*	MATCHING 25p	
AC187/8	20p*	TIP29 & 30 ea	64p*
AD149	49p*	TIP29C & 30C	85p*
AD161/162 ea	50p*	TIP31 & 32 ea	74p*
BC107	10p*	TIP31C & 32C	£1*
BC107B	13p*	TIP41	74p*
BC108	9p*	TIP41C	£1.35*
BC108B	13p*	TIP42	85p*
BC109	9p*	TIP12C	£1.50*
BC109B	14p*	TIP2955	99p*
BC109C	15p*	TIP3055	69p*
BC147/8/9	9p	TIS43 Unijunc	27p*
BC157/8/9	12p	2N706 & 8	16p*
BC167/8/9	12p	2N2646 UJT	49p*
BC177/8/9	20p	2N2904 & 5 pnp	29p*
BC182/3/4a&110p		2N2926Brovrg	11p
BC212/3/4a&112p		2N3053	18p*
BCV70/1/2	18p*	2N3055 115W	45p*
BD131 & 132ea	39p	2N3055 RCA	89p*
DFR39/88&50V39p		2N3614 TO3	£1.50*
BFY50	15p*	2N3702/3/4/5	10p
BFY51	15p*	2N3706/7/8/9	12p
BFY52 & 53	15p*	2N3710/11	14p
BSX19/20/21	20p*	2N3771/2/3	£2.25*
MJ2955 TO3	95p*	2N3819e & 23e	16p
MJE3055	64p*	2N3820 FET	40p
MPU131 PUT	49p	2N3904/5/6	17p
		2N5457 FET	29p

INS BUSH SETS 5p, DATA LIST 15p.

741 22p
8pin

555 35p

BC 109 9p

2N3055 45p

FET3819 16p

MC1310 £2

CMOS TTL

SAFE MOTOROLA	7400N	15p*	
CD4000	15p*	7401	16p*
CD4001	19p*	7402/3	16p*
CD4002	19p*	7404	19p*
CD4006	£1*	7405/6/7	36p*
CD4007	19p*	7408/9/10	19p*
CD4008	87p*	7411/12	22p*
CD4009	50p*	7413	28p*
CD4010	50p*	7417	28p*
CD4011	18p*	7420/27	23p*
CD4012	19p*	7430/32	22p*
CD4013	50p*	7440	16p*
CD4015	94p*	7441	75p*
CD4016	50p*	7442	65p*
CD4017	94p*	7445	78p*
CD4020	£1*	7447	79p*
CD4022	87p*	7450/3/4	16p*
CD4023	19p*	7470	20p*
CD4024	72p*	7472	25p*
CD4025	19p*	7473	31p*
CD4027	50p*	7474	31p*
CD4028	87p*	7475	49p*
CD4040	94p*	7476	38p*
CD4042	78p*	7480	45p*
CD4046	£1.24p*	7481	99p*
CD4049	50p*	7482	69p*
CD4050	50p*	7483	82p*
14501	26p*	7485	£1*
14502	99p*	7486	33p*
14507	69p*	7490	42p*
14510	£1.64*	7491	75p*
14511	£1.65*	7492	45p*
14512	£1.20*	7493	45p*
14516	£1.70*	7495	68p*
14518	£1.40*	7496	68p*
14519	£ 69p*	74100	£1.10*
14520	£1.40*	74107	33p*
14527	£1.99*	74121	32p*
14528	£1.00*	74122	42p*
14541	£2.16*	74123	65p*
14543	£1.99*	74141	83p*
14553	£3.85*	74145	72p*
14566	£1.59*	74147	£2*
14583	99p*	74151	68p*
14585	£1.25*	74154	£1.20*

DIGITAL CLOCK IC

AY51224 4DIGIT £3.49

SWITCHES

SPST 18p* DPDT 24p*
SUBMIN SPST 65p*
WAVECHANGE SWITCHES ALL 40p*
JPOLE 12 WAY, 2P6W, 3P4W, 4P3W.
COIL FORMERS 0.2 or 0.3" 10p.

GAS DETECTOR TGS

TGS308 £4* MAINS KIT £6*

POTENTIOMETERS AB EGIN

2 MEG LIN OR LOG ONLY 10p. ea
2.2K 5K & 10K 100K 20p ea
ALL OTHER VALUES ONLY 16p ea

PRESSETS 6p. RESISTORS 4W 1p. ea.

HEATSINKS TO5 & 18 7p* TO3 16p*

TVA PLASTIC POWER 17p*

TO3 EXTRUDED 4" FINNED 45p*

DIN PLUGS ALL 15p ea

DIN SOCKETS all 10p ea.

LARGE RANGE OF OTHER PLUGS ETC.

ALSO CASES, SOLDER, METERS

MANY VERO CASES AVAILABLE PLUS:-

2518 £1.90* 2520 £2.15* etc.

BLACK PLASTIC CASES IN ABS x42mm

80x60 50p* 100x75 75p*

120x100 89p* MATCHBOX 40p*

CAPACITORS

CERAMIC 22pf to 0.1 uf 50V. op

ELECTROLYTIC, IN 10, 25 & 50V.

2UF/10V, 10, 50, & 100uf 25V

& 10V 7p ea. 50VOLT 10p ea.

1000 uf 25V 18p, 200/500uf 9p.

ALUMINIUM BOXES

AB7 50p* AB9. 47p* AB12 44p*

AB13 85p* AB5 50p* AB10 50p*

DIL RELAY 1A 250V SPCO £1*

TRANSFORMERS 100mA 6, 9 or 12 £1.

4A/1A 6/12 or 12/24 £2 each.



TRANSISTOR DATA LEAFLET 15p
TTL DATA LEAFLET 15p
OPTO LED & DISPLAYS £4.15p
CMOS BOOK £2.50- CLOCK 15p
ALL OTHER PRODUCTS e&c 10p

DIODES

OA81 & OA91 Germanium 5p.
1N4001 1A50V & 1N4002 5p*
1N4004 6p* 1N4007 9p*
1N4148 & 1N914 SILICON 4p*
ZENERS BZV88 400mV 10p
BRIDGE RECTIFIERS 1A50V 22p*
1A 400V 30p* 6AMP 100V 55p*

SCR's TRIACS

SCR's; TAG1/400 1A 400V 50p*
1A 50V 39p* 1A 600V 69p*
C106 4A 400V THYRISTOR 55p*
TRIACS: SC146 10A 400V £1*
15A 400V DISCO TRIAC £1.50*
DIACS: BR100 & MV2 25p ea.

BULK OFFERS PER 100 off_

1N4001 £3,* 1N4004 £3.50*
1N4007 £5* BC107 £8.*
BC108 £7.50* BC109 £8.*
2N3055 £33* NE555 £30*
741C(8) £18 *3819FET £12
1A 50V BRIDGE £16.

BARGAIN PAKS £1 ea. Full spec.

PAK A: 11 RED LEDES full spec £1*
PAK B 5 741C 8 PIN OP AMP £1*
PAK C 4 2N3055 115V 12 BC109 £1*
PAK E 11 BC182 £1.11 2N3704 £1*
PAK G 7 BFY51 £1* H 8 2N3819 £1*
PAK J 6 2N3053 £1* K 1N914x40 £1*
PAK M 3 T099 3055 £1* N 25 OA91 £1

cassettes

LOW NOISE NOT REJECTS.
C60 33p ea TEN FOR £2.70
C90 42p ea TEN FOR £3.65

PRACTICAL WIRELESS

VOL. 52 NO. 9

ISSUE 839

JANUARY 1977

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 Metall

TECHNICAL EDITOR

Terry Carter

PRODUCTION & NEWS EDITOR

Bill Tull

TECHNICAL ARTIST

Alan Martin

SECRETARIAL

Linda Walji

Jill Austin

ADVERTISING MANAGER

01-634 4383

Roy Smith

CLASSIFIED ADVERTISING

01-261 5762

Colin R. Brown

PLEASE NOTE: We do not operate a Technical Query Service except on matters concerning constructional articles published in PW. We do not supply service sheets or information on commercial radios, TV's or electronic equipment.

All queries must be accompanied by a stamped, self-addressed envelope otherwise a reply cannot be guaranteed.

Send letters concerning advertising matters to the Advertising Manager, Roy Smith.

Send letters concerning editorial matters to the Editor, Lionel Howes.

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

BINDERS

Binders £2.10 and indexes 45p (inc. VAT) can be supplied by the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London, SE1 0PF.

● NEWS & COMMENT

744 LEADER ARTICLE—Ration Cards

744 NEWS . . . NEWS . . . NEWS . . .

750 PW READERS PCB SERVICE

763 NEXT MONTH IN PRACTICAL WIRELESS

772 HOTLINES—Recent Developments—*Ginsberg*

780 TELEVISION—What's in the January issue

784 ON THE AIR—Amateur Bands—Eric Dowdeswell G4AR

Broadcast Bands SW—Derek Bell

Broadcast Bands MW—Charles Molloy

● CONSTRUCTIONAL

746 AN OSCILLOSCOPE CALIBRATOR—*J. Thornton Lawrence*
(*R.Tech.Eng*)GW3JGA

751 ICELERT—Black Ice Warning—*Ian Hickman*

757 CHROMACHASE 4 part 2—*William Bean*

764 ELECTRONIC POLYPHON part 1—*M. J. Hughes MA,*
C.Eng.,MIERE

773 VIDEO-WRITER part 6—*M. J. Hughes MA, C.Eng., MIERE*

778 S-DeC PROJECTS No. 2—'Christmas Pudding Saver'—
David Gibson

● OTHER FEATURES

781 VAGARIES OF VHF (Contd.)—*Ron Ham, F.R.A.S.*

782 SPECIAL PRODUCT REPORT—RTVC Stereo Amplifier Kit

790 TECHNICROSS—Puzzle No. 17

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.

Sparkrite mk2

Capacitive discharge electronic ignition kit

VOTED BEST OF 8 SYSTEMS TESTED BY 'POPULAR MOTORING' MAGAZINE



- * Smoother running
- * Instant all-weather starting
- * Continual peak performance
- * Longer coil/battery/plug life
- * Improved acceleration/top speeds
- * Up to 20% better fuel consumption

Sparkrite Mk. 2 is a high performance, high quality capacitive discharge, electronic ignition system in kit form. Tried, tested, proven, reliable and complete. It can be assembled in two or three hours and fitted in 15/30 mins.

Because of the superb design of the Sparkrite circuit it completely eliminates problems of the contact breaker. There is no misfire due to contact breaker bounce which 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. (Most capacitive discharge ignitions are not completely foolproof in this respect). All kits fit vehicles with coil/distributor ignition up to 8 cylinders.

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/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. Also available RPM limiting control for dashboard mounting (fitted in case on ready built unit).

CALLERS WELCOME. For Crypton tuning and fitting service — phone (0922) 33008.

PRICES INCLUDE VAT, POST AND PACKING. IMPROVE PERFORMANCE & ECONOMY NOW

Note—Vehicles with current impulse tachometers (Smiths code on dial RV1 will require a tachometer pulse slave unit). Price £3.35 inc. V.A.T. post & packing.

POST TODAY!

Quick installation
No engine modification required

Electronics Design Associates, Dept., PW/1
82 Bath Street, Walsall, WS1 3DE. Phone: (0922) 33652

Name

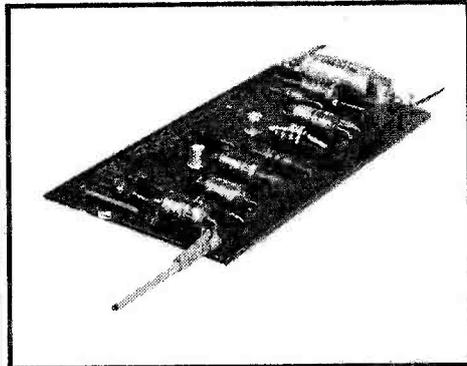
Address

Mk. 2 DIY Ass. Kit @ £11.80	QUANTITY REQD	I enclose cheque/PO's for £
Mk. 2 Ready Built Negative Earth @ £14.97		
Mk. 2 Ready Built Positive Earth @ £14.97		Cheque No.
Ignition Changeover switches @ £4.30		
R.P.M. Limit systems in above units @ £2.42		Send SAE if brochure only required.

Still the *simplest, fastest* way of constructing your electronic circuits. Vero Electronics Ltd manufacture boards to suit most of your requirements, including, Verostrip, Dual in line I.C. boards, Plain Boards, etc. A new catalogue is available (price 10p + S.A.E. at least 7" x 9")

VERO

VEROBOARD



Vero Electronics Limited, Retail Dept.,
Industrial Estate, Chandler's Ford, Hants., SO5 3ZR
Telephone: Chandler's Ford 2956 (STD 04215)

DORAM kits

DORAM KITS CONTAIN EVERYTHING DOWN TO THE LAST NUT!

CAR RADIO

MW/LW PUSH-BUTTON



£19.50
+H

A professional standard Car Radio you can build yourself. 5 push-button selectors or manual tuning. Full 4W RMS output with tone control, illuminated tuning scale and automatic polarity selection, suitable for any 12V car. Supplied complete with full assembly instructions, fitting kit & speaker. Order code 991-962

Car Radio less speaker £16.95 + H VAT (Order code 991-978)

Overseas orders—add 15% for p & p. All items offered for sale subject to the Terms of Business as appears in Doram Edition 3 catalogue, price 60p. The Doram Kit brochure is also available, price 25p. Combined price only 70p which also entitles you to 2 x 25p vouchers each one usable on an order placed to the value of £5.00 or more (ex VAT).

DORAM ELECTRONICS LTD, P.O. BOX TR8 LEEDS LS12 2UF

An Electrocomponents Group Company

RSC 200 WATT DISCO SYSTEM

100 plus 100 WATT OUTPUT

AT A FANTASTIC LOW PRICE!



Consisting of
(1) Twin Turntable Console with Pre-Amp and P.U. Cartridges
(2) 100 + 100 watt Power Amplifier.
(3) & (4) Pair 100 Watt Loudspeakers including 12" Units Console complete with lid

Rec. Mic. UD150 Cardioid £9.95 extra with system only

40W SYSTEM £99.95. 100W SYSTEM inc. Mic. & H'phones £169.95
OTHERS UP TO 300 WATTS AT UNBEATABLE PRICES. Send stamp for Free catalogue.

DISCOMAJOR TWIN TURNTABLE POWER CONSOLE £119.95



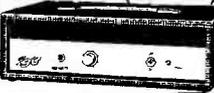
Twin Full size BSR turntables, Sonotone or Acos Carr. £2.50 (Cartridges with Diamond Stylus. Facilities as TD1 Console but with built-in 100 watt Power Amplifier complete with lid. Terms: Deposit £17.95 and 18 fortnightly pymts. £6.89 (Total £138.37)

STEREO VERSION £155 Carr. £3 or Deposit £25 and 18 fortnightly pymts. £8.52 (Total £178.34)

ALL RSC PRICES INCLUDE VAT RSC PHANTOM 50 COMBO AMP. £59.95

Rating 50 watts. 3 inputs, 2 vol. controls - Bass, Treble Presence. Carr. £11.80 Suitable for Lead or Rhythmic guitar, mics., Radio, Tape etc. Inc. High Flux 12" 50w Speaker. Dep. £9.95 & 8 monthly payments £7.88 (Total £69.99).

POWER (SLAVE) AMPLIFIER 100 WATT



Suitable for use with DISCO-Consols. Also for increasing output of lower-powered Amp. Dep. £9.00 and 8 mthly payments of £6.05 (Total £57.40) Carr. £1 (100 + 100W) MODEL £69.95

TITAN TA/50A 50W AMPLIFIER



Solid state, 3 sep. controlled inputs plus Master controls - Bass & Treble Controls. Vynair covered cab. with corner protectives. List price £80 Terms: Dep. £9 & 8 mthly pymts £49.95 £9.05 (Total £57.40). Carr. £1.00



TITAN TA/100A as above but 100w R.M.S output £69.95 Dep. £14.00 & 12 mthly pymts £5.60 (Total £81.20). Carr. £1.50

TITAN TA/50A WITH 70W TWIN SPEAKER UNIT Vynair covered. Fitted protective corner pieces. Dep. £13 £89.95 & 18 fortnightly pymts £4.72 (Total £102.80). Carr. £2.50

TITAN TA100A with 100W TWIN SPEAKER UNIT For all purposes inc. Bass Guitar. Terms: Dep. £17.95 & 18 fortnightly pymts £6.89 (Total £138.37). Carr. £2.50

RSC TRANSFORMERS, L.F. CHOKES FULLY GUARANTEED Impreg. and Interleaved where necessary.

MIDGET CLAMPED TYPE 200-250v 50 Hz
250v. (Or 250.0-250v) 60mA 6.3v. 2a. £1.75
STD. UPRIGHT MOUNTING OR DROP-THRO
250-0-250v. 100mA 6.3v. 4a. 0.5-6.3v. 3a. £4.85
300-0-300v. 150mA 6.3v. 4a. 0.5-6.3v. 3a. £5.20
1a. for Mullard 510 Amplifier. £5.20
350-0-350v. 100mA 6.3v. 4a. 0.5-6.3v. 3a. £4.85
350-0-350v. 150mA 6.3v. 4a. 0.5-6.3v. 3a. £5.20
425-0-425v. 200mA 6.3v. 4a. C.T. 5v. 3a. £9.85
200mA 6.3v. 4a. 0.5-6.3v. 3a. £10.00
450-0-450v. 250mA 6.3v. 4a. C.T. 5v. 3a. £10.45
250-0-250v. 70mA 6.3v. 2a. 0.5-6.3v. 3a. £2.60
250-0-250v. 100mA 6.3v. 3-5a. £4.80
250-0-250v. 100mA 6.3v. 2a. 6.3v. 1a. £3.80
300-0-300v. 80mA 6.3v. 2a. 0.5-6.3v. 3a. £3.20
300-0-300v. 100mA 6.3v. 4a. 0.5-6.3v. 3a. £4.85
FILAMENT OR TRANSFORMER POWER PACK
12v. 1a. £1.10. 6.3v. 1.5a. £1.05. 6.3v. 2a. £1.10.
6.3v. 3a. £1.70. 6.3v. 6a. £2.60. 12v. 3a. or 24v. 1.5a.
£2.60 0.9-18v. 1.5a. £2.20. 0.12-25-42v. 2a. £3.10
CHARGER TRANS 0.9-10v. 1.5a. £2.03; 2.5a. £2.26;
3a. £2.32; 5a. £2.84. 6a. £3.19; 8a. £3.48.

AUTO (STEP UP/STEP DOWN)
TRANSFORMERS 0.110V/120V 200-250v. 80w. £2.90; 150w. £5.20; 250w. £6.37; 500w. £9.84.
OUTPUT TRANSFORMERS
Pentode 500V or 700V to 3Ω £1.12;
Push Pull 8v EL84 to 3 or 15Ω £1.68;
12v 6V6 to 3 or 15Ω £2.61;
12v 6V6 to 3 or 15Ω £2.72;
EL84 to 3 or 15Ω 12v £2.61; Ultra Linear for Mullard 510 etc. £4.35;
18w. sect. wound 6L6, KT66 etc. to 3 or 15Ω £3.71; 20w. sect. wound EL84, 6L6, KT66 etc. to 3 or 15Ω £6.37.
L.F. CHOKES 150mA, 7-10H, 250Ω £1.28; 100mA, 10H, 200Ω £1.10; 60mA, 10H, 400Ω 41p.

£209.95

TDIM DISCO CONSOLE

Terms: Dep. £42.95 and 12 monthly payments £18.70 (Total £243.85)

Incorporating twin BSR MP60 type turntables and Sonotone or Acos 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 Vynair covered Cabinet with lid. Or DEP. £14.95 and 18 fortnightly pymts. £5.58 (Total £115.89) Carr. £1.50

£99.95

TD2S STEREO VERSION OF ABOVE £125.00

Terms DEPOSIT £20 and 18 fortnightly payments £8.89 (Total £144.02) Carr. £2.00



TITAN 100W BASS BINS £99.95

High quality 15" high flux Bass Unit and J304 Horn Tweeter in fold horn type enclosure to provide amazing level of sound output. List price £144 Terms Dep. £14.95 and 18 fortnightly payments £5.58 (Total £115.89) Carr. £2.

FANE HIGH POWER SPEAKERS

Power ratings R.M.S. Cont. 2 YRS GUARANTEE *Gauss 14000 Imp 8-15 ohms. CARR FREE.
*POP 33T 12" 33w £13.95 Dual cone. Full range
*POP 50/2 12" 50w £15.99 Dep for Pair £8.00 and 8 monthly pymts £3.54 (Total £36.32)
*POP 60 15" 60w £25.95 Dep £7.00 & 8 monthly pymts £2.87 (Total £29.96)
*POP 100 18" 100w £44.95 Dep £10.00 & 8 monthly pymts £5.17 (Total £51.36)

TITAN GROUP/DISCO SPEAKERS

MODEL	List RSC Price	£15.80	£10.95
T12/35 12" 35w	£15.80	£10.95	
T12/60A 12" 60w	£21.00	£12.95	
T12/100 12" 100w	£36.00	£24.95	
T15/80 15" 80w	£26.00	£18.99	
T15/70 15" 70w	£28.00	£18.95	
T15/100 15" 100w	£41.00	£29.95	
T18/100 18" 100w	£47.00	£32.95	



TERMS MONTHLY PAYMENTS TOTAL DEPOSIT
Model T12/35 (Pair) £5.50 & 8 at £2.56 £25.98
Model T12/60A (Pair) £7.50 & 8 at £2.87 £30.46
Model T12/100 (Each) £5.50 & 8 at £2.94 £29.02
Model T15/60 (Each) £4.50 & 8 at £2.32 £23.06
Model T15/70 (Each) £5.00 & 8 at £2.37 £23.96
Model T15/100 (Each) £7.00 & 8 at £3.39 £34.12
Model T18/100 (Each) £7.95 & 8 at £3.69 £37.77

TITAN H.F. UNITS



Incorporating a pair of Highly Sensitive Horns. Frequency range 3-5 kHz to 15kHz. Rating 70/100 watts. For 8 or 15Ω. Or Dep. £6.95 & 8 monthly payments £3.12 (Total £31.91)



50 WATT H.F. HORNS Imp. 8Ω Range 3 kHz to 15 kHz Exceptionally sensitive. Complete with Fane HPX2 'Crossover' £9.95

HI-POWER TWEETER

Response 3KHz-20KHz with 7" mid. Non elect. filter available 55p Rating 50 Watt Imp 8Ω £6.95

'SOUND TO LIFE' SYSTEM PULSAR

Special price £106.95 Dep. £18.00 and complete kit £12.84 (Total £122.87). 8 monthly pmts. £12.84 (Total £122.87). Super SL 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. £21.60
FAL SOUND-TO-LITE UNIT £21.60
3-WAY SPOT BANK Exc. Bulbs £16.20
COMPLETE SYSTEM £55 Incl. 2 Spotbanks and bulbs

JINGLE MACHINES from £37.95
ECHO CHAMBERS from £49.95
COLUMN SPEAKERS from £29.95
GROUP/DISCO SPKRS in CABS from £11.95

New Branches at YORK CARLISLE, DEWSBURY LIVERPOOL, PRESTON

OPEN ALL DAY SATURDAYS (5 Day Week)
BRADFORD 10 North Parade (Closed Wed.). Tel. 25349
BOLTON 23 Deansgate (Closed Wed.). Tel. 33512
BIRMINGHAM 303/1 Great Western Arcade. Tel. 021-238 1270 (Closed Wed.).
CARLISLE 8 English Street. (Closed Thurs.). Tel. 38744
COVENTRY 17 Shelton Sq., The Precinct. Tel. 25983
DERBY 87 St. Peter's Street. (Closed Wed.). Tel. 41381
DARLINGTON 19 Northgate (Cl. Wed.). Tel. 68043
DEWSBURY 111 Kingsway (Closed Tues.). Tel. 468058
DONCASTER 3 Queensgate, Waterdale Centre. (Closed Thurs.). Tel. 63069

INTEREST REFUNDED ON CREDIT PURCHASES SETTLED IN 3 MONTHS

Barclaycard and Access accepted
All items subject to availability. Prices correct at 21.10.76 E. & O.E.
EDINBURGH 101 Lothian Rd. (Cl. Wed.). Tel. 225 9501
GLASGOW 326 Argyle St. (Cl. d Thurs.). Tel. 248 4188
HOLL 7 Whitfairgate (Closed Thurs.). Tel. 20505
LEICESTER 32 High Street (Closed Thurs.). Tel. 56420
LEEDS 5-7 County (Mecca) Arcade, Briggate (Closed Wed.). Tel. 458252
LIVERPOOL 35 Dawson's Way, St. John's Shopping Centre Tel: 708 9380 (Cl. Wed.). Tel. 723 1829
LONDON 238 Edgware Road, W.2. (Closed Thurs.). Tel. 238 9778
MANCHESTER 60A Oldham Street (Closed Wed.). Tel. 238 9778
MIDDLESBROUGH 103 Linthorpe Rd. Tel. 210585 (Closed Wed.)

MAIL ORDERS & EXPORT ENQUIRIES TO:-
AUDIO HOUSE, HENKORNER LAKE, LEEDS, 13. Tel: 0532 577631.
MAIL ORDERS MUST NOT BE SENT TO SHOPS TERMS D.W.O. or C.O.D. No C.O.D. under \$1. POSTAGE 40p PER ORDER OR AS QUOTED. PLEASE SEND STAMP FOR FREE CATALOGUE.
NEWCASTLE UPON TYNE 24 Newgate Shopping Centre, 59 Grainger St. (Closed Wed.). Tel. 21469
NOTTINGHAM 19/19A Market Street (Closed Thurs.). Tel. 48068
PRESTON 41 Friargate Walk, St. Georges Shoppg Prec. Tel. 81978
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. 70574
YORK 5 CHURCH ST. (Closed Wed.) Tel. 34355

BENTLEY ACOUSTIC CORPORATION LTD.

7a GLOUCESTER ROAD, LITTLEHAMPTON, SUSSEX
All prices inclusive of V.A.T. at 12½% Telephone 6743

0B2	40	6B9G	-85	6K7G	-35	12B17	-55	30PL15	1.00	DF91	-30	ECR80	-50	EMM803	-39	PCC84	-39	PY500A1-20	U281	1.00	AC168	-44	BF185	-47							
0Z4	-55	6BA6	-40	6K8G	-50	12B17	-85	35A3	-75	DF96	-80	ECF82	-50	EMM803	3.50	PCC85	-47	PY800	-40	U301	-55	AC176	-44	BF750	-26						
1A3	-80	6B0C	-80	6K8GT	-55	12E1	3.50	35C5	-80	DK40	-70	ECF86	-80	EMM803	-45	PCC89	-49	PZ30	-50	U404	-75	ACY17	-30	BFY52	-23						
1A5GT	-55	6BR6	-40	6L1	2.50	12J5GT	-40	35D5	-80	DK96	-70	ECF88	-50	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1A7GT	-80	6BH6	-70	6L6G	-60	12K1	1.50	35E4	-85	DL86	-60	ECF88	-50	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1B3GT	-55	6BT6	-65	6L7	-60	12K1	1.50	35E4	-85	DM70	-80	ECF88	-50	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1B5GT	-55	6BK7A	-85	6L18	-80	12K7GT	-50	35Z3	-80	DM70	-80	ECF88	-50	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1L4	-25	6BQ7A	-80	6L19	2.00	12K8	-75	35Z4GT	-70	DM71	1.75	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1N5GT	-75	6BR7	1.00	6LD20	-80	12Q7GT	-50	35Z5GT	-80	DY87/6	-85	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1R5	-50	6BR8	1.25	6N7GT	-70	12S7	-50	42	1.50	DY90Z	-45	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
184	-40	6BS7	1.00	6Q7G	-50	12S8GT	-55	43	1.25	E80C2	2.50	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1U4	-70	6BW6	1.00	6Q7GT	-50	12S8GT	-55	43	1.25	E80C2	2.50	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
1U5	-65	6BW7	-85	6Q7(M)	-65	12S7	-60	50C5	-70	E80F	2.20	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
2D21	-55	6BZ6	-60	6R7G	-70	12S9GT	-80	50C5D8G	-70	E80F	2.20	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
2GK5	-75	6C4	-40	6SA7	-55	12H7	-75	50EHS5	-85	E180F	1.15	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
2X2	-70	6CS6	-80	6SC7GT	-75	14H7	-75	50EHS5	-85	E180F	1.15	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
3A4	-55	6C6	-45	6R8GT	-50	14S7	1.00	50L6GT	-70	E192CC	-70	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
3D6	-40	6C9	2.00	6S8GT	-55	19AQ5	-65	85A2	-75	E188CC	3.00	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
3Q4	-80	6C8BA	-50	6S8GT	-55	19H1	4.00	85A3	-45	85A2	-75	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
3Q5GT	-70	6C8AG	1.00	6SK7GT	-65	20D1	7.00	90AG	3.00	E1148	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
384	-45	6C8G8A	-80	6Q7G	-50	20P2	-85	150B2	1.00	EA50	-40	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
3V4	-80	6CL6	-75	6V6G	-60	20P2	-85	150B2	1.00	EA50	-40	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
4CB6	-75	6CL8A	-85	6V6GT	-55	20L1	1.00	2159G	-80	EA76	1.30	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
5CG8	-75	6CM7	1.00	6X4	-45	20P1	1.00	807	1.10	EA8C90	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21						
5R4GY 1.00	6C1U5	-80	6X5GT	-60	20P3	1.00	1255	2.50	EA91	-55	EL32	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21					
5U4G	-80	6D3	-80	6D3	-80	20P4	-80	1255	2.50	EA92	-70	EL34	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21				
5V4G	-80	6D7	-80	6D7	-80	20P4	-80	1255	2.50	EA92	-70	EL34	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21				
5V4G	-80	6D7	-80	6D7	-80	20P4	-80	1255	2.50	EA92	-70	EL34	-60	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21				
5Y3GT	-55	6DT6A	-85	7H7	-80	25A6G	-70	5763	1.85	EB34	-30	EL37	3.00	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21				
5Z2	1.00	6E6W6	-85	7R7	2.00	25L6G	-70	6067	1.00	EB91	-17	EL41	-57	KTW63	1.50	EL37	3.00	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21
5Z4G	48	6E5	1.00	7Y4	-80	25Y5G	-60	6060	1.00	EB91	-17	EL41	-57	KTW63	1.50	EL37	3.00	ECF40	-75	EMM803	-45	PCC189	-52	QV03/10	2.00	U4020	-75	ACY19	-23	BY114	-21
5Z4GT	-55	6F1	-80	7Z4	-80	25Z4G	-50	6067	1.00	EB90	-40	EL84	-34	99	PL605	1.55	U10	1.00	AC128	-23	BCY38	-26	OC82	-18	OC82D	-18					
6/30L2	-79	6F8G	-80	8D2	-60	25Z5	-75	7183	-60	EB93	-45	EL86	-60	MU14	1.15	PL608	1.00	U19	4.00	AC156	-23	BF168	-23	OC84	-28	OC84D	-28				
6A8G	1.40	6F18	-85	8D2	-60	25Z6G	-80	9002	-55	EB93	-45	EL86	-60	MU14	1.15	PL608	1.00	U19	4.00	AC156	-23	BF168	-23	OC84	-28	OC84D	-28				
6A8G	-55	6F18	-85	8D2	-60	25Z6G	-80	9002	-55	EB93	-45	EL86	-60	MU14	1.15	PL608	1.00	U19	4.00	AC156	-23	BF168	-23	OC84	-28	OC84D	-28				
6AG5	-85	6F15	-75	10D7	-80	25D7	2.00	9006	-45	EB93	-45	EL86	-60	MU14	1.15	PL608	1.00	U19	4.00	AC156	-23	BF168	-23	OC84	-28	OC84D	-28				
6AG7	-60	6F18	-80	10F1	-67	30C15	-77	ACPEN	60	EC86	-84	EM81	-60	PC92	-55	PY80	-50	U38	1.75	AC166	-30	BF181	-47	OC172	-41	OC172D	-41				
6AH6	-70	6F23	-65	10F9	-65	30C17	-77	AL60	1.20	EC88	-84	EM81	-60	PC92	-55	PY80	-50	U38	1.75	AC166	-30	BF181	-47	OC172	-41	OC172D	-41				
6AJ5	-70	6F24	-80	10F18	-65	30C18	1.00	ARP3	-60	EC88	-84	EM81	-60	PC92	-55	PY80	-50	U38	1.75	AC166	-30	BF181	-47	OC172	-41	OC172D	-41				
6AK5	-45	6F26	1.00	10D11	-75	30F5	70	ATP4	50	EC88	3.00	EM84	-45	PC95	-70	U45	1.00	PC98	62	PY33/2	50	U38	1.75	AC166	-30	BF181	-47	OC172	-41		
6AK6	-70	6F28	-74	12P13	-60	30F13	-70	ATP4	50	EC88	3.00	EM84	-45	PC95	-70	U45	1.00	PC98	62	PY33/2	50	U38	1.75	AC166	-30	BF181	-47	OC172	-41		
6AM8A	-70	6F32	-70	10P14	2.50	30F14	1.00	AZ81	-60	EC80	-90	EM85	-120	PC97	-39	PY83	-44	U81	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AN8	-70	6F36	-60	12A6	-65	30L15	-75	AZ41	-60	EC81	-84	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AQ5	-47	6GH8A	-80	12AC6	-80	30L17	-70	B36	-75	EC82	-84	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AR5	-80	6GK5	-75	12AD6	-80	30P4MR	95	BL63	2.00	EC83	-84	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AS7G	-1.00	6GU7	-80	12AE6	-80	30P12	-74	CL33	1.75	EC84	-35	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AT6	-50	6HG7	-30	12AT6	-65	30P19	-70	CT1C	1.00	EC85	-39	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AV6	-40	6J5GT	-50	12AU6	-50	30P4	-90	CY31	-70	EC86	1.25	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AV6	-50	6J6	-55	12AV6	-60	30P11	1.00	DAF91	-35	EC88	-51	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AW8A	-84	6J7G	-35	12BA6	-60	30P13	1.00	DAF96	-80	EC8189	-80	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		
6AX4	-75	6JU8A	-80	12B6E	-55	30P14	1.20	DC90	-70	EC8087	1.40	EM87	1.10	PC90	-40	PY88	-40	U91	-50	1/OC44	2.50	1/OC46	50p	1/OC82D	2.50	1/OC82D	2.50	1/OC82D	2.50		

Special offer of EF50 valves. Soiled but unused and tested. £1 each.

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

20x20 Watt STEREO AMPLIFIER

Superb Viscount IV unit in teak-finished cabinet. Black fascia with aluminium rotary controls and pushbuttons, red mains indicator and stereo jack socket. Function switch for mic, magnetic and crystal pick-ups, tape, tuner, and auxiliary. Rear panel features two mains outlets, DIN speaker and input sockets, plus fuse, 20+20 watts rms, 40+40 watts peak.



HOW YOU CAN SAVE £2990
+ p & p £2.10

SYSTEM 1B

For only £80, you get the 20+20 watt Viscount IV amplifier; a pair of our 12-watt-rms Duo Type 11b matched speakers; a BSR MP 60 type deck complete with magnetic cartridge, de luxe plinth and cover.

£80.00
+ p & p £6.50

SYSTEM 2

Comprising our 20+20 watt Viscount IV amplifier; a pair of our large Duo Type 11l matching speakers which handle 20 watts rms each; and a BSR MP 60 type deck with magnetic cartridge, de luxe plinth and cover.

£92.00
+ p & p £7.60

Carriage surcharge to Scotland: System 1b £2.50, System 2 £5 + p & p £7.60

SPEAKERS Two models— Duo 11b, teak veneer, 12 watts rms, 24 watts peak, 18 1/2" x 13 1/2" x 7 1/4" approx.

£34 + p & p £6.50
PER PAIR

Duo 11l, 20 watts rms, 40 watts peak, 27" x 13" x 1 1/2"

£48 £7.50
PER PAIR

TURNTABLE Popular BSR MP 60 type, complete with magnetic cartridge, diamond stylus, and de luxe plinth and cover.

£24.00
+ p & p £3.50

VALUE



30x30 AMPLIFIER KIT

Specially designed by RT-VC for the experience constructor, this kit comes complete in every detail. Same facilities as Viscount IV amplifier. Chassis is ready punched, drilled and formed. Cabinet is finished in teak veneer. Black fascia and easy-to-handle aluminium knobs. Output 30+30 watts rms, 60+60 peak.

£29.00
+ p & p £2.10

STEREO CASSETTE DECK KIT

Again, this kit is specially designed for the experienced constructor—for mounting into his own cabinet.

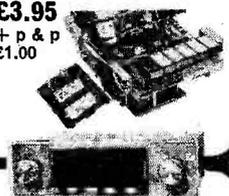
Features include solenoid-assisted AUTO-STOP, 3-digit counter, record/replay PC board, mains transformer and input and output controls. AC BIAS AND ERASE.

£32.50
+ p & p £1.50

DELUXE ACCESSORY KIT

Comprises of a matched pair of dynamic mics, and two replacement slider level controls. P & P FREE WHEN PURCHASED TOGETHER.

£3.95
+ p & p £1.00



DIY STEREO SYSTEM

COMPLETE WITH SPEAKERS

Here's real value in DIY! Comprises ready-built amplifier module, 3-speed Garrard auto-return deck, and teak-veneer simulate cabinets with clear plastic top. Easily built by hobbyists.

£26.95
+ p & p £4.05



NEW sinclair I.C 20,20WATTS STEREO AMPLIFIER KIT WITH PZ 20 POWER UNIT

FANTASTIC SAVING. A build-it-yourself stereo power amplifier with latest integrated circuitry, 10W RMS per channel output, full short-circuit and overheat protection.

LIST £14.50 OUR PRICE **£4.95** p+p £1.

TOURIST IV PUSH BUTTON CAR RADIO KIT (Motor Top 10 Award)

Complete with speaker, baffle and fixing strips. The Tourist IV—for the experienced constructor only.

The Tourist IV has five push buttons, four medium band and one for long wave band. The tuning scale is illuminated and attractive spin aluminium control knobs are used for manual tuning and volume control. The modern style fascia has been designed to

blend with most car interiors and the finished radio, will slot into a standard car radio aperture. Size: approx. 7" x 2" x 4 1/2". Power Supply: Nominal 12 volts positive or negative earth (altered internally). Power Output: 4 watts into 4 ohms.

£10.50 + p & p £1.50



35-WATT DISCO AMP

Here's the mono unit you need to start off with. Gives you a good solid 35 watts rms, 70 watts peak output. Big features include two disc inputs, both for ceramic cartridges, tape input and microphone input. Level mixing controls fitted with integral push-pull switches. Independent bass and treble controls and master volume.

£27.50 + p & p £1.50

PORTABLE DISCO CONSOLE with built-in pre-amplifiers

Here's the big-value portable disco console from RT-VC! It features a pair of BSR MP 60 type auto-return, single-play professional series record decks. Plus all the controls and features you need to give fabulous disco performances. Simply connects into your existing slave or external amplifier.

£55.00
+ p & p £6.50



70 and 100 WATT DISCO AMPLIFIERS

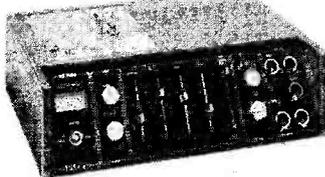
Brilliantly styled for easy disco performance! Sloping fascia, so that you can use the controls without fuss or bother. Brushed aluminium fascia and rotary controls. Five smooth-acting, vertically mounted slide controls—master volume, tape level, mic level, deck level.

PLUS INTER-DECK FADER for perfect graduated change from record deck No. 1 to No. 2, or vice-versa. Pre-fade level control (PFL) lets YOU hear next disc before fading it in. VU meter monitors output level. 70 watts rms, 140 watts peak output.

All the big features as on the 70-watt disco amplifier, but with a massive 100 watts rms, 200 watts peak output power.

£49.00
+ p & p £3.00

£65.00
p & p £4.00



EASY-TO-BUILD, WITH ENCLOSURE

Specially designed by RT-VC for cost-conscious hi-fi enthusiasts, these kits incorporate two teak-simulate enclosures, two EMI 13" x 8" (approx.) woofers, two 3 1/4" (approx.) tweeters and a pair of matching crossovers. Easily constructed, using a few basic tools. Supplied complete with an easy-to-follow circuit diagram, and crossover components. Input 15 watts rms, 30 watts peak, each unit. Cabinet size 20" x 11" x 9 1/2" (approx.).

£25.50 + p & p £5.50
PER PAIR

15-WATT KIT IN CHASSIS FORM

When you are looking for a good speaker, why not build your own from this kit. It's the unit which we supply with the above enclosures. Size 13" x 8" (approx.) EMI woofer, 3 1/4" (approx.) tweeter, and matching crossover. Power handling capacity 15 watts rms, 30 watts peak.

£7.50 + p & p PER SET

DECCA 20 WATTS STEREO SPEAKER

This matching loudspeaker system is hand-made, as only Decca know how, built to a specification, not down to a price.

The kit comprises of two 8" diameter approx. base drive unit, with heavy die cast chassis laminated cones with rolled P.V.C. surrounds Two 3 1/2" diameter approx. domed tweeters complete with crossover networks.

Our price per stereo pair **£30.00**—£4.00 P & P

DIY SPEAKER KITS

'COMPACT' FOR TOP VALUE

How about this for incredible bookshelf value from RT-VC! A pair of high efficiency units for only £7.50 — just what you need for low-power amplifiers. These infinite baffle enclosures come to you ready mitted and professionally finished. Each cabinet measures 12" x 9" x 5" (approx.) deep, and is finished in Rosewood. Complete with two 8" (approx.) speakers for max. power handling of 7 watts.

£7.50
p & p £1.70 per pair

ELECTROLYTIC CAPACITORS AT BARGAIN PRICES

all brand new from reputable international manufacturers.
PACK 1 Containing 30 mixed Electrolytics, valves from 4.7 mfd to 47 mfd. Minimum 16V working. 55p + 20p p&p.
PACK 2 Containing 17 mixed Electrolytic valves from 100 mfd to 2200 mfd. Minimum 16V working. Majority 40V working. 75p + 20p p&p.

ALL PRICES INC. VAT AT CURRENT RATES

GOODS NOT DESPATCHED OUTSIDE U.K. All items subject to availability

Price correct at 1/11/76 and subject to change without notice.

We are unable to show all our products, so please send S.A.E. for our fully descriptive catalogue and any further information.



21C, HIGH STREET, ACTON, LONDON W3 6NG
323 EDGWARE ROAD, LONDON W2
Personal Shoppers EDGWARE ROAD: 9 a.m.—5.30 p.m.
Half day Thurs.
ACTON 9.30a.m.—5p.m. Closed all day Wed and half day Sat.



Minimum order on Access and Barclaycards £15

DO NOT SEND CARD Just write your order giving your credit card number

AUDIO MODULES

A NEW APPROACH TO QUALITY HI-FI

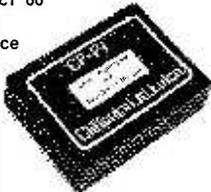
Cliffpalm Ltd. introduce a flexible range of high quality modules to enable a sophisticated hi-fi system to be built up from simple beginnings.

An initial 20W r.m.s. + 20W r.m.s. stereo with standard controls can be expanded to give a 40W + 40W system with (in addition to the normal bass, treble and balance controls) a further range comprising "rumble" and "hiss" switchable controls with a range of frequencies; and a stereo image width control.

STEREO PRE-AMP: CP-P1: PRICE £13.30
+ VAT £1.66

Specification

Input	Sensitivity	Signal/Noise	Impedance
Magnetic	3mV	>70dB	47KΩ
Tuner	100mV	>70dB	10KΩ
Tape	100mV	>70dB	10KΩ
Auxiliary	1-100mV	60dB-70dB	200KΩ



Magnetic i/p overload 33dB;
Distortion 0.04% at 1KHz; Output 1v r.m.s. into 10KΩ;
Supply voltage ±18v nominal;
Tone controls, Bass ±12dB at 100Hz; Treble ±12dB at 10KHz.

Description: This is a general purpose 2 channel pre-amplifier suitable for use with gramophone, tape, microphone or tuner inputs. It requires no external components other than the potentiometers for the bass, treble, balance and volume controls and the input selector switch. The unit is internally protected against accidental reversed supply connection.

AMPLIFIER: CP2-15-20 PRICE: £12.85
40W r.m.s. single + VAT £1.61
20W r.m.s. + 20W r.m.s. stereo

Specification:

Power output; 40W r.m.s. into 8Ω, 1 channel or 30W r.m.s. into 15Ω, 1 channel or 20W r.m.s. + 20W r.m.s. into 4Ω, 2 channel or 15W r.m.s. + 15W r.m.s. into 8Ω, 2 channel
Input Sensitivity 1v r.m.s.; Frequency response 20Hz-20KHz, at -3dB; Distortion 0.04% at 15W; Supply Voltage ±18v nominal; Size 5.1x4x1.25 inches, 130x102x32mm.

Description: This module is designed to give either a 20W + 20W stereo amplifier or alternatively a 40W single channel. It has built-in protection against accidental reversed supply connection and it incorporates a thermal shut-down facility to prevent over-dissipation. No external components are required.

FUNCTION GENERATOR: CP-FG1 PRICE: £11.75
+ VAT £1.47

For those requiring a wider range of facilities, this module provides bass and treble filter controls, comprising switchable cut-off frequencies for rumble and hiss reduction. Also included is a stereo separation control. The unit is complete except for potentiometers and switches.

POWER SUPPLY: CP-PS 18/2D PRICE: £5.75
+ VAT £0.72

This is suitable for one 20W + 20W complete system. For a 40W + 40W system, two power supplies are required.

Full application notes are provided.

Post and Packing are free on all orders.

All units are guaranteed for 2 years.

Cliffpalm Ltd.

DEPT. HF/PW, 13 HAZELBURY CRESCENT,
LUTON LU1 1DF, BEDS.

INDUSTRIAL PRICES FOR THE HOBBYIST ALL 'BIG NAME' BRANDED GOODS — MONEY BACK GUARANTEE

CD 4000AE 0-19	CD 4038AE 0-99	CD 4086BE 0-66	CA 3127E 1-31
CD 4001AE 0-19	CD 4040AE 0-98	CD 4089BE 1-42	CA 3600E 1-01
CD 4002AE 0-19	CD 4041AE 0-77	CD 4093BE 0-73	
CD 4003AE 1-08	CD 4042AE 0-77	CD 4094BE 1-24	D.I.L. Sockets
CD 4007AE 0-19	CD 4043AE 0-92	CD 4095BE 0-96	8 pin 0-18
CD 4008AE 0-88	CD 4044AE 0-86	CD 4096BE 0-96	14 pin 0-20
CD 4009AE 0-52	CD 4045AE 1-28	CD 4097BE 3-41	16 pin 0-22
CD 4010AE 0-92	CD 4046AE 1-22	CD 4099BE 1-68	24 pin 0-33
CD 4011AE 0-92	CD 4047AE 0-84	CD 4502BE 1-13	28 pin 0-37
CD 4012AE 0-19	CD 4048AE 0-77	CD 4510BE 1-24	LM 555CN 0-53
CD 4013AE 0-52	CD 4049AE 0-52	CD 4511BE 1-43	703CN 0-98
CD 4014AE 0-92	CD 4050AE 0-52	CD 4514BE 2-51	709CN 0-40
CD 4015AE 0-92	CD 4051BE 0-86	CD 4515BE 2-87	710CN 0-56
CD 4016AE 0-92	CD 4052BE 0-86	CD 4516BE 1-25	711CN 0-63
CD 4017AE 0-92	CD 4053BE 0-86	CD 4520BE 1-14	8 pin 741CN 0-29
CD 4018AE 0-92	CD 4054BE 1-07	CD 4527BE 1-44	747CN 1-07
CD 4019AE 0-52	CD 4055BE 1-21	CD 4532BE 1-32	748CN 0-49
CD 4020AE 1-01	CD 4056BE 1-21	CD 4535BE 0-84	3900CN 0-75
CD 4021AE 0-92	CD 4060AE 1-02	CD 4556BE 0-84	301AN 0-58
CD 4022AE 0-88	CD 4063BE 1-00		
CD 4023AE 0-19	CD 4066AE 0-57	AUDIO IC's	
CD 4024AE 0-72	CD 4067BE 3-42	CA 3028A 0-83	
CD 4025AE 0-19	CD 4068BE 0-20	CA 3035 1-41	DIODES
CD 4026AE 1-58	CD 4069BE 0-19	CA 3045 2-99	1N 4001 0-04
CD 4027AE 0-52	CD 4070BE 0-54	CA 3046 0-73	1N 4002 0-04
CD 4028AE 0-83	CD 4071BE 0-20	CA 3048 -78	1N 4004 0-05
CD 4029AE 1-05	CD 4072BE 0-20	CA 3052 1-23	1N 4005 0-05
CD 4030AE 0-52	CD 4073BE 0-20	CA 3053 0-48	1N 4006 0-05
CD 4031AE 2-02	CD 4074BE 1-42	CA 3065 1-40	1N 4007 0-05
CD 4032AE 0-98	CD 4075BE 0-54	CA 3075 1-35	1N 4148 0-02
CD 4033AE 1-28	CD 4076BE 0-54	CA 3080 0-54	1N 914 0-03
CD 4034AE 1-75	CD 4077BE 0-20	CA 3081 0-82	BZY 88c 2-7v
CD 4035AE 1-07	CD 4078BE 0-20	CA 3082 0-84	33v 0-06
CD 4036AE 0-87	CD 4081BE 0-20	CA 3089E 2-01	OA 47 0-05
	CD 4082BE 0-20	CA 3090E 0-92	OA 200 0-07
	CD 4085BE 0-66	CA 3097E 0-98	OA 202 0-07

Transistors	2N	3703	0-17	40360	0-24	40594	0-69	BCY 72	0-11
2N 2102	0-70	2N 3704	0-18	40361	0-25	40636	1-06	BFX 29	0-37
2N 2369	0-23	2N 3706	0-17	40362	0-26	40673	0-49	BFX 30	0-40
2N 2905	0-39	2N 3708	0-15	40406	0-42	BC 107	0-14	BFX 84	0-27
2N 3053	0-18	2N 4038	0-59	40407	3-33	BC 108	0-13	BFX 85	0-33
2N 3054	0-58	2N 4037	0-48	40408	0-48	BC 109	0-16	BFX 88	0-28
2N 3055	0-62	2N 5296	0-42	40409	0-49	BC 237	0-12	BFY 50	0-28
2N 3440	0-57	3N 128	0-71	40410	0-49	BCY 70	0-18	BFY 51	0-27
2N 3442	1-54	3N 140	0-89	40411	2-44	BCY 71	0-20	BFY 52	0-27
2N 3702	0-17	3N 141	0-79	40595	0-80				

TERMS: C.W.O. 15P POST & PACKING. 12½% VAT.
8% VAT ON CMOS. Send SAE for comprehensive list

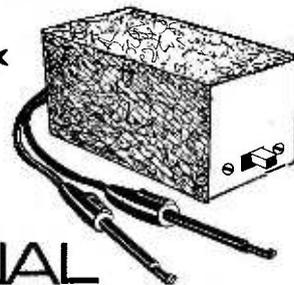
ROWNSGEM LTD.

Rosebank Parade, Plough Road, Yateley, Camberley, Surrey.
Phone No. 0252 871388
The Professional Organisation for the 'Hobbyist'

DORAM kits

DORAM KITS CONTAIN EVERYTHING DOWN TO THE LAST NUT!

£2.20 +S



IC SIGNAL INJECTOR

For audio fault finding, this battery operated unit may be simply attached at any point in the circuit to provide a 1KHz square wave of pre-settable amplitude, up to 5V. Using only one IC the unit, complete with battery, is incorporated in a case only 50 x 50mm x 100mm long with probes to provide connection to circuit. Easy to construct for only

£2.20 + S VAT (Order code 991-877)

Overseas orders—add 15% for p & p. All items offered for sale subject to the Terms of Business as appears in Doram Edition 3 catalogue, price 60p. The Doram Kit brochure is also available, price 25p. Combined price only 70p which also entitles you to 2 x 25p vouchers each one usable on an order placed to the value of £5.00 or more (ex VAT).

DORAM ELECTRONICS LTD, P.O. BOX TR8 LEEDS LS12 2UF

An Electrocomponents Group Company

CASIO

fx-201P (Illus.)
10 digit or 8 digit, 2 Exp.
127 Steps, 10 Inde.
mems, cos, sin, tan.
All log functions
Degree Rad, Un-
conditional jump
and manual jump
as well as indirect
address, subroutine
etc. The programme
function allows you
to handle any type
of calc. under any
condition. ***£49.95**



fx-102. The world's first fractional
calculator. 10 digits or 8 plus 2 Exp.
sin, cos, tan, Deg. rad. (exp. 10 ± 99).
Trig. Inverse common & Natural logs.
Reciprocals. Sexagesimal, Pi entry.
Statistical calcs. Incl. 2 kinds of
Standard deviation and other appli-
cations. ***£19.95**

fx-19. 8 digits or 6 plus 2 Exp. Trig.
Inverse trig. All log functions. Sq
roots, Reciprocals. Sexagesimal/
Decimal conversions. 2 kinds of
Standard Deviation and other appli-
cations. ***£16.95**

AL8 A-dig. Fractional Calcs. standard
deviations remainder from division.
Time calcs. 2 mem. facs. **£13.95**
 $\sqrt{\quad}$, %.

TEXAS

SR56 (Illus.)
100 Step program-
mable. 10 digit,
2 Exp. 10 Inde mem-
ories, all log trig
and Stat functions.
Can be programmed
for maths, elec-
tronic engineering,
statistical, financial
and navigation. **£57.95(R)**



SR52. 224 programme steps. 20 inde-
pendent memories. 9 level parenthesis.
Card programmable. Supplied with 20
blank magnetic cards and prog. manual
(R)£199.00

Any of the following pre-programme
manuals: 1. Statistics. 2. Electrical
Engineering. 3. Mathematics. 4. Finance.
ONLY £25 each

SR51. 10 digit, 2 Exp. Rechargeable. All
log and trigs, Hyperbolic x to the root
of y, Rad & Deg. Factorial, Mem. 3
Inde. mems. Linear regression, Mean,
variance, standard deviation, Permuta-
tion, Perms. Random number generation
+ 20 basic converts., and their inverse.
(R)£47.95

T130. 48 functions plus Algebraic
operating system. 15 seals parenthesis.
Constant, logs, powers, reciprocals.
Sci notation. Log, trig, deg rad, mem,
step function. **£15.95. Charger £7.95**

NOVUS

4640 (Illus.)
10 digit, 2 Exp. 54 functions. 4-level
roll stack. 3 Fully addressable memories.
Logs, Trigs, Stat and Metric conversions
etc. **(R)£42.95**

4650. 8 digit, 2 Exp. Algebraic logic.
2-level parentheses. Full mem. Address-
able. Trig, sin, cos, tan and inverse
trig functions. Deg rad. Reciprocal,
Sq root. Powers and Pi entry. Mem Ex
and Register Ex **(R)£27.50**

4525. 8 + 2 Exp: 100 step prog. R.P.N
Full log and trig. XY Exchange. Mem.;
4 roll stack, skip, delete. Additiona
progs within the 100 step **(R)£34.95**

4515. 100 step prog version **(R)£31.95**

6035. 100-step programmable Statistician.
Rechargeable. **(R)£34.95**

6025. Rechargeable. Financier 100-step
programmable **(R)£34.95**

4510. 8 digits. 3 level stack. All trig &
log functions. $\sqrt{\quad}$, π . Reciprocal
Memory, etc. **£12.95***

6030. Statistician. **£15.95***

6010. Metric. **£15.95***

The ZYCON range of Quality Electronic Watches

L.C.D.

KLC3
L.C.D. Constant display
Shows Hrs, Mins &
pulsating secs. Chrome
finish with Stainless
Steel back and FREE
Adjustable S/Steel
bracelet. **£24.50**
Gold Plate **£26.45**

KLC9
Constantly shows hrs, mins
& Pulsating secs. Press
command button for mth
& date, press again for
mins & secs. May be set
to alternate hr & mins to
mth & date every 2 secs.
resets to time. 4 yr cal.
'Nite Lite' **£37.90**
Gold Plate **£42.40**.
FREE matching bracelets
with each.

KLCS
U.S.A. MODULE
Shows hrs, mins &
pulsating secs. Press
command button for mth
& date. Press again for
secs readout. Setting for
alternating hrs & mins to
mth & date every 2 secs.
Auto-time reset. 4 yr
calendar. 'Nite-lite' .
FREE matching S/Steel
bracelet **£39.95**

KLCS
U.S.A. MODULE
Shows hrs, mins &
pulsating secs. Press
command button for mth
& date. Press again for
secs readout. Setting for
alternating hrs & mins to
mth & date every 2 secs.
Auto-time reset. 4 yr
calendar. 'Nite-lite' .
FREE matching S/Steel
bracelet **£39.95**



L.E.D.

KED5
5-Functions. Shows Hrs, Mins.
Secs, Mth & Dato. 4-Yr
calendar. Beautifully
finished with S/steel back
& FREE Leatherette
Strap. **£19.95**
Gold Plate **£22.95**

KED6 A fantastic 6-Functions—
window display shows
Hrs, Mins, Secs, Mth &
Date. Day of week in
letters. Single button.
Auto-hold & Fade-out.
4 Yr calendar. Case in
Heavy Rhodium on Brass
+ S/steel back. FREE
matching S/steel
adjustable bracelet.
£29.95 Gold Plate **£33.90**

KED6 PLUS
Month & Day of the Week
in Letters! Shows Hrs,
Mins, Secs, Date, Mth &
Date, Day of Week, Auto
4-Yr calendar, A.M./P.M.
Set/Indicate. One of the
most sophisticated
watches at this price.
Accurate to within a few
secs a year. Finished in
Satin Stainless Steel with
FREE matching Steel
bracelet. Trimest watch in the world.
£37.50 ONLY Gold Plate **£40.50**



EXCLUSIVE! Digital Alarm Watch

Just arrived and only
from us! Shows Hrs,
Mins, Secs, Mth, Date
& Day! Advance beep
as a reminder then
PULSATING BLEEP for
15 secs unless stopped
when it will beep 5 mins
later as a further reminder
AM/PM feature. Simple to set. Alarm-
set check. Single command button for
all time functions. **NO MORE PARK-
ING FEES!** Solid Stainless Steel
throughout with matching bracelet.
ONLY £38.90 + £1.50 Ins. & P&P.



LADIES DIGITAL THE IDEAL PRESENT!

An elegant 6-function
watch. Shows Hrs,
Mins, Secs, Mth,
Date, Day! She'll love
this piece of
miniaturised elec-
tronic wizardry! Gold
Plate or with stylised
Chrome Bezel, each
with matching
bracelet.
GOLD PLATE
£39.95
S/Steel **£36.95**
+ £1.50 Ins. P&P



AT LAST—THEY'VE ARRIVED! SOLAR WATCHES AND YOU HAVE A CHOICE OF TWO!

Restrained elegance by ZYCON
Ultra thin dress watch exclusive to us. In 20 micron **GOLD PLATE!**
Shows Hours, Minutes, Seconds and Date. Backlight for viewing
in darkness. This is the nearest Solar Watch we have seen!
With flexible, adjustable Gold Plate bracelet.

AND FOR THE SPORTSMAN . . .

A really rugged watch in solid Stainless
Steel with Stainless Steel adjustable band.
Shows Hours, Minutes, Seconds, Month and
Date. Ideal for wearing when indulging in
outdoor activities.

£120.00
£115.00 £1.50 Ins. & P&P + £1.50 Ins. & P&P
ALL WATCHES COME IN FREE PRESENTATION BOX
ALL ZYCON WATCHES CARRY OUR 'NO
QUIBBLE' 1 YEAR GUARANTEE

ROCKWELL

64RD (Illus.) 12-digit
or 8-digit + 2 Exp.
Additional to the
44RD. Polar rec.
co-ordinates. Log
Trig, rad or grad.
£24.50*
44RD. 9-digit or
5-digit + 2 Exp.
Green Display. Store.
Similar to the 63R
less factorial. **£19.50***

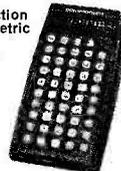


24K. Stainless Steel Slimline. Green
display. In beautiful leatherette wallet
to hold pen, note pad and credit cards
(all included). Full memory. Click
buttons. Rechargeable. **(R)£21.95**

**ALL ITEMS CARRY 1 YR. GUAR.
PRICES INCLUDE V.A.T.**
* Free B.S.I. adaptor. (R) Free recharger

CBM

4190R (Illus.)
10-digit, 2 Exp. 90 function
pre-programmed. Metric
conversions. Extra
functions to the 4148R:
Perms and combina-
tions. Gamma. Pois-
son and Binomial
distributions. factor-
ial, complex num-
bers, hyperbolic
functions, linear
regression and inte-
gration of $Y = f(x)$. **(R)£36.95**



7919D. 8-digit or 5-digit + 2 Exp. Full
trig and log functions. Sq root. Reci-
procal Y^x , X^y , π . Register exchange.
Memory plus. Store recall. Sign change.
Algebraic logic **£10.95***

4148. 10-digit + 2 Exp. Full log and
trig funct. X^y , Reciprocal, π , root of y.
Polar rectangular co-ordinates. 2-store
mem. Mean and Standard deviation. **(R)£26.95**

1800. As 4148 but Green display and
Bat operation. **£20.95***

SINCLAIR

CAMBRIDGE SCIENTIFIC

5-digit + 2 Exp
C & CE key • sin
cos • tan • arcsin
• arccos and tan
• reciprocal • E to
the X • natural log
• antilog • memory
+ • memory
• memory exchange
• memory cancel
• EE exponent
• change notation
• PLUS a degree
radian switch.



ONLY £8.95

OXFORD 300—
Larger version of above. **£13.90***

DECIMO DIGITAL CLOCK RADIO



**LARGE
DIGITAL
READOUT**

This is the most unique clock/radio in
the country today having a soft, $\frac{1}{2}$ " high
orange-glow digital readout which is
completely silent and non-pulsating.
In a beautifully styled enclosure with
up-to-date VHF/MW radio. You can
awake to soft music or alarm—and if
you want up to ten minutes more—just
press the drowse button. Automatic
80 minute 'sleep' button in case you
drop off while the radio is on!

OUR PRICE £33.95 Plus
£1 P&P

ORDER FORM

PHONE CALLS AND PERSONAL CALLERS WELCOME MONS TO
THURS BETWEEN 2 & 5 p.m. 01-453 4755. SUNDAYS 10 a.m. to 1 p.m.
To: BARCLAY ELECTRONICS Dept. 12PW,
1115 FINCHLEY ROAD, TEMPLE FORTUNE, LONDON N.W.11

Please send me.....
with/without optional mains adaptor. I enclose cheque/money order total
value £.....Please add 55p to all items to cover p. & p.

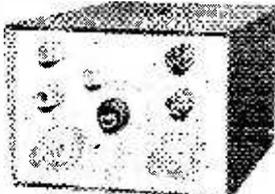
NAME

ADDRESS

PHONE BARCLAYCARD OR
ACCESS ORDERS.



INVERTORS



240v-50Hz from your 12v car battery
 25 watt-£4.75 300 watt (12v)-£33.08
 40 watt-£8.27 400 watt (24v)-£39.05
 75 watt-£12.03 500 watt (24v)-£48.18
 150 watt-£21.27 1 Kw (50v)-£127.00
 300 watt (24v)-£26.45 1.5 Kw (110v)-£140.80
 All above invertors are in kit form but may be purchased built up in metal case and ready for use. Price list sent on receipt of s.a.e. Prices include p. and p.

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) £24.50 plus £1.70 p.p.

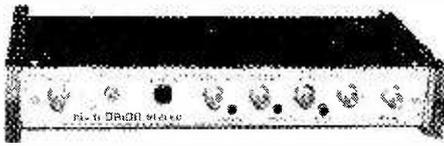
DIGITAL WATCH

FOUR FUNCTION DIGITAL WATCH FOR ONLY £16 with 1 Year Guarantee
 HOURS . MINS. . SECONDS . DATE
 American Design, UK Manufacture.

TRANSFORMERS AND COILS

Both high volume and small order capacity available.
 Special offer. Miniature mains transformer 6-0-6v-6VA. 85p + 10p p. & p.

P.E. ORION STEREO AMPLIFIER & TUNER



20 + 20 Watts r.m.s. into 8 ohm load. Distortion less than 0.01% 100Hz-10kHz. Frequency response ± 1 dB 20 Hz to 20kHz. Hum level virtually nil with volume 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 and knobs £48.60 inc. VAT and p. & p.

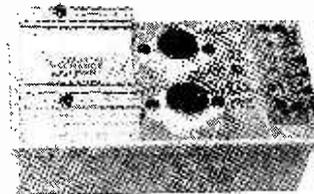
The bookend case, I.C's and semiconductors, P.C. board, Transformer, etc. may be purchased separately if desired. Send S.A.E. for further information.

P.E. ORION TUNER UNIT

PARTS MAY BE PURCHASED AS FULL KIT OR SEPARATE ITEMS. SEND S.A.E. FOR DETAILS.

N.B.—DELIVERIES ON ALL ITEMS MAY TAKE UP TO 28 DAYS, DEPENDING ON AVAILABILITY AND DEMAND. CASH IN REGISTERED ENVELOPE OR POSTAL ORDERS CAN REDUCE TIME by NOT HAVING TO CLEAR CHEQUES

ASTRO IGNITION

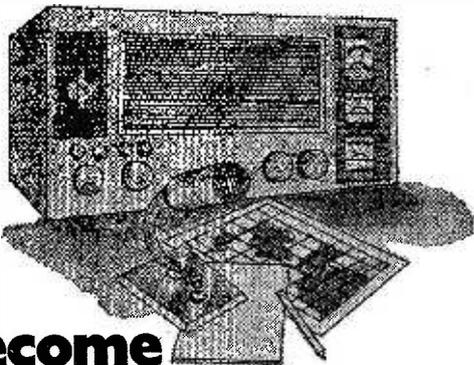


ASTRO IGNITION SYSTEM

Complete kit of parts for this proven and tested system £10.45 inc. VAT
 Ready built with only two connections to alter £13.75 inc. 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 ON ALL PRODUCTS

ASTRO ELECTRONICS
 Springbank Road, West Park
 CHESTERFIELD. 31475



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.

WAA
WK17

Brochure, without obligation to:
BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL,
 P.O. Box 156, Jersey, Channel Islands.

Free!

NAME _____

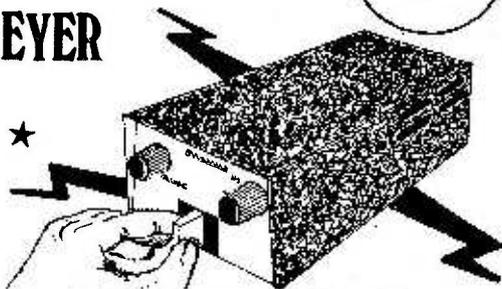
ADDRESS _____ (Block caps please)

DORAM kits

DORAM KITS CONTAIN EVERYTHING DOWN TO THE LAST NUT!

CMOS MORSE KEYER

£9.45
+H



Fully electronic automatic morse keyer giving perfectly spaced dots and dashes of correct duration. Sidetone or silent operation with variable speed to suit novice or expert. Very low current drain on internal battery. Single paddle operation; suitable for most transmitters with a keying facility. Give your morse that precision quality.

£9.45 + H VAT (Order 997-049)

As featured in Sept '76 edition of RAD. COMM.

Overseas orders—add 15% for p & p. All items offered for sale subject to the Terms of Business as appears in Doram Edition 3 catalogue, price 60p. The Doram Kit brochure is also available, price 25p. Combined price only 70p which also entitles you to 2 x 25p vouchers each one usable on an order placed to the value of £5.00 or more (ex VAT).

DORAM ELECTRONICS LTD. P.O. BOX TR8 LEEDS LS12 2UF

An Electrocomponents Group Company

CRESCENT RADIO LTD.

164-166 HIGH ROAD, LONDON N22 6EJ
(also) 13 SOUTH MALL, EDMONTON, N.9
MAIL ORDER DEPT.
1 ST. MICHAELS TERRACE, WOOD GREEN,
LONDON N22 4SJ Phone 888 4474

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 mA Full Scale
ME10 = 0 to 5 mA Full Scale
ME11 = 0 to 10 mA Full Scale
ME12 = 0 to 50 mA Full Scale
ME13 = 0 to 100 mA Full Scale
ME14 = 0 to 500 mA Full Scale
ME15 = 0 to 1 amp Full Scale
ME16 = 0 to 50 volts
ME17 = 0 to 300 volts
ME18 = "S" Meter
ME19 = "VU" Meter



MULTI-METER MM12

50,000 o.p.v.
If you need a good instrument for your work/hobby and you're not prepared to settle for a small scale and poor ranges, then read the specifications for the MM12, and send for one!

AC volts: 0 to 1.5, to 0/500 in 10 ranges. DC volts: 0 to 0.5, to 0/500 in 12 ranges. DC current: 0 to 25 μ A, to 0/10 amps 10 ranges. Resistance: 0 to 100 ohms, to 0/16 meg ohms in 4 ranges. Decibels: -20 to -62 db in 10 ranges. Size: 64 x 41 x 24mm. Price £19.50 + 8% VAT.

OUR PRICE £9.50 + 8%

"100W" 100 WATT AMPLIFIER

All built and tested, mounted on a plain aluminum chassis which measures 18" x 9 1/2" x 4" and which you can mount into a cabinet of your choice. Four controlled inputs, master volume, treble, middle and bass controls. 5fc protected output. 100 watts clean into 8ohm L/S. Ideal for disco, music groups, P.A. and clubs. A bargain at £42 + £1 carr. + 8% VAT.

AIRCRAFT BAND CONVERTER

A most popular unit providing instant conversion of any medium wave radio to cover the fascinating V.H.F. aircraft band. Speed: 9 volts. Used with any AM or FM radio without requiring to be connected. Tunes: 110-135 MHz. Size: 100 x 70 x 40mm. Our price £5.60 + 12% VAT.



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). OUR PRICE 50p. + 8%

POWER SUPPLY UNITS

+ 8%



PPI switched 3, 4, 6, 7, 9 and 12 volts at 500 mA, with on/off switch and pilot light. Size: 130mm x 55mm x 75mm.

ONLY £4.50

TI MULTI-METER

Ideal tester for everybody interested in electronics. Weighing less than 100 grammes and only 60 x 24 x 90 mm. Ranges: A.C. volts: 0-10V, 50V, 250V, 1,000V. D.C. volts: 0-10V, 50V, 250V, 1,000V. D.C. current: 0-1mA, 0-100mA. Resistance: 0-150 kohm. Price £4.75 + 8% VAT.

FERRIC CHLORIDE

Anhydrous ferric chloride in double sealed one pound poly packs. Our Price 65p + P/P + VAT @ 8% per lb.

3 KILOWATTS 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%

MS CONDENSER MICROPHONES

Cardioid and omni-directional 600 ohm and 50K ohm impedance. 20-18,000 Hz. On/off switch and wind shield. Complete with stand adaptor. Packed in presentation box. Price £18.50 + 12% VAT.



3 WAY MULTIPLE AC ADAPTOR

This compact adaptor enables a large range of battery powered radios, and calculators to be more economically operated off the mains (220-240V A.C.) Instantly switchable for 6, 7.5 or 9 Volts, current rating is 250mA. A polarity reversing complex is incorporated into the 2 metre lead which is terminated by a unique 4 way plug offering connections by 2-1 and 2-5mm sockets, 2-5 and 3-6mm plug. The sealed moulded unit is fitted with a 2 pin 5 amp mains plug and measures 47 x 35 x 63mm. Nominal weight: 0.22 kg. ONLY £2.50 + 8%.

TE-CLIP CONDENSER MICROPHONE

Omni-Directional 600 ohm 40-15,000Hz. Extra long lead. Ideal for stage work, conferences, etc. Price £3.50 + 12% VAT.



LOW NOISE LOW PRICE CASSETTES + 8%
Good quality tape in well made screw type cassettes. Presented in single plastic cases.
C80 = 33p C90 = 48p C120 = 60p
10% Discount on ten or more cassettes of one type

LOUDSPEAKERS + 12 1/2%

2 1/2" 8 ohm 60p
2 1/2" 40 ohm 60p
2 1/2" 80 ohm 60p
5" 8 ohm ceramic £1.25



A19 STEREO PRE-AMPLIFIER

Using standard phono plug connections. Input impedance: 50,000 ohms. Maximum input: 30 mv. Maximum output: 1.8v (at 1% distortion). Gain: 10mv input, 0.5v output. Frequency response: 20-20,000 Hz. S/N ratio: over 60 dB. Power supply: 240V AC. Dimensions: 101 x 63 x 40mm. Our Price £5.50 + 12 1/2% VAT.

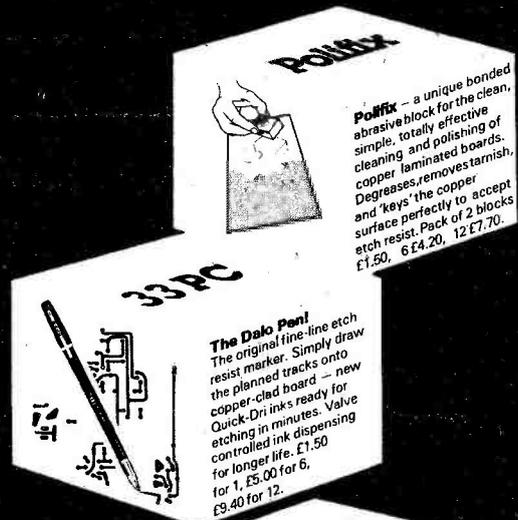
EFFECTS PROJECTOR "150"

No Disco should be without our new effects projector, we believe that this is the most versatile machine for projecting coloured images to supplement your music. Speed:—Volts = 220/240 AC 50Hz. Lamp = A1/187 150 watts. Standard Lens = 60 mm.

A sturdy metal construction and takes a range of lenses and accessories. Comes complete with 6" liquid wheel and ready to use. A bargain at £27 + VAT 8%.

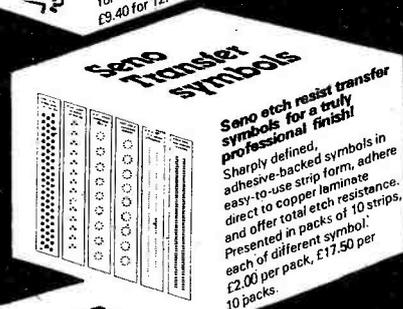


The easy way to a PCB... ...the Seno 33 system!

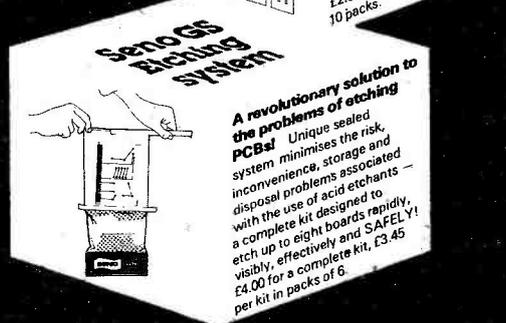


Polifix — a unique bonded abrasive block for the clean, simple, totally effective cleaning and polishing of copper laminated boards. Degreases/removes tarnish, and 'keys' the copper surface perfectly to accept etch resist. Pack of 2 blocks for 1, £5.00 for 6, £9.40 for 12.

The Dako Pen!
The original fine-line etch resist marker. Simply draw the planned tracks onto copper-clad board — new Quick-Dri inks ready for etching in minutes. Valve controlled ink dispensing for longer life. £1.50 for 1, £5.00 for 6, £9.40 for 12.



Seno etch resist transfer symbols for a truly professional finish!
Sharply defined, adhesive-backed symbols in easy-to-use strip form, adhere direct to copper laminate and offer total etch resistance. Presented in packs of 10 strips, each of different symbol. £2.00 per pack, £17.50 per 10 packs.



A revolutionary solution to the problems of etching PCBs!
Unique sealed system minimises the risk, inconvenience, storage and disposal problems associated with the use of acid etchants — a complete kit designed to etch up to eight boards rapidly, visibly, effectively and SAFELY! £4.00 for a complete kit, £3.45 per kit in packs of 6.

Seno 33 — The Laboratory in a box

From your usual component supplier or direct from:

DECON LABORATORIES LTD.
Ellen Street, Portlodge,
Brighton BN4 1EQ
Telephone: (0273) 414371
Telex: IDACON BRIGHTON 874.43

All prices post & VAT inclusive. Data sheets free of charge.

BI-PAK High quality audio



STEREO FM TUNER

Fitted with Phase Lock-loop

- ★ FET Input Stage
- ★ VARI-CAP diode tuning
- ★ Switched AFC
- ★ Multi turn pre-sets
- ★ LED Stereo Indicator

Typical Specification:
 Sensitivity 3µ volts
 Stereo separation 30db
 Supply required 20-30v
 at 90 Ma max.

OUR PRICE ONLY

£20.45

The 450 Tuner provides instant programme selection at the touch of a button ensuring accurate tuning of 4 pre-selected stations, any of which may be altered as often as you choose, by simply changing the settings of the pre-set controls.

Used with your existing audio equipment or with the BI-KITS STEREO 30 or the MK60 Kit etc. Alternatively the PS12 can be used if no suitable supply is available, together with the Transformer T461.

The S450 is supplied fully built, tested and aligned. The unit is easily installed using the simple instructions supplied.

STEREO PRE-AMPLIFIER PA 100



A top quality stereo pre-amplifier and tone control unit. The six push-button selector switch provides a choice of inputs together with two really effective filters for high and low frequencies, plus tape output.

Frequency Response + 1dB
 20Hz-20KHz.

- Sensitivity of inputs:
1. Tape input 100mV into 100K ohms
 2. Radio Tuner 100mV into 100K ohms
 3. Magnetic P.U. 3mV into 50K ohms

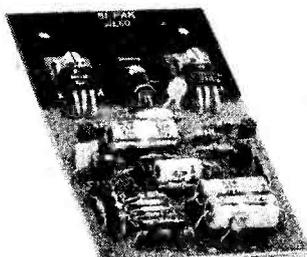
P.U. Input equalises to R1AA curve within 1dB from 20Hz to 20KHz. Supply 20-35V at 20mA. Dimensions—295mm x 89mm x 35mm.

£13.75 p & p
 45p

MK60 AUDIO KIT:
 Comprising: 2 x AL60's 1 x SPM80, 1 x BTM80, 1 x PA100, 1 front panel and knobs. 1 Kit of parts to include on/off switch, neon indicator, stereo headphone sockets plus instruction booklet. **COMPLETE PRICE £29.95 plus 62p postage.**

TEAK 60 AUDIO KIT:
 Comprising: Teak veneered cabinet size 163" x 113" x 33", other parts include aluminium chassis, heatsink and front panel bracket plus back panel and appropriate sockets etc. **KIT PRICE £10.70 plus 62p postage.**

VAT ADD 12½%



AL 60

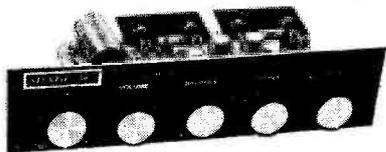
25 Watts (RMS)

- Max Heat Sink temp. 90C.
- Frequency response 20Hz.
- Distortion better than 0.1 at 1kHz.
- Supply voltage 15-50v.
- Thermal Feedback.
- Latest Design Improvements.
- Load—3,4,5, or 16ohms.
- Signal to noise ratio 80db.
- Overall size 63mm. 13mm.

Especially designed to a strict specification. Only the finest components have been used and the latest solid-state circuitry incorporated in this powerful little amplifier which should satisfy the most critical A.F. enthusiast.

ONLY **£4.35**

STEREO 30 COMPLETE AUDIO CHASSIS



7 + 7 WATTS R.M.S.

The Stereo 30 comprises a complete stereo pre-amplifier, power amplifiers and power supply. This, with only the addition of a transformer or overwind will produce a high quality audio unit suitable for use with a wide range of inputs i.e. high quality ceramic pick-up, stereo tuner, stereo tape deck etc. Simple to install, capable of producing really first class results, this unit is supplied with full instructions, black front panel, knobs, mains switch, fuse and fuse holder and universal mounting brackets enabling it to be installed in a record plinth, cabinets of your own construction or the cabinet FI performance with a minimum of installation difficulty (can be installed in 30 mins.).

TRANSFORMER £2.45 plus 62p p & p

TEAK CASE £5.25 plus 62p p & p.

£16.25 P & P 45p.

Stabilised Power Supply Type SPM80

SPM80 is especially designed to power 2 of the AL60 Amplifiers, up to 15 watts (r.m.s.) per channel simultaneously. With the addition of the Mains Transformer BMT80, the unit will provide outputs of up to 1.5A at 35V. Size: 63mm, 105mm, 30mm. Incorporating short circuit protection.

INPUT VOLTAGE 33-40V. A.C.
OUTPUT VOLTAGE 33V. D.C. Nominal
OUTPUT CURRENT 10mA-1.5 amps **£3.75**
OVERLOAD CURRENT 1.7 amps approx.
DIMENSIONS 105mm x 63mm x 30mm
TRANSFORMER BMT80 £2.60 + 62p. postage

equipment mono and other modules for Stereo

NOW BI-PAK BRINGS YOU— The AL80

35^{RMS} w power Amp!

**ONLY
£6.95**

+ 8% VAT

A High Fidelity Power Amplifier with a maximum Power Output of 35 watt R.M.S., which has a maximum operating voltage of 60v. A MUST for all HI-FI users.

Maximum supply voltage	15-60v
Power output for 2% THD	35 watts R.M.S.
Harmonic distortion	0.1%
Load impedance	3-8-16 ohm
Input impedance	50K ohm
Frequency response +3dB	20Hz-40KHz
Sensitivity for 25 watts O/P	280mV R.M.S.
Max. Heat sink temperature	90°C
Dimensions	102mm x 64mm x 15mm
Mounting	2, 4BA fixing holes in heat sink
Fuse requirements	1.5A



MPA 30



Enjoy the quality of a magnetic cartridge with your existing ceramic equipment using the new Bi-Pak M.P.A. 30 which is a high quality pre-amplifier enabling magnetic cartridges to be used where facilities exist for the use of ceramic cartridges only. Used in conjunction are 4 low noise high gain silicon transistors. It is provided with a standard DIN input socket for ease of connection. Supplied with full, easy-to-follow instructions.

£2.85

**VAT
ADD
12½%**

POSTAGE & PACKING
Postage & Packing add 25p unless otherwise shown. Add extra for airmail. Min. £1.00

AL 20-30 AUDIO AMPLIFIER MODULES



The AL20 and AL30 units are similar in their appearance and in their general specification. However, careful selection of the plastic power devices has resulted in a range of output powers from 5 to 10 watts R.M.S. The versatility of their design makes them ideal for use in record players, tape recorders, stereo amplifiers and cassette and cartridge tape players in the home. Harmonic Distortion $P_o = 3$ watts $f = 0-25\%$ Load Impedance 8-16 ohm

Frequency response $\pm 3dB$ $P_o = 2$ watts 50Hz-25KHz.
Sensitivity for Rated O/P— $V_s = 25v$. $RL = 80$ ohm.
 $f = 1KHz$ 76mV. R.M.S. Size: 75mm x 63mm x 25mm.

AL20: 5w **£2.95** R.M.S. AL30: 10w **£3.25** R.M.S.

AND for those who need more P-O-W-E-R

AL250

125^{RMS} w



POWER AMP

Specially designed for use in—
Disco Units, P.A. Systems, high power
Hi-Fi, Sound reinforcement systems

SPECIFICATION:

Output Power: 125 watt RMS Continuous	Total harmonic distortion 50 watts into 4 ohms: 0.1% 50 watts into 8 ohms: 0.06%
Operating voltage: 50-80	S/N ratio: better than 80dBs
Loads: 4-16 ohms	Damping factor, 8 ohms: 65
Frequency response: 25Hz- 20kHz Measured at 100 watts	Semiconductor complement: 13 transistors 5 diodes
Sensitivity for 100 watts output at 1kHz: 450mV	Overall size: Heatsink width 190mm, length 205mm, height 40mm
Input impedance: 33K ohms	

ONLY £15.95 +8% VAT

**NEW PA12
£6.70**

NEW PA12 Stereo Pre-Amplifier completely redesigned for use with AL20-30 Amplifier Modules. Features include on/off volume, Balance, Bass and Treble controls. Complete with tape output.
Frequency Response 20Hz-20KHz (-3dB)
Bass and Treble range $\pm 12dB$
Input impedance 1 meg ohm
Input Sensitivity 300mV
Supply requirements 24v. 5mA
Size 152mm x 84mm x 33mm

PS12 Power supply for AL20-30, PA12, S450 etc. Input voltage 15-20v A.C. Output voltage 22-30v D.C. Output Current 800 mA Max. Size 60mm x 43mm x 26mm. **£1.30**

Transformer T538 **£2.30**

BI-PAK

P.O. BOX 6 WARE HERTS
COMPONENT SHOP: 18 BALDOCK STREET, WARE. TEL: 61 593

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 at "O" & "A" levels	Farming	Sales
Accountancy	Heating	Storekeeping
Air Conditioning Building	Industrial	Work Study
	Management	
	Mechanical	

POST OR PHONE TODAY FOR FREE BOOKLET.

ICS

To: International Correspondence Schools

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

Subject of Interest

Name

Address

Telephone Number

complete DIGITAL CLOCK KITS TEAK CASES



prompt order despatch

NON-ALARM
£10-65

+ VAT £0-85

ALARM

£13-43

+ VAT £1-07

including P & P

"DELTA"

GENUINE TEAK OR PERSPEX CASE

DELTA DATA: 4 Radiant Red 1/2 inch high LEDs. 12hr display with AM/PM indication. Beautiful Burma Teak Case or Pretty Perspex in White, Black, Blue, Red, Green. Power failure is indicated by flashing display.

MODULES: Kits can be bought without case: Non Alarm £9-00 Alarm £12-50 Inclusive.

READY BUILT: Buy a working tested module and fit your own case. Non Alarm £9-50. Alarm £13-00. Or put it with our case parts @ £4-32 and save on complete clock price. Complete Clock ready built. 2 yr guarantee. Non Alarm £13-50 Alarm £18-50.

ALARM FEATURES: Pulsed tone. Tilt operated 10 minute 'Snooze' period. Single switch setting Optional extra mercury switch (45p) allows Alarm reset by tilting clock. Digit brightness is automatically controlled to suit lighting level.

"ALPHA" CHRISTMAS OFFER

4 Glowing Green 1/2" high digits 12 or 24 hour. Non Alarm. **£11-00 inc.** Built & Tested module plus perspex case.

NOVUS CALCULATORS: 650: £5-40 4510: £16-20
850: £6-75 6030: £21-60

Send payment with order. SAE for complete range of clocks, calculators and components.

PULSE ELECTRONICS LTD

DEPT. PW4, 202 SHEFFORD ROAD,
CLIFTON, SHEFFORD, BEDS.
Telephone Hitchin (0462) 814477

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

ANTEX SOLDERING IRONS AND ACCESSORIES

15W 'C' Miniature Irons complete with 3/32" bit	£3-20	Spare Elements	
15W 'CCN' Low Leakage Irons complete with 3/32" bit	£3-45	'G' £1-50	'CCN' £1-85
18W 'G' Miniature Irons complete with 3/32" bit	£3-25	'C' £1-85	'X25' £1-60
25W 'X25' Low Leakage Irons complete with 1/8" bit	£2-90	Spare Bits (slide on & off) 3/32", 1/8", 3/16" each	£0-50
'SKI' Soldering Kits Fitted with 'C' iron, 2 spare bits 2.3 and 4mm, heat sink, reel of solder. Booklet 'How to solder' gives useful tips	£4-40	(N.B. state type of iron)	
'MLX' 12V, 25W Iron Will work off car-type battery. Useful for repairs on motor cars, boats, etc. Complete with 1/8" bit, 4mm lead, crocodile clips, walter, 'How to solder'	£4-10	'X25' De-soldering bits Dual-in-line, 14A, 14B, each	£3-95
		'ST3' Stands—for all models High grade insulated base—chromium plated steel spring. Replaceable cleaning sponges, space for spare bits	£1-45
		25W De-soldering Irons	£9-50
		18W De-soldering Irons	£2-25
		Foot pump	£0-45
		SOLDER in handy dispenser	£0-45
		WIRE STRIPPERS/CUTTERS Bib BB, B gauge selector, automatic opening, easy grip handles	£0-85

OVER 2,000 ELECTRONIC COMPONENTS IN A

BIG NEW FREE
100 PAGE CATALOGUE

YOURS BY POSTING TODAY

Please send me the 100 page Tandy catalogue

Name

Address

Postcode

TANDY

Nationwide supermarket of sound!

Tandy Corporation (Branch UK), Bilston Road, Wednesbury, W. Midlands WS10 7JN.

Practical Wireless, January 1977

Get a great deal from Marshall's

A. Marshall (London) Ltd. Dept: PW

40-42 Cricklewood Broadway London NW23ET 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

Catalogue price 55p post paid
(30p to callers)

Call in and see us 9-5.30 Mon-Fri 9-5.00 Sat

WE ARE NOW AT NEWCASTLE-ON-TYNE
Marshall Aitken Ltd, 35 High Bridge Tel: 0632 26729

Top 200 IC's TTL, CMOS & Linears

CA3020A £1.45	CD4049	56p	NE555V	48p	SN7447	89p	SN74154	£1.48	
CA3028A £1.85	CD4050	56p	NE556	£1.30	SN7448	89p	SN74157	78p	
CA3035 £1.35	CD4510	£1.54	NE560	£4.48	SN7450	21p	SN74160	£1.20	
CA3046	73p	CD4511	£1.54	NE565	£1.30	SN7451	21p	SN74161	£1.20
CA3048	£2.15	CD4516	£1.54	LS141A	£2.35	SN7453	21p	SN74162	£1.20
CA3052	£1.62	CD4518	£1.38	LS10C	£2.35	SN7454	21p	SN74163	£1.20
CA3089E	£2.00	CD4520	£1.38	LS161C	£2.35	SN7460	21p	SN74164	98p
CA3090Q	£4.25	LM301AH	47p	LS1612C	£2.35	SN7470	35p	SN74165	98p
CA3130	88p	LM308N	£1.17	LS1620C	£2.35	SN7472	29p	SN74167	£4.20
CD4000	20p	LM309K	£1.80	LS1621C	£2.35	SN7453	33p	SN74174	98p
CD4001	20p	LM380	98p	LS1623C	£2.75	SN7474	33p	SN74175	98p
CD4002	20p	LM381AN	£2.07	LS1640C	£4.00	SN7475	46p	SN74176	98p
CD4006	£1.16	LM702C	75p	SN7400	21p	SN7476	39p	SN74180	£2.96
CD4007	20p	LM709	SN7401	21p	SN7480	55p	SN74181	£2.85	
CD4008	97p	TO99	40p	SN7402	21p	SN7481	£1.25	SN74190	£1.48
CD4009	57p	8D1L	40p	SN7403	26p	SN7482	77p	SN74191	£1.27
CD4010	57p	14D1L	40p	SN7404	26p	SN7483	£1.04	SN74192	£1.27
CD4012	20p	LM710	45p	SN7405	26p	SN7484	£1.00	SN74193	£1.27
CD4012	20p	LM723C	60p	SN7406	59p	SN7485	£1.48	SN74196	£1.27
CD4013	59p	LM741C	SN7407	59p	SN7486	32p	SN74197	90p	
CD4014	£1.01	TO99	38p	SN7408	22p	SN7490	49p	SN74198	90p
CD4015	£1.01	8D1L	38p	SN7409	22p	SN7491	77p	SN74199	£2.28
CD4016	56p	14D1L	40p	SN7410	21p	SN7492	49p	SN76003N	£2.28
CD4017	£1.01	LM747	78p	SN7412	49p	SN7493	49p	SN76013N	£1.90
CD4018	£1.01	LM748	SN7413	51p	SN7494	85p	SN76023N	£1.91	
CD4019	57p	8D1L	44p	SN7416	46p	SN7495	61p	SN76033N	£2.50
CD4020	£1.12	14D1L	41p	SN7417	46p	SN7496	88p	TAA263	£1.25
CD4021	£1.01	LM3900N	55p	SN7420	21p	SN74100	£1.23	TAA300	£2.67
CD4022	97p	LM7805P	£1.36	SN7423	30p	SN74107	33p	TAA30A	£2.48
CD4023	20p	LM7812P	£1.39	SN7425	30p	SN74118	99p	TAA550	40p
CD4024	79p	LM7815P	£1.39	SN7427	30p	SN74119	£2.02	TAA611C	£2.25
CD4025	20p	LM7824P	£1.39	SN7430	31p	SN74121	39p	TAA621	£2.15
CD4027	56p	MCI 1303L	£1.44	SN7432	20p	SN74122	54p	TAA661B	£1.32
CD4028	91p	MCI 1310P	£1.91	SN7437	43p	SN74123	46p	TBA641B	£2.50
CD4029	£1.17	LM309	£1.35	SN7438	30p	SN74141	81p	TBA651	£1.80
CD4030	57p	MCI 1351P	£1.87	SN7440	21p	SN74145	83p	TBA800	89p
CD4031	£2.26	MCI 14553	£4.07	SN7441	80p	SN74150	£1.66	TBA810	98p
CD4037	97p	MCI 4666L	£3.98	SN7442	61p	SN74151	85p	TBA820	85p
CD4041	83p	MCI 4699R	£2.50	SN7446	96p	SN74153	85p	TBA920	£1.79

SEND FOR OUR NEW CATALOGUE WITH 500 NEW LINES—
55p post paid.

Call in or send S.A.E. for details.

POPULAR SEMICONDUCTORS

2N696	25p	2N3906	22p	AF139	69p	BD139	42p	MPS456	20p
2N697	16p	2N4052	20p	AF239	74p	BF115	36p	OC28	£2.00
2N699	55p	2N4058	18p	AF279	80p	BF117	70p	OC42	50p
2N706	12p	2N4921	60p	AF280	85p	BF154	25p	TIP29A	50p
2N708	21p	2N4923	70p	AL102	£1.50	BF180	36p	TIP31A	62p
2N916	43p	2N5245	29p	BC107	14p	BF181	36p	TIP32A	75p
2N918	34p	2N5294	35p	BC109	15p	BF184	35p	TIP34A	£1.20
2N1202	37p	2N5296	36p	BC147	10p	BF194	12p	TIP3A	£2.50
2N1306	45p	2N5458	26p	BC149	13p	BF196	13p	TIP36A	£3.55
2N1308	60p	2N5459	29p	BC157	12p	BF197	14p	TIP41A	70p
2N1711	27p	2N6027	45p	BC158	11p	BF198	15p	TIP42A	70p
2N2102	60p	3N128	80p	BC167	12p	BF244	35p	TIP2955	£1.00
2N2148	£1.65	3N140	£1.00	BC168	12p	BF258	49p	TIP3055	50p
2N2218A	47p	3N141	85p	BC169	14p	BF259	49p	TIS42	30p
2N2219A	52p	3N200	£2.60	BC182	11p	BF598	27p	ZTX300	15p
2N2220	35p	40361	45p	BC182L	14p	BF739	24p	ZTX301	15p
2N2221	22p	40362	48p	BC183	11p	BF779	24p	ZTX501	15p
2N2222	25p	40406	48p	BC183L	14p	BFX29	36p	ZTX502	15p
2N2267	25p	40407	30p	BC184	12p	BFX34	38p	IN914916	7p
2N2646	55p	40408	50p	BC184L	14p	BFX85	41p	IN4007	18p
2N2905	37p	40409	55p	BC212	14p	BFX88	32p	IN4148	7p
2N2906	28p	40410	55p	BC212L	14p	BFY50	30p	IN5404	18p
2N2907	21p	40411	£2.30	BC213	16p	BFY51	38p	IN5408	40p
2N2926G	13p	40594	75p	BC214L	19p	BFY52	36p	AA119	14p
2N3053	25p	40595	88p	BC237	14p	BRV39	50p	BA102	15p
2N3054	50p	40636	£1.15	BC239	16p	ME0412	20p	BA145	19p
2N3055	65p	40673	73p	BC257	17p	ME4102	10p	BA155	12p
2N3391	29p	AC126	37p	BC259	18p	MJ480	£1.05	BB103B	20p
2N3393	15p	AC127	44p	BC301	45p	MJ481	£1.30	BB104B	34p
2N3440	57p	AC128	37p	BC307	20p	MJ490	£1.05	BY127	29p
2N3442	£1.20	AC152	50p	BC309	25p	MJ491	£1.55	BYZ11	70p
2N3638	16p	AC153	40p	BC327	20p	MJ2955	£1.21	BYZ12	70p
2N3702	17p	AC176	40p	BC328	19p	MJ370	68p	OA47	10p
2N3703	15p	AC187K	40p	BCY70	25p	MJ371	81p	OA90	6p
2N3706	14p	AC188K	45p	BCY72	24p	MJ520	65p	OA91	6p
2N3708	14p	AD161	75p	BD121	£2.00	MJ521	75p	OA200	8p
2N3716	£2.60	AD162	£2.00	BD124	£2.00	MJ2955	£1.25	BY164	57p
2N3771	£1.60	AF106	45p	BD131	51p	MJ3055	75p	ST2diac	20p
2N3773	£2.65	AF109	45p	BD132	54p	MP8113	45p	40669	£1.00
2N3789	£2.60	AF115	65p	BD136	36p	MPSA05	20p	TIC44	29p
2N3819	36p	AF116	65p	BD137	36p	MPSA06	20p	C106D	65p
2N3904	21p	AF118	65p	BD138	39p	MPSA55	20p	ORP12	70p

"FULL RANGE OF THYRISTORS, TRIACS, DIACS & ZENERS - ALWAYS IN STOCK"

Prices correct at 9th. Nov., 1976, but all exclusive of VAT, P. & P. 30p

PRACTICAL WIRELESS T.V. SOUND TUNER

(Nov. 75 article by A. C. Alnlie)

IF Sub-Assembly (G8) £6.80. P & P 75p.
Mullard ELC1043 Varicap UHF Tuner £4.00. 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 30p.
Mains Transformer £2.50. P & P 30p.

Add 12½% VAT to price of goods. P & P all items 75p.

Copy of original article supplied on request

Callers welcome at shop premises.

MANOR SUPPLIES

172 WEST END LANE, LONDON NW6

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

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" x 11-3/4" x 14-11/16". Weight: 19 ounces.

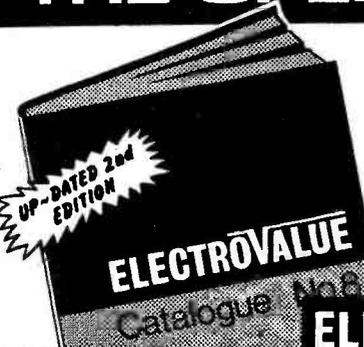
£8.50 each Stereo pair £16.50

INCLUSIVE OF VAT AND POSTAGE

web europa

P.O. Box 9, Ruthin Clwyd

THE OPEN DOOR TO QUALITY



This 144 page catalogue—Electrovalue Catalogue No. 8 (Issue 2, up-dated) offers items from advanced opto-electronic components to humble (but essential) washers. Many things listed are very difficult to obtain elsewhere. The Company's own computer is programmed to expedite delivery and maintain customer satisfaction. Attractive discounts are allowed on many purchases; Access and Barclaycard orders are accepted.

40p

POST PAID
inc. 40p Refund
Voucher

+ FREE POSTAGE

on all C.W.O. mail orders in U.K. over
£2.00 list value (excluding V.A.T.) if under,
add 15p handling charge.

All communications to Dept. PW/10
28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY
TW20 0HB. Tel Egham 3603. Telex 264475 Shop 9-5.30, 9-1 pm Bats
NORTHERN BRANCH: 680 Burnage Lane, Burnage, Manchester
M19 1NA. Tel: (061) 432 4945. Shop 9-5.30pm, 1 pm Bats.

ELECTROVALUE LTD

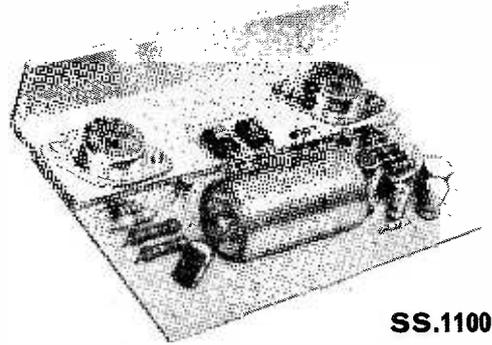
Stirling Sound

QV★ MODULES FOR COST-CONSCIOUS CONSTRUCTORS

HERE IS THE NEW STIRLING SOUND

SS.1100

ONE HUNDRED WATTS RMS POWER AMP
AND IT COSTS UNDER £10.00



SS.1100

Why pay more when you can buy this professionally designed well engineered 100 watt R.M.S. job for only £9.65? Ruggedly built in our own Essex factory, the SS.1100 delivers 100 watts R.M.S. into 4 ohms from a 70 volt supply and is designed for long unbroken spells of work such as disco and P.A. Size approx. 5½" x 3½" x 1¼" with built-in output condenser and heatsink type bracket.

£9.65

POWER AMPLIFIERS

SS.103 3 watt r.m.s. mono I.C. short

£1.75

SS.100-3 Stereo version of above using two I.Cs

£3.75

SS.105 5 watts r.m.s. into 4 ohms, using 12V

£2.25

SS.110 10 watts r.m.s. using 24V and 4 ohm load

£2.75

SS.120 20 watts r.m.s. into 4 ohms, using 34V

£3.25

The above all measure 89 x 50 x 19mm (13½ x 2½in). Suitable power supplies available.

SS.140 40 watts into 4 ohms using 45V supply, i.e., SS.345, size 4 x 3 x ¾in

£3.95

PRE-AMPS AND CONTROL UNITS

SS.100 Active tone control, stereo ± 15dB on bass and on treble

£1.60

SS.101 Pre-amp for ceramic cartridges, etc. Stereo. Passive tone control details supplied

£1.60

FM TUNING MODULES

SS.201 Front end tuner, slow geared drive, two gang. A.F.C. facility. Tunes 88-108 MHz

£5.00

SS.202 I.F. amplifier. Metering and A.F.C. facilities

£2.65

SS.203 Stereo Decoder for use with the above or other FM mono tuners. A LED may be fitted

£3.85

★ THE BUILT-IN QV FACTOR

means Stirling Sound's guarantee of QUALITY AND VALUE to give you today's best all-round value in modules



A member of the BI-PRE-PAK group of companies

220-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SS0 9DF

Telephone: Southend (0702) 46344

PERSONAL CALLERS WELCOME

Practical Wireless, January 1977



SS.105 and 120



SS.140

SS.102 Stereo pre-amp for low output magnetic PUs. R.I.A.A. corrected. Linear feedback facility

£2.65

UNIT ONE PRE-AMP/CONTROL

Combined pre-amp with active tone-control circuits, ±15dB at 10kHz treble and 30Hz bass. Stereo. Vol/balance/treble/bass. 200mV out for 50mV in. Takes 10-16V.

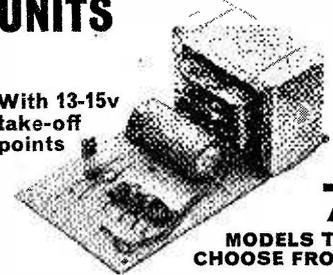
£7.80



SS.202

TODAY'S BEST VALUE IN POWER SUPPLY UNITS

With 13-15v take-off points



7 MODELS TO CHOOSE FROM

Complete with mains transformers and low volt take-off points (except SS.300). All at 8% V.A.T. rate. Add 50p for p/p any model.

SS.312 12V/1A £3.75*

SS.318 18V/1A £4.15*

SS.324 24V/1A £4.60*

SS.334 34V/2A £5.20*

SS.345 45V/2A £6.25*

SS.350 50V/2A £6.75*

SS.300 Power stabilising unit 10-50V adjustable, for adding to un stabilised supplies. (p/p 35p)

£3.25*

SS.310/50

Complete stabilised power supply with variable output from 10 to 50V/2A with built in protection against short.

£11.95*



£11.95*

WHEN ORDERING

add 35p for p/p unless stated otherwise. V.A.T. add 12½% to total value of order unless price is shown* when the rate is 8%. Make cheques etc. payable to BI-Pre-Pak Ltd. Every effort is made to ensure correctness of information at time of going to press. Prices subject to alteration without notice.

JUST PUBLISHED
**RADIO
 COMMUNICATION
 HANDBOOK**

Fifth edition
VOLUME I



First published in 1938, the *Radio Communication Handbook* has long been a standard textbook on the theory and practice of amateur radio. Its almost encyclopedic coverage of this fascinating subject draws on the practical experience, gained over many years, of a multitude of radio amateurs in this country and abroad. The text, which has been completely revised and reset for this edition, is supplemented by hundreds of line diagrams, together with many photographs, charts and tables, making this probably the most valuable all-round reference book a radio amateur can possess.

Volume I chapter titles

1. Principles
2. Electronic tubes and valves
3. Semiconductors
4. HF receivers
5. VHF and uhf receivers
6. HF transmitters
7. VHF and uhf transmitters
8. Keying and break-in
9. Modulation systems
10. RTTY

464 + xvi pages

£7.50 + 81p p&p

Volume 2 (in preparation for publication early 1977) chapter titles:

- | | |
|-----------------------------------|--|
| 11. Propagation | 19. Operating technique and station layout |
| 12. HF aerials | 20. Amateur satellite communication |
| 13. VHF and uhf aerials | 21. Image communication |
| 14. Mobile and portable equipment | 22. The RSGB and the radio amateur |
| 15. Noise | 23. General data |
| 16. Power supplies | |
| 17. Interference | |
| 18. Measurements | |

Size and price to be advised.

Obtainable from
RSGB PUBLICATIONS (Sales)
 35 Doughty Street, London WC1N 2AE

Random FLASHER UNIT
 Wired ready for use Complete with three 100 watt coloured lamps that flash independently at random. **£18.95**

TWIN BANK 6 LIGHT UNIT
 (less lamps) LENGTH 14 1/2 inches
 B.C. Fitting **£9.55** EACH
 E.S. Fitting **£10.35** EACH

Sound to Light MASTER UNIT
 600 WATTS PER CHANNEL
£30.95
 INCLUDING 2 MINOR WIRELESS OUTPUT PLUGS AND MAINS INPUT SOCKET.

TYPE A SPOT
 (less lamp)
 B.C. Fitting **£1.95** EACH | E.S. Fitting **£2.12** EACH

TYPE B 3 BANK UNIT
 (Less Lamps)
 B.C. Fitting **£6.90** EACH | E.S. Fitting **£7.26** EACH

TWIN BANK 12 LIGHT UNIT
 Length 31 1/2"
 (less lamps)
 B.C. Fitting **£15.60** EACH | E.S. Fitting **£17.00** EACH

100 WATT SPOT LAMPS
 RED, YELLOW, GREEN, BLUE, CLEAR **£1.18** each
 3 lamps B.C. or E.S. Fitting **£3.54**

ALL PRICES INCLUDE V.A.T. and POST & PACKING (These prices apply to the United Kingdom only)

ALBEN ENGINEERING CO. LTD.
 DEPT. P.W. THE CRESCENT, WORSTHORNE,
 BURNLEY, LANCs. Tel. Burnley 20940

Send 20p for illustrated booklet & price list

WELBROOK STEREO

This new hi-fi amplifier from Welbrook is the result of painstaking design incorporating 5 I.C.'s 22 transistors plus 10 diodes and offers outstanding value for money to the discerning enthusiast.

30W RMS per channel into 8 ohms load.
 Total harmonic distortion less than 0.1% at all power levels.

Hum/Noise — 80db Tape/Tuner
 — 65db Disc (Magnetic Input)

Complete unit comprising power supply, pre-amplifier with filter networks, two power amplifiers and loudness control all in teak finished cabinet only **£88.00** plus VAT. As above but without filters and loudness control only **£79.00** plus VAT.

Also available in module form complete with front panel but without cabinet—easily assembled by the average enthusiast.

Send for details and full price list to:-

Welbrook Engineering & Electronics Ltd., Brooks Street, Hillgate, STOCKPORT SK1 3HT.

T.T.L. 74 I.C.'s. Prices include Postage and V.A.T. plus BIG QUANTITY DISCOUNTS

7400 12p	7413 30p	7432 25p	7454 15p	7490 35p	74121 25p	74139 100p	74156 70p	74174 100p	74189 350p
7401 12p	7414 60p	7437 25p	7460 15p	7491 75p	74122 40p	74141 60p	74157 70p	74175 75p	74190 140p
7402 12p	7416 30p	7438 25p	7470 30p	7492 45p	74123 60p	74142 270p	74160 90p	74176 100p	74191 140p
7403 12p	7417 30p	7440 15p	7472 25p	7493 40p	74125 50p	74143 270p	74161 90p	74177 100p	74192 120p
7404 12p	7420 15p	7441 65p	7473 30p	7495 60p	74126 50p	74144 270p	74162 90p	74178 140p	74193 120p
7405 12p	7422 20p	7442 65p	7474 30p	7496 70p	74130 130p	74145 75p	74163 90p	74179 140p	74194 100p
7406 35p	7423 25p	7445 80p	7475 30p	74100 95p	74131 100p	74147 230p	74164 125p	74180 100p	74195 100p
7407 35p	7425 25p	7446 85p	7476 30p	74104 40p	74132 65p	74148 160p	74165 125p	74181 200p	74196 75p
7408 15p	7426 25p	7447 75p	7483 85p	74105 40p	74135 100p	74150 120p	74166 125p	74182 75p	74198 100p
7409 15p	7427 25p	7448 75p	7485 100p	74107 30p	74136 80p	74151 65p	74167 325p	74184 150p	74197 100p
7410 15p	7427 25p	7450 15p	7486 30p	74109 50p	74137 100p	74153 65p	74170 200p	74185 150p	74198 185p
7411 20p	7428 40p	7451 15p	7489 25p	74118 90p	74138 125p	74154 120p	74173 150p	74188 350p	74199 185p
7412 20p	7430 15p	7453 15p		74120 90p		74155 70p			

SPECIAL OFFER ALL 22 I.C.'s FOR P.W. DIGITAL FREQUENCY COUNTER FOR £7.50

POPULAR BRANDED TRANSISTORS

BC147 — BC148 — BC149 — BC157 — BC158 — BC159 — BF194 — BF195 — BF196 — BF197
7p each. 100 for £6.00. Type numbers may be mixed for quantity discount.

Bulk Purchase I.T.T. IN4148 10 for 30p, 100 for £1.50

1 Amp Diodes IN4001, IN4002, IN4003 4p each, 30 for £1.00
IN4004, IN4005, IN4006 6p each, 30 for £1.50

Zener Diodes BZY88, 400MW 3V to 33V 7p each, 100 for £6.00

NEW LOW PRICE
741 OP Amps
ANY QUANTITY 20p each
555 TIMERS
ANY QUANTITY 35p each

TRANSISTORS, etc.

AC123 12p	MTCHN PR	AF117 18p	BC148 7p	BC182L 12p	BC212L 12p	BCY72 16p	BF180 30p	BFX85 25p	2N3702 12p
AC176 12p	80p	BC107 8p	BC149 7p	BC183 10p	BC547 12p	BD124 70p	BF182 30p	BFX87 25p	2N3704 12p
AD149 45p	AF114 18p	BC108 9p	BC157 7p	BC183L 11p	BC548 12p	BD131 35p	BF183 30p	BRY39 35p	1N914 3p
AD161 35p	AF115 18p	BC109 9p	BC159 7p	BC184 11p	BC549 12p	BD132 35p	BF200 30p	BRY56 35p	BY100 15p
AD162 35p	AF116 18p	BC147 7p	BC169 12p	BC184L 12p	BCY70 16p	BD135 50p	BF244 16p	BSX20 16p	BY126 16p
			BC182 11p	BC212 12p	BCY71 16p	BD137 40p	BFX84 25p	2N3055 50p	BY127 12p

PLEASE NOTE THAT ALL PRICES INCLUDE POSTAGE AND V.A.T. AT 8 OR 12½% AS APPROPRIATE

**MAIL ORDER ONLY
XEROZA RADIO**

1, EAST STREET, BISHOPS TAWTON, BARNSTAPLE, DEVON

TRANSFORMERS

ALL EX-STOCK—SAME DAY DESPATCH

MAINS ISOLATING
Pri. 120/240V
Sec. 120/240
Centre tap with screen
Ref. VA (Watts)

07*	20	4.57
149	60	6.68
150	100	7.65
151	200	11.95
152	250	14.47
153	350	17.14
154	500	19.73
155	750	27.25*
156	1000	37.97*
157	1500	43.33*
158	2000	48.34*
159	3000	76.36*

*115V or 240V Sec. only.

30 VOLT RANGE

Pri. 200-240V
Sec. 0-12-15-20-24-30V
Ref. Amps £

111	0.5	3.15
79	1.0	4.00
3	2.0	5.55
20	3.0	6.87
21	4.0	7.91
51	5.0	9.55
117	6.0	10.69
88	8.0	14.15
89	10.0	14.51

60 VOLT RANGE

Pri. 200-240V
Sec. 0-24-30-40-48-60V
Ref. Amps £

124	0.5	3.94
126	1.0	5.43
127	2.0	7.65
125	3.0	11.00
123	4.0	13.07
40	5.0	14.20
120	6.0	16.64
121	8.0	19.56*
122	10.0	24.09*
189	12.0	25.16*

12 and or 24 Volt PRIMARY 240-240V

Ref. Amps £

111	0.5	0.25	2.30
113	1.0	0.5	3.01
71	2.0	1.0	3.69
63	3.0	1.5	5.10
13	4.0	2.0	4.56
85	5.0	2.0	5.61
70	6.0	3.0	6.36
102	8.0	4.0	7.34
108	10.0	5.0	7.86
115	12.0	6.0	8.39
117	16.0	8.0	10.48
115	20.0	10.0	13.42
187	30.0	15.0	19.50
226	60.0	30.0	21.94*

HIGH VOLTAGE Mains Isolating

Pri. 200/220 or 400/440
Sec. 100/120 or 200/240 P & P
VA Ref. £

60	243	6.62
350	247	15.23
1000	250	32.68*
2000	252	54.80*

AUTO TRANSFORMERS

Ref VA (Watts) £

113	20	0-115-210-240	2.81
64	75	0-115-200-220-240	4.65
66	300	"	6.24
67	500	"	8.62
84	1000	"	19.70
93	1500	"	23.62*
95	2000	"	31.56*
73	3000	"	45.76*

CASED AUTO TRANSFORMERS

240V mains lead input & USA 2 pin outlets.
Ref VA £

20VA	£ 4.95	Ref 113W
150VA	£ 8.94	Ref 4W
500VA	£ 15.11	Ref 67W
1000VA	£ 22.84	Ref 84W*
2000VA	£ 35.66	Ref 95W*

Electronic Construction Kit
10-Project (including electronic organ)
ideal gift at £8.63. "No soldering"

50 VOLT RANGE

Pri. 200-240V
Sec. 0-19-25-33-40-50V
Ref. Amps £

102	0.5	4.07
103	1.0	5.27
104	2.0	7.17
105	3.0	8.77
106	4.0	11.20
107	6.0	17.29
118	8.0	18.67
119	10.0	22.04*

SCREENED MINIATURES

Ref mA Volts £

238	200	3-0.3	2.90
212	1A	0-6 0.6	2.97
13	100	0-0.9	2.28
235	330	0-5 0.9	2.39
207	500	0-8.9 0.8-9	3.14
208	1A	0-8.9 0.8-9	4.51
236	200	0-15 0-15	2.20
214	300	0-20 0-20	3.46
221	700 (DC)	20-12-0-12-20	3.22
206	1A	0-15-20 0-15-20	5.37
203	500	0-15-27 0-15-27	4.77
204	1A	0-15-27 0-15-27	6.00
5112	500	12-15, 20, 24, 30	3.15

1 Decs Solderless Bread'ng

S Dec 70 contacts £2.41
T Dec 208 contacts £3.92
U Dec 'A' for IC's etc. £2.41
U Dec 'B' for IC's etc. £7.82

BRIDGE RECTIFIERS

200V 2A 0.67
400V 2A 0.72
200V 4A 0.89
500V 10A 2.70

NO HIDDEN EXTRAS—Prices include VAT and P & P. EXCEPT WHERE CARRIAGE WILL BE ACCORDING TO WEIGHT & DISTANCE—MRS

Electropoil, Audio accessories, semiconductors, Multi-Meters

C1000 MINI-MULTIMETER

DC-1000mA AC-1000V, 1000Ω/V
RES-150KΩ
BARGAIN AT £4.59

ANTEX SOLDERING IRONS
15W £3.57 18W £3.31 25W £2.99
SOLDERING IRON KIT
£4.48
STAND FOR ABOVE £1.49

MAGNETIC TO CERAMIC CARTRIDGE CONVERTER
OPERATING VOLTAGE 20-45V
ONLY £3.17.

HIGH QUALITY MODULES

5 Watt RMS AMPLIFIER £3.17
10 Watt RMS AMPLIFIER £3.61
25 Watt RMS AMPLIFIER £4.67
125W RMS AMPLIFIER £17.50
PRE-AMP for 3-5-10W £7.50
PRE-AMP for 25W £15.79
POWER SUPPLIES 3-5-10W £1.54
POWER SUPPLIES 25W £3.56
TRANSFORMER 3W £2.77
TRANSFORMER 5-10W £3.22
TRANSFORMER 25W £3.56

BSR 144R (CHASSIS)

With magnetic cartridge £27.34
GARRARD SP25 IV (£) £21.36

POWER UNIT PLUGS

Direct into 13A 3 pin socket
6-75-9V 300mA £3.59

NEW STEREO 30

Complete Stereo Chassis inc. 7-7W RMS Amp, Pre-amp, Power Supply, Front Panel, Knobs (only needs Mains Trans.), Stereo 30 £17.99. Mains Trans £3.56. Teak veneered cab. £4.54.

CALLERS WELCOME (MON.-FRI.) OR SEND STAMP FOR LISTS.

COMPONENT PAKS

200 Mixed value resistors (count by weight)
150 Mixed value precision resistors (count by weight)
30 Mixed value precision resistors ½w 2%
15 Assorted pots & pre-sets
10 Reed switches
3 Micro Switches
20 Assorted tag strips
PLEASE STATE PAK REQUIRED
90p PER PAK.

AUDIO KIT 25W

2+25W Amplifiers
1+ Pre-Amp
1+ Power supply
1+ Transformer
1+ Front Panel
1+ Kit of parts to include on/off switch, neon ind. Stereo headphone socket. Plus instructions book £32.18.

TEAK AUDIO KIT 25W

Teak veneered cabinet
16" x 11" x 3", aluminium chassis, heat sink and front panel brackets plus back panel and sockets etc. £11.21

CARTRIDGES

Magnetic Sonotone 100 £5.31
Ceramic E.E.I. CS 2000 £2.72
ACOS GP93-I £2.11
AT-55 £4.42

STEREO FM TUNER

fitting with Phase-lock Loop
4 Pre-selected stations supply 20-35V. 90mA Max. £22.72

Barrie Electronics Ltd.

3, THE MINORIES, LONDON EC3N 1BJ

TELEPHONE: 01-488 3316/7/8

NEAREST TUBE STATIONS: ALDGATE & LIVERPOOL ST

SAXON ENTERTAINMENTS LTD

A FULL RANGE OF PRINTED CIRCUIT
MODULES FOR ALL P.A. & DISCO &
GROUP APPLICATIONS

SYSTEM 7000 HAS IT!

A COMPLETE SELECTION OF READY
TO USE PROFESSIONAL QUALITY
AUDIO & LIGHTING EQUIPMENT

POWER AMPLIFIER MODULES 30—240 WATTS



- Fully tested & guaranteed.
- Full RMS Sine Wave output.
- Distortion typically 0.2%
- 10 Transistors, 4 Diodes.
- Response 30HZ-30KHZ
- Fully short & open circuit proof
- Sensitivity suits most mixers.
- Built-in surge suppression & compensation
- Twin D.C. & output fuses.
- Top-grade components throughout.

30 Watts rms		60 Watts rms		120 Watts rms		240W rms	
SA308	SA604	SA608	SA1204	SA1208	SA2404		
30W rms/ 8 ohms	60W rms/ 4 ohms	60W rms/ 8 ohms	120W rms/ 4 ohms	120W rms/ 18 ohms	240W rms/ 4 ohms		
£9.50	£12.50	£13.50	£14.50	£21.00	£25.50		

POWER SUPPLIES FOR THE ABOVE MODULES—READY WIRED & FUSED ON
GLASS FIBRE PCB

PM301	PM601/4	PM601/8	PM1201/4	PM1201/8	PM1202/4	PM1202/8	PM2404/1
For 1/2	For 1/2	For 1/2	For 1	For 1	For 2	For 2	For 1
SA308	SA604	SA608	SA1204	SA1208	SA1204	SA1208	SA2404
£9.90	£12.50	£12.50	£12.50	£12.50	£19.50	£19.50	£19.50

DISCO MIXER MODULES Mono or Stereo (with Auto Fade)



Printed circuit module assembled &
tested with all components ready
mounted.

Mono **£19.50** Stereo **£29.50**

* Front panel to suit **£3.50**

- Mixes two decks, tape and mic.
- Wide-range bass & treble controls on mic. & music channels.
- Variable autofade (mic. override)
- Ample headphone power.
- Needs only front panel* knobs and selector switch.
- Push-pull monitor circuit.
- 20HZ-20KHZ—Noise —77dB
- Comprehensive wiring details provided
- Perfect for incorporation in your system

ALL PURPOSE CUSTOM—MIXER MODULES (Mono or Stereo)



- Using these modules, mixers may be built to your specification up to 20 Channels, mono or stereo, or a combination of both. System 7000 custom-mixer modules have monitoring facilities too!

INPUT MODULES

- Accept low/high 2 mics, ceramic & magnetic cartridges, all musical instruments & line signals
 - Low-noise circuitry—high grade components
 - Wide-range bass & treble controls (23dB)
 - 20HZ-30KHZ Noise —80dB
 - Echo sound/return etc easily fitted
- Mono—IM7001M **£5.50**
Stereo—IM7001S

Power supply for up to 20 modules—PPM18 **£8.50**

MIXING MODULES

- Only one required per mixer track whether mono or stereo
- Feeds up to ten power modules
- Complete with 1/2W monitor amplifier
- Accepts up to 20 input modules
- Will match any other make of amplifier

Mono—IM7002M **£9.00**
Stereo—IM7002S

QUADRAFACT FOUR CHANNEL 4KW SEQUENCER WITH DIMMERS

A COMPLETE
LIGHT
SHOW!!



£29.50

* PANEL **£2.50**

THE ONLY MODULAR
SOUND TO LIGHT UNIT WITH:

- * Four integral dimmers.
- * Two + Two sequencer
- * Automatic audio level

- RCA 8A Triacs
- Sequence 0.5-20HZ
- I.C. circuitry
- Needs only front panel*
- Audio trigger 1-240W
- Fully suppressed
- Individual fuses
- Complete with speed Slider control



THREE CHANNEL 3KW SOUND/LITE—Low Cost— Superb Value



£16.50

* Panel **£2.50**

- Long-established Saxon design
- Individual level controls + master
- RCA 8A Triacs
- 1W-240W input
- Individual channel fuses
- Needs only front panel*

SYSTEM 7000

MINOTAUR 100—All Purpose Wide Range Amplifier



- 100W rms — 1dB
 - Standard 8 ohm output
 - Twin mixed inputs accept a wide range of signals
 - 30HZ-30KHZ ±2dB
 - 23dB bass/treble
- A four input, high power amplifier which will deliver up to 150 watts output. An absolute must where multiple mixing & power are required
- Four individually mixed inputs
 - Wide range bass/treble+master

An extremely compact and versatile amplifier with full protection and a clean, attractive appearance. Ideal for all groups, disco's & clubs

- Vynide covered case
- Fully short proof
- Superb value for money

£49.50

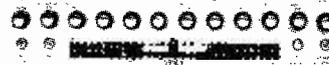


SAXON 150 HEAVY DUTY AMPLIFIER **£59.00**

SYSTEM 7000

COMPLETE DISCO MIXERS (with Auto Fade)

*Ready to plug in & use
* Mono or Stereo



The choice of the professional D.J.

Controls: Mic, volume, bass, treble, A/fade depth, tape, L/deck r/deck vols., treble, bass, master, headphones vol., selector, left/right fader.

MONO 18V **£37.50** MONO MAINS **£43.50**

- Automatic mic. override
 - Mixes two decks, tape & mic
 - Facilities as for modular version opposite
 - Mute positions on headphone selector for ease of monitoring
 - Two tone stainless steel panel
 - Sockets on front & rear panels
 - Left/right deck fader
 - May be operated from any power supply or from mains
- Stereo 18V **£53.50**
Stereo Mains **£59.50**

SYSTEM 7000 COMPLETE CUSTOM MIXERS (Mono or Stereo)



- Similar to the modules opposite these mixing modules are complete with front panels, sockets, knobs, monitor switch etc. Up to 20 channels (mono or stereo) may be incorporated in one system with any number of output tracks.

Ideal for the economical & quick assembly of a purpose built mixer with individual channel monitoring, and optional extra facilities—consult our technical dept. to discuss your needs.

- Stainless steel panels
- Built-in monitoring
- Will feed all amplifiers
- Professional appearance
- Accepts all types of signals
- Infinitely adaptable

Mono input module	£8.50
Stereo input module	£12.00
Mono mixing module	£8.50
Stereo mixing module	£12.00
Power supply	£8.50

SYSTEM 7000 LIGHTING CONTROL MK II



HAS YOUR SOUND TO
LIGHT CONVERTER GOT:

- 4000W Handling
- Integral individual dimmers
- Automatic audio level control
- Two + Two sequence facility

OURS HAS! — PLUS:

- Stainless steel panel
- Heavy duty terminations
- Bonded case
- Matches System 7000 mixers

ALL YOUR ELECTRONIC
LIGHTING NEEDS IN ONE
SUPERBLY DESIGNED
UNIT.

£42.50



SAXON SOUND-LITE—An old design with improved appearance

- Scintillating performance
- Similar to Mk II lighting control in appearance
- 3KW power handling
- Individual bass, treble, middle & master controls
- 1-240W input
- Fully fused & isolated

Complete with heavy
duty terminations

£24.75

EXPORTERS TO 17 COUNTRIES — ENQUIRIES WELCOMED — NATIONWIDE DISTRIBUTION BY NORMAN

BRANCHES AT CROYDON & WALLINGFORD

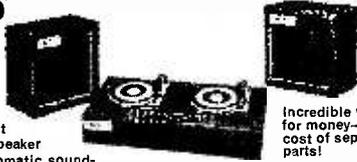
CUSTOMERS INCLUDE BBC, LONDON WEEKEND TV,
SCOTTISH TELEVISION, NATIONAL TYRES,
POST OFFICE, GOVT. DEPTS.

**A READY-TO-USE 100W STEREO DISCO WITH
BUILT-IN SOUND/LITE SEQUENCER AND LIGHTS
FOR ONLY £199**

THE CENTAUR

(Carr free in U.K.)

- 100W rms stereo output
 - Twin heavy duty loudspeaker
 - Four channel fully automatic sound-lite with variable speed sequence
 - I.C. pre-amp with tape input & X fade
 - Separate mic. & music treble and bass controls
 - Attractive Vynlde cabinets
 - Twin BSR decks with autostop & lift arm
- Incredible value for money—2/3 cost of separate parts!
- All connecting leads supplied—ready to plug in
 - Loudspeakers have kick-proof grills
 - Four colour built-in light display gives ever changing pattern with or without music



**A READY-TO-USE 50W MONO DISCO COMPLETE WITH
TWIN HEAVY DUTY LOUSPEAKERS FOR ONLY**

£89.90

- 50W rms output
 - Twin heavy duty loudspeakers
 - Separate mic. input
 - Wide range bass & treble controls
 - Smart Vynlde cases—clip together to form one neat package
 - Twin BSR decks with autostop
- Tremendous value—price includes leads just plug in & go!

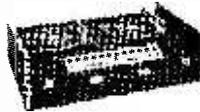


Accessories for complete discos & other systems

- Electret Condenser Mic ECM31 C/W windshield & clip £12.00
- ECM78—as above but dual impedance with removable lead £13.00
- Crown Stereo Headphones £6.75
- Heavy duty boom mic. stand £12.50

CUSTOM BUILT DISCOS

A full range of custom consoles are available using System 7000, from 50W mono to 500W stereo. Ask for our price list.



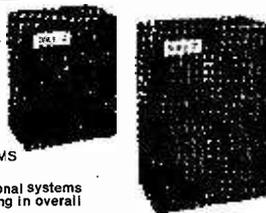
LOUDSPEAKER CABINETS

- Kick proof grills.
- Jointed construction
- Protective corners
- Smart & professional
- Heavy duty units.
- Black Vynlde finished.

Single Twelve: Empty £14
With 80W unit £33.00
Twin Twelve: Empty £24
With units from £59.00
Folded Horn—Full range P.A. Bin 100W RMS
£120.00

This cabinet is 3-4 times as loud as conventional systems for a given input power—thus there is a saving in overall size & cost.

- Many other cabinets available—ask for details.



EMPTY DISCO CONSOLES

£19 with plain motorboard. £21 with cutouts.
■ Black Vynlde finish ■ Protective corners ■ With your choice of cutouts

STROBES & PROJECTORS (We stock the full Pluto range) Send for details

SUPERSTROBE £19.75

- 2-3 Joules
- 80W Tube for long life
- Compact 4" x 4" x 4"

PRO-STROBE £32.50

- 6-8 Joules
- External trigger
- Long Life tube timer circuit



150 WATT LIQUID WHEEL PROJECTOR

- Accepts all accessories
 - C/w with wheel & motor plate
 - Sturdy steel construction
- Remarkable value—Sold elsewhere at £39.50. Our price is only:

£31.50

Please add 8% VAT to all orders (12 1/2% for SA308/PM301)
We accept Access & Barclaycard—simply telephone or send your card number—Do not send your card.

You may pay by cheque, crossed postal orders, cash (registered) or bank draft

To order—or for advice phone (01) 684 6385 or (01) 684 0098
Mail orders to: 327-333 Whitehorse Rd., Croydon, Surrey CR0 2HS
Shop open 9am-5pm Mon.-Sat. Mail order desk 10am-3pm Mon.-Fri.

Wallingford Branch: Flint House, High St., Wallingford, Oxon
(Callers only)
9am-5pm Mon.-Sat. Telephone (0491) 35629

ROSE ELECTRICAL TO BONA FIDE TRADE CUSTOMERS

Ham re-born with Record-breaking Antenna!

The JOYSTICK VFA (Variable Frequency Antenna—a six band, patented omni-directional antenna of extreme flexibility) is a MUST for confined locations—at the worst it can stand in the corner of the shack and still do its stuff! But space problem or no... what you need most is EFFICIENCY.

Ex-G3IYQ is making a come-back after nearly 16 years off the air. He has a "System A" Joystick and tuner and describes himself, at present, as a "receiver-designing SWL". In his rather unfavourable QTH, the System A gives up to 4 S-points over any other antenna and he looks forward to getting his ticket back to test the JOYSTICK on transmission. (You won't be disappointed, OM!)

Alan also enthuses about recently hearing, courtesy of the Joystick, a GC working all over G, GI, GM & GW. The GC was coming in like a bomb and in almost all cases both sides of the SSB QSO's were logged Q5, and this on Top Band in late afternoon! **ALREADY IN USE BY AMATEUR TRANSMITTING AND SWL STATIONS WORLD-WIDE AND IN GOVERNMENT COMMUNICATION.**

SYSTEM 'A'

£32.40

250 w.p.e.p. OR for the SWL.

SYSTEM 'J'

£38.60

500 w.p.e.p. (improved 'Q' on receive).

PARTRIDGE SUPER PACKAGES

COMPLETE RADIO STATIONS FOR ANY LOCATION

Both Packages feature the World Record Joystick Aerial (System 'A'), with 8' feeder, all necessary cables, matching communication headphones. Deliv. Securior our risk. Assembled in seconds! **BIG CASH SAVINGS!**

PACKAGE No. 1 As above with R.300RX **£210.55**
SAVE £13.87!

PACKAGE No. 2 Is offered with the FRG7 RX. **£193.11**
SAVE £13.87!

RECEIVERS ONLY, inclusive delivery, etc.

R.300 £184.50 FRG7 £167.06

Prices include VAT, insurance and delivery by post or carrier



Just telephone
your
card number



Phone 0843 62535 (or 62839 after office hours)

IMPORTANT

All lines offered are correct at time of going to press and prices include VAT and carriage. At present we are enjoying occasional selling peaks when demand exceeds supply for a day or two and we will be able to serve you the better for a quick phone call when we can advise you on your intending purchase and "pencil-in" your order, take your card number, etc. All enquiries or sales by post or telephone receive the personal attention of George A. Partridge, G3CED, inventor of the VFA.

BOX 5

G3CED



G3VFA

TAMBA ELECTRONICS

QUALITY PRODUCTS
FOR HI-FI, DISCO,
P.A. GROUP AND CLUB USE

A BRAND NEW RANGE OF AMPLIFIER MODULES 5 to 100 WATT/RMS

Choose the power you need from these five pure complementary amplifiers
Two-year guarantee

All amplifiers feature a pure complementary symmetry output stage for low distortion and high reliability—the highest grade components (by Mullard—Texas, Plessey—RCA, etc.) used throughout



- Suits loads 4-16 ohms (optimum load 8 ohms, TAM50/100/250, 4 ohms TAM500/1000)
- Low distortion (0.1%)
- 20-20,000 Hz \pm 1dB
- Silicon circuitry throughout
- Inherently open circuit proof
- Four simple connections

- High sensitivity—100mV
- Low profile (1in high 3½in x 3in)
- 75% efficient
- Glass fibre printed circuit board
- Accepts most mixers/pre-amplifiers

TAM50 5W RMS 25V supply	£3.20
TAM100 10W RMS 35V supply	£3.75
TAM250 25W RMS 45V supply	£4.25
TAM500 50W RMS 45V supply	£6.95
TAM1000 100W RMS 65V supply	£9.80
(all modules carriage free)	

POWER SUPPLIES

For 1 or 2 TAM50/100	£4.25 (carr 50p)
For 1 or 2 TAM250/500	£6.95 (carr 50p)
For 1 or 2 TAM1000	£9.80 (carr 50p)

You may order as follows: C.W.O. (crossed cheques, P.O.s, M.O.s, etc.) C.O.D. (50p extra). We accept Access and Barclaycard—send or telephone your number—do not send your card. Add VAT at 8% to orders for 50-100W units and a 12½% for 5-25W units

Hours, 9.30 a.m.—5 p.m.
Monday—Saturday.
Callers welcome.
Tel: (01) 684 0098

TAMBA ELECTRONICS

BENSHAM MANOR ROAD PASSAGE, BENSHAM MANOR ROAD, THORNTON HEATH, SURREY

→ Teach yourself the latest techniques of digital electronics

Elementary course:

Digital Computer Logic & Electronics

- 1 Basic Computer Logic
- 2 Logical Circuit Elements
- 3 Designing Circuits to carry out Logical Functions
- 4 Flip-flops and Registers

£4.20 + 80 pence P & P

Order both books at the same time for the bargain price of

£9.70 + 80 pence P & P

Advanced course:

Design of Digital Systems

- 1 Computer Arithmetic
- 2 Boolean Logic
- 3 Arithmetic Circuits
- 4 Memories and Counters
- 5 Calculator Design
- 6 Computer Architecture

£6.20 + 80 pence P & P

To: Cambridge Learning Enterprises (Dept. CIR)
FREEPOST, St. Ives, Huntingdon, Cambs. PE17 4BR

*Please send me set(s) of Design of Digital Systems at £7.00 each, p & p included.

*or set(s) of Digital Computer Logic and Electronics at £5.00 each, p & p included.

*or combined set(s) at £10.50 each, p & p included.

Name

Address

*delete as applicable.

No need to use a stamp—just print FREEPOST on the envelope.

PW1

VALVE BARGAINS

Any 5-54p, 10-£1.00, 50-£4.50.
Your choice from the list below.

ECC82, EF80, EF183, EF184, EH90, PCF80, PCF802, PCL82, PCL84, PCL85, PCL86, PCL805, PL504, PY81/800, PY88, 30PL-14, 6F28.

Colour Valves—PL508, PL509, PL519, PY500/A. All tested. 30p each.

Aerial Splitters—2 way, 75 OHMS, Inside Type, £1.50

Press Button UHF Tuners—4 Button Transistor—British made—£2.50 each.

AERIAL BOOSTERS

Aerial boosters can produce remarkable improvements on the picture and sound, in fringe or difficult areas.

B11 For TH stereo and standard VHF/FM radio.

B12 For the older VHF television—Please state channel numbers.

B45 For Mono or colour this covers the complete UHF Television band. All boosters are complete with battery with Co-ax plugs & sockets. Next to the set fitting. £3.80

50p BARGAIN PACKS

All Packs Un-used Parts—PK1-40-C280 (Mullard) Axial Lead Capacitor mixed values from .01µF to .47µF (250V/W). PK2-30-C281 (Mullard) Radial Lead Capacitors mixed values from .015µF to 1.5µF (250V/W). PK3-6 Co-ax. plugs. PK4-6 Co-ax connectors. PK5-8-5m/m formers with slugs. PK6-25-AC128 Transistors. PK7-3 BF200 (VHF) Transistors. PK8-2 BF182 (UHF) Transistors. PK9 Any 6 Transistors BC108, BC113, BC135, BC153, BC171, BC172, BF194, BF195, BF196, BF197. PK10 8-1 amp 400 volts rectifiers. PK11 4-5 pin din plugs (180°). PK12-5 PP3 Battery Connectors.

All prices include VAT. P&P 20p per order. Please send uncrossed P.O. or Cheques for returning if we are out of stock of Bargain Packs or older types of new valves.

ELECTRONIC MAILORDER LTD.

62 BRIDGE ST., RAMSBOTTOM, BURY, LANCs. TEL. RAMS. (070 682) 3036



WILMSLOW AUDIO

THE Firm for speakers!

SPEAKERS

Baker Group 25, 3, 8 or 15 ohms	£9.00
Baker Group 35, 3, 8 or 15 ohms	£10.25
Baker Group 50/12 8 or 15 ohms	£14.00
Baker Group 50/15 8 or 15 ohms	£18.62
Baker Deluxe 12" 8 or 15 ohms	£13.38
Baker Major 3, 8 or 15 ohms	£10.69
Baker Super 8 or 15 ohms	£16.31
Baker Regent 12" 8 or 15 ohms	£9.00
Baker Auditorium 12" 8 or 15 ohms	£14.65
Baker Auditorium 15" 8 or 15 ohms	£19.41
Celestion G12M 8 or 15 ohms	£12.95
Celestion G12H 8 or 15 ohms	£15.95
Celestion G12/50 8 or 15 ohms	£18.00
Celestion G12/50TC 8 or 15 ohms	£20.00
Celestion G15C 8 or 15 ohms	£26.95
Celestion G18C 8 or 15 ohms	£39.95
Celestion HF1300 8 or 15 ohms	£6.98
Celestion HF2000 8 ohms	£3.95
Celestion MH1000 8 or 15 ohms	£13.50
Celestion CO3K	£4.46
Decca London ribbon horn	£29.95
Decca London CD/1000/8 Xover	£6.95
Decca DK30 ribbon horn	£19.95
Decca CO1/8 Xover (DK30)	£4.75
EMI 14 x 9 Bass 8 ohms 1A4770	£11.92
EMI 8 x 5, 10 watt, d/cone, roll surr.	£3.75
EMI 6 1/2" d/cone, roll surr. 8 ohms	£3.93
EMI 8" roll surr. bass	£5.73
EMI 5" mid range	£3.15
EIac 59RM109 (15) 59RM114 (8)	£3.38
EIac 6 1/2" d/cone, roll surr. 8 ohms	£3.95
EIac 10" 19RM239 8 ohms	£1.57
Eagle Crossover 3000hz 3, 8 or 15 ohm	£5.51
Eagle FR4	£8.95
Eagle FR65	£11.95
Eagle FR8	£14.98
Eagle FR10	£3.98
Eagle HT15	£4.95
Eagle HT21	£4.00
Eagle MHT10	£5.95
Eagle FF28 multicell. horn	£5.50
Fane Pop 15, 8 or 16 ohm	£9.75
Fane Pop 33T, 8 or 16 ohm	£12.50
Fane Pop 50, 8 or 16 ohm	£16.75
Fane Pop 55, 8 or 16 ohm	£19.95
Fane Pop 80, 8 or 16 ohm	£21.75
Fane Pop 70, 8 or 16 ohm	£33.95
Fane Pop 100, 8 or 16 ohm	£42.95
Fane Crescendo 12A, 8 or 16 ohms	£44.95
Fane Crescendo 12BL, 8 or 16 ohms	£54.95
Fane Crescendo 15/100A, 8 or 16 ohms	£64.95
Fane Crescendo 15/125, 8 or 16 ohms	£75.95
Fane Crescendo 18, 8 or 16 ohms	£15.75
Fane 910 Mk II horn	£45.95
Fane 920 Mk II horn	£25.50
Fane HPX1 crossover 200 watt	£2.50
Fane 13 x 8, 15 watt dual cone	£8.96
Fane 801T 8" d.c. roll surr.	£8.50
Goodmans Axiom 100	£14.95
Goodmans Audiom 200 8 ohm	£22.00
Goodmans Axiom 402 8 or 15 ohm	£19.50
Goodmans Twinaxiom 8, 8 or 15 ohm	£10.95
Goodmans Twinaxiom 10, 8 or 15 ohm	£6.50
Goodmans 8P 8 or 15 ohm	£6.95
Goodmans 10P 8 or 15 ohm	£16.50
Goodmans 12P 8 or 15 ohm	£17.75
Goodmans 12PD 8 or 15 ohm	£18.75
Goodmans 12AX 8 or 15 ohm	£44.00
Goodmans 15AX 8 or 15 ohm	£49.00

SPEAKERS

Goodmans 15P 8 or 15 ohm	£24.00
Goodmans 18P 8 or 15 ohm	£39.95
Goodmans Hifax 750P	£16.00
Goodmans 5" midrange 8 ohm	£4.05
Gauss 12"	£95.00
Gauss 15"	£110.00
Gauss 18"	£121.00
Jordan Watts Module 4, 8 or 15 ohm	£15.38
Kef T27	£5.75
Kef T115	£1.75
Kef B110	£7.95
Kef B200	£9.25
Kef B139	£17.95
Kef DNB	£2.50
Kef DN12	£5.95
Kef DN13 SP1015 or SP1017	£4.95
Lowther PM5	£32.00
Lowther PM6 Mk 1	£35.00
Lowther PM7	£48.60
Peerless KO10DT 4 or 8 ohms	£8.25
Peerless DT10HFC 8 ohms	£9.50
Peerless KO40MRF 8 ohms	£9.95
Peerless MT225HFC 8 ohms	£3.48
Richard Allan C412 12" bass	£18.80
Richard Allan HP8B	£12.50
Richard Allan LP8B	£8.50
Richard Allan DT20	£6.25
Richard Allan CN8280	£3.15
Richard Allan Super disco 60W 12"	£3.15
Richard Allan CG15 15" bass	£27.45
Richard Allan Super Disco 10" 50 watt	£13.25
Richard Allan Super Disco 8" 50 watt	£12.95
Radford MD9	£11.50
Radford MD6 dome mid range	£15.75
Radford TD 3	£8.25
Radford Crossover network	£14.75
BD25 Mk II	£23.20
Soles 4001 G & K	£5.90
Tannoy 10" HPD	£78.00
Tannoy 12" HPD	£86.00
Tannoy 15" HPD	£99.95
Wharfedale Super 10 RS/DD 8 ohms	£13.50
Castle 8 RS/DD	£9.28

SPEAKER KITS

Baker Major Module 3, 8 or 15 ohms	each	£13.28
Goodmans DIN 20 4 or 8 ohms	each	£15.75
Goodmans Mezzo Twin Kit	pair	£51.95
Helme XLK 20	pair	£17.50
Helme XLK 30	pair	£21.95
Helme XLK 35	pair	£26.75
Helme XLK 40	pair	£38.50
KEF kit 1	pair	£51.00
KEF kit III	each	£46.00
Peerless 1060	pair	£34.00
Peerless 1070	each	£46.50
Peerless 1120	each	£54.00
Peerless 2050	pair	£39.50
Peerless 2060	pair	£53.00
Richard Allan Twin assembly	each	£13.95
Richard Allan Triple 8	each	£20.75
Richard Allan Triple 12	each	£25.95
Richard Allan Super Triple	each	£29.50
Richard Allan RA8 Kit	pair	£37.80
Richard Allan RA82 Kit	pair	£59.40
Richard Allan RA82L Kit	pair	£65.70

SPEAKER KITS

Fane Mode One Mk2	each	£10.35
Wharfedale Linton II kit	pair	£21.50
Wharfedale Glendale 3XP kit	pair	£47.70
Wharfedale Dovedale III kit	pair	£59.40
Wharfedale Denton 2XP Kit	pair	£23.25
Wharfedale Linton 3 - P Kit	pair	£34.25

HI-FI

ON DEMONSTRATION in our showrooms

Akai, Armstrong, Bowers and Wilkins, Castle, Celestion, Dual, Goodmans, Kef, Leak, Pioneer, Radford, Richard Allan, Rotel, Tandberg, Trio, Videotone, Wharfedale, etc. Ask for our Hi-Fi Discount Price List.

THIS MONTH'S SPECIALS! Carr.
 £2.50 Rotel RA 412 £77.95. Rotel RX 202 Mk II £97.50. Videotone Minimax II £43.00. Videotone Saphir II £49.00. Pioneer SX 450 £116.00. Sansui SC 2000/2002 £149.70.

We stock the complete Radford range of amplifiers, preamplifiers, power amplifiers, tuners, etc., and also Radford Audio Laboratory equipment, low distortion oscillator, distortion measuring set, audio noise meter, etc.

All Prices Include VAT (Prices correct at 1.11.76)

Send stamp for Free 38 page booklet 'Choosing a Speaker'.

All units guaranteed New and Perfect. Carriage and Insurance:

Speakers up to 12"	60p
12"	£1.00
15"	£1.75
18"	£2.50

Kits £1.00 each (£2.00 per pair)

Tweeters & Crossovers 33p each

WILMSLOW AUDIO

Dept. PW

Loudspeakers, Mail Order and Export: Swan Works, Bank Square, Wilmslow.

Hi-Fi, Radio & TV: Swift of Wilmslow 5 Swan Street, Wilmslow, Cheshire.

PA, Hi-Fi & Accessories: Wilmslow Audio, 10 Swan Street, Wilmslow, Cheshire.

Telephone:

Loudspeakers, Mail Order and Export Wilmslow 29599

Hi-Fi, Radio, etc., Wilmslow 26213
(Access and Barclay Card orders accepted by phone).

Complete kits in stock for Radford Studio 90, Radford Monitor 180, Radford Studio 270, Radford Studio 360, HiFi Answers Monitor (Rogers), HiFi News No Compromise (Frisby), HiFi News State of the Art, Wireless World Transmission Line (Bailey), Practical HiFi and Audio Monitor (Giles), Practical HiFi and Audio Triangle (Giles), Popular HiFi (Colloms), etc.

Construction leaflets for Radford, Kef, Jordan Watts, Tannoy, Hi-Fi On dem. Answers Monitor, State of Art, Free on Request.

P.A. Amplifiers, microphones etc. by Shure, Linear, Eagle, Beyer, AKG etc.

FREE with orders over £10—"HiFi Loudspeaker Enclosures" Book

KITS PW 'EASYBUILD' CAR CLOCK KIT, Oct '76

Everything included except battery—IN STOCK NOW



order as:
"AUTOCLOCK KIT"
£17-85

only 40mm x 154mm x 85mm

FULLY AUTHOR-APPROVED KIT (We wrote the article)

● Only high quality components used—Piher resistors, roller flined fibre-glass PCB's etc. ● Full instructions included. Simple but sophisticated circuitry gives you good performance at low cost. You benefit from our experience in clock kit design. After sales service available at very reasonable cost. Uses our own crystal timebase kit.

Also available less case—order as "AUT-MODULE KIT" £16-45

Other Kits: For details see previous adds or Catalogue:

- "ACK" Advanced 6 digit alarm clock kit £26-80
- "GCK" 4 digit mini mantelpiece clock (green displays) £14-40
- "XTK" 50Hz crystal timebase kit £6-28
- "ACK + BBK + XTK" £33-58
- "GCK + GBBK + XTK" £19-40

Send for **FREE CATALOGUE** giving details of our complete range of **Clock kits, Led displays, Cases** and other components

memory ic's and microprocessors

Please: Microprocessors should only be bought by experienced constructors. Sorry, we cannot answer technical queries or supply data other than from our data selection.

IM6100CDDL	£45-36	MPUS 6820	£17-67
8080A (2µS)	£32-25	6850	£17-67
6800	£33-87	3224	£9-76
ISPA/500 (SC/MP)	£18-75	3228	£12-16
2650	£27-00	8251	£17-67
		8255	£17-67

MEMORY IC's

- Intel 2102A-6 (new version of 2102-2). 16 pin IC, TTL compatible, Single +5V supply, 650nsec., 1024 x 1 bit Static NMOS RAM. £3-61
- Intel 2112A-4 650nsec. 256 x 4 bit Static NMOS RAM. £4-76
- Intersil IM6598C CMOS 1024 x 1 bit Static RAM. £8-05

Add 8% VAT + 25p p&p on all orders. Phone orders see "Fast service" for details. Export orders welcome, but you must contact us first for special order form and postage rates. **OFFICIAL ORDERS WELCOME.**

SINTEL

DATABOOK and DATASHEETS: (may be photocopies)

New 1976 RCA CMOS and Linear IC Combined Databook	£6-70
New 1976 RCA 'Power Transistors, SCR's, Databook'	£7-30
National Semiconductor 7400 series TTL Databook, c. 200 pages	£3-45
TTL Pin-Out Card Index. Set of cards with pin-outs (top and bottom views) of T.L. TTL range and many other T.L. IC's	£2-95
Intel Memory Design Handbook, c. 280 pages	£5-20
Intel 8080 Microcomputer Systems Users Manual, c. 220 pages	£5-25
Motorola CMOS Databook (Vol. 5 Series A) c. 500 pages	£3-50
Motorola M6800 Microprocessor Applications Manual, c. 650 pages	£12-95
Motorola M6800 Programming Manual, c. 200 pages	£5-35
Motorola Booklet Introducing Microprocessors	£1-80
National SC/MP Introductory Users Manual	£0-75
National SC/MP Programming and Assembly Manual	£6-30
National SC/MP Technical Description	£1-95
2650 Microprocessor Manual 220 pp	£24-50

DATASHEETS on Microprocessors: (usually Xerox Copies)

Intersil IM6100 12 bit CMOS	£0-75	RCA CDP1802 8 bit CMOS	£0-75
National SC/MP 8 bit, Low cost	£0-75	Zilog Z80	£0-75
Signetics 2650 8 bit, Low cost	£0-75	Motorola MC6800	£0-75

CMOS From the top manufacturers, mainly RCA and MOTOROLA

CD4000 0-17	CD4027 0-64	CD4051 1-07	CD4086 0-82	CLOCK	
CD4001 0-18	CD4028 1-03	CD4052 1-07	CD4089 1-73	CHIPS	
CD4002 0-17	CD4029 1-31	CD4053 1-07	CD4090 0-82	AY51202	2-89
CD4006 1-35	CD4030 0-64	CD4054 1-33	CD4049 2-15	AY51224	3-50
CD4007 0-18	CD4031 2-55	CD4055 1-51	CD4095 1-20	MK50253	5-60
CD4008 1-11	CD4132 2-23	CD4056 1-51	CD4096 1-20	FLAT	
CD4009 0-64	CD4033 1-60	CD4059 5-48	CD4097 4-28	CABLE	
CD4010 0-64	CD4034 2-19	CD4060 1-23	CD4098 1-26	20-w 1m.	1-00
CD4011 0-20	CD4035 1-35	CD4063 1-26	CD4099 2-11	10m, for	8-00
CD4012 0-19	CD4036 3-65	CD4066 0-71	CD4502 1-43	VEROCASES	
CD4013 0-64	CD4037 1-09	CD4067 4-28	CD4510 1-57	751410J	3-64
CD4014 1-16	CD4038 1-24	CD4068 0-24	CD4511 1-80	751411D	2-84
CD4015 1-16	CD4039 3-55	CD4069 0-24	CD4514 3-15	751237J	1-72
CD4016 0-64	CD4040 1-23	CD4070 1-24	CD4515 3-60	751237D	2-15
CD4017 1-16	CD4042 0-96	CD4071 0-24	CD4516 1-56	SUNDRY	
CD4018 1-16	CD4042 0-96	CD4072 0-24	CD4518 1-25	CA3130	1-14
CD4019 0-64	CD4043 1-16	CD4073 0-24	CD4520 1-43	uA 741	0-35
CD4020 1-28	CD4044 1-07	CD4075 0-24	CD4527 1-82	SOLDERCON	
CD4021 1-16	CD4045 1-61	CD4076 1-61	CD4532 1-65	PINS	
CD4022 1-11	CD4046 1-53	CD4079 0-60	CD4555 1-04	1000	0-50
CD4023 0-24	CD4047 1-04	CD4078 0-24	CD4556 1-04	FAST SERVICE.	
CD4024 0-89	CD4048 0-64	CD4081 0-24	MC14528 1-22	We guarantee that Telephone Orders for goods in stock, received by 4.15 Mon-Fri, will be despatched the same day. Private customers use Access or Barclaycard (min. tel. order £5). Official orders no min.	
CD4025 0-24	CD4049 0-64	CD4082 0-24	MC14553 4-68		
CD4026 1-98	CD4050 0-64	CD4085 0-82	IM6508 8-05		

SINTEL

PO BOX 57,
Oxford
Tel. 0865 49791



PRECISION PETITE LTD.

119A HIGH STREET, TEDDINGTON, MIDDX. TEL. 01-977 0878

24 hour telephone answering service

NOW PRESENT THEIR NEW DRILL!

(MODEL P2)

WITH OUR CURRENT MODEL P1
"THE PERFECT PAIR"

SPECIFICATIONS

- MODEL P2 (illustrated)**
- Diam. 170 x 40mm
 - Weight 300g.
 - Torque 320cmg. r.p.m. 12,000
 - 4 collets 0-3-5mm
 - 3 amp 12v. DC
- Price incl. VAT £16-50. p.p. 65p

- MODEL P1**
- Diam. 33mm
 - Length 125mm
 - Weight 160g.
 - 3 collets 0-2-5mm
 - R.P.M. 10,000
 - Torque 120cmg
 - 2 amp 12v. D.C.
- Price incl. VAT £8-79. p.p. 35p

STAND AVAILABLE FOR P.1.
P.2 STAND SOON!

Variable Speed Transformer for both drills available.



SAE 9x4" for Leaflets and Order Form

'GREENWAY'

RADIAL Lead Polyesters—from 3p.
Radial Lead Polycarbonate—from 25p.
Dipped Tantalum—from 10p. Send for List of Prices.

Potentiometers Presets *Piher Horizontal & Vertical. **Linear** 2W 100R; 220R; 470R; 1K; 2K2; 4K7; 10K; 22K; 47K; 100K; 220K; 1 Meg 12p. ***Carbon Track Potentiometers**—single Gang 25W Log & Lin (2K2-). Values as Presets 25p each. Switch Type D.P. (250V)—55p.

BARGAINS *10p each 14mm & 18mm Ferrites; Twin Mounted Pots 50K Log AB; Slide Switch 47K Log; Slider Potentiometer (stereo 20p); Phono Panel with 4 sockets 6/10/12/17 way; Connectors .15 pitch; L1296 28V Lamps; 1 1/4 P.C. Fuseholders; Mixed Concentric Pots 100K & 10K.

SPECIAL OFFER Toroidal Transformers 20V 500MA; 35V 200MA £1-25 + 42p p&p. A.C. Capacitors 16mfd 500V £1-25 + 42p p&p. Isostat Solinoid Switch Coil 16ahms 24V 60p.

INDUSTRIAL DISTRIBUTORS—Send S.A.E. for Mail Order List. VAT (*) Add 12 1/2%, others 8%. P&p on orders under £3 25p.

Greenway Electronic Components

(East Grinstead), Ltd.

62 Maypole Rd., Ashurst Wood, East Grinstead, Sx. RH19-3RB.

Tel: Forest Row 3782 (STD 034-282) 3713

15-240 Watts!

HY5 Preamplifier

The HY5 is a mono hybrid amplifier ideally suited for all applications. All common input functions (mag Cartridge, tuner, etc) are catered for internally. The desired function is achieved either by a multi-way switch or direct connection to the appropriate pins. The internal volume and tone circuits merely require connecting to external potentiometers (not included). The HY5 is compatible with all I.L.P. power amplifiers and power supplies. To ease construction and mounting a P.C. connector is supplied with each pre-amplifier.

FEATURES: Complete pre-amplifier in single pack—Multi-function equalization—Low noise—Low distortion—High overload—Two simply combined for stereo.

APPLICATIONS: Hi-Fi—Mixers—Disco—Guitar and Organ—Public address

SPECIFICATIONS:

INPUTS: Magnetic Pick-up 3mV; Ceramic Pick-up 30mV; Tuner 100mV; Microphone 10mV; Auxiliary 5-100mV; Input impedance 4-7k Ω at 1kHz.

OUTPUTS: Tape 100mV; Main output 500mV R.M.S.

ACTIVE TONE CONTROLS: Treble \pm 12dB at 10kHz; Bass \pm at 100Hz.

DISTORTION: 0-1% at 1kHz. Signal/Noise Ratio 68dB.

OVERLOAD: 38dB on Magnetic Pick-up. SUPPLY VOLTAGE \pm 16-50V.

Price \pounds 4.75 + 59p VAT P&P free.

HY30 15 Watts into 8 Ω

The HY30 is an exciting New kit from I.L.P. It features a virtually indestructible I.C. with short circuit and thermal protection. The kit consists of i.C., heatsink, P.C. board, 4 resistors, 6 capacitors, mounting kit, together with easy to follow construction and operating instructions. This amplifier is ideally suited to the beginner in audio who wishes to use the most up-to-date technology available.

FEATURES: Complete Kit—Low Distortion—Short, Open and Thermal Protection—Easy to Build

APPLICATIONS: Updating audio equipment—Guitar practice amplifier—Test amplifier—audio oscillator.

SPECIFICATIONS:

OUTPUT POWER 15W R.M.S. Into 8 Ω ; DISTORTION 0-1% at 1-5W.

INPUT SENSITIVITY 500mV. FREQUENCY RESPONSE 10Hz-16kHz—3dB.

SUPPLY VOLTAGE \pm 18V.

Price \pounds 4.75 + 59p VAT P&P free.

HY50 25 Watts into 8 Ω

The HY50 leads I.L.P.'s total integration approach to power amplifier design. The amplifier features an integral heatsink together with the simplicity of no external components. During the past three years the amplifier has been refined to the extent that it must be one of the most reliable and robust High Fidelity modules in the World.

FEATURES: Low Distortion—Integral Heatsink—Only five connections—7 amp output transistors—No external components

APPLICATIONS: Medium Power Hi-Fi systems—Low power disco—Guitar amplifier

SPECIFICATIONS: INPUT SENSITIVITY 500mV

OUTPUT POWER 25W RMS into 8 Ω LOAD IMPEDANCE 4-16 Ω DISTORTION 0-04% at 25W

at 1kHz SIGNAL/NOISE RATIO 75dB FREQUENCY RESPONSE 10Hz-45kHz—3dB.

SUPPLY VOLTAGE \pm 25V SIZE 105 50 25mm

Price \pounds 6.20 + 77p VAT P&P free.

HY120 60 Watts into 8 Ω

The HY120 is the baby of I.L.P.'s new high power range. Designed to meet the most exacting requirements including load line and thermal protection this amplifier sets a new standard in modular design.

FEATURES: Very low distortion—Integral heatsink—Load line protection—Thermal protection—Five connections—No external components

APPLICATIONS: Hi-Fi—High quality disco—Public address—Monitor amplifier—Guitar and organ

SPECIFICATIONS

INPUT SENSITIVITY 500mV.

OUTPUT POWER 60W RMS into 8 Ω LOAD IMPEDANCE 4-16 Ω DISTORTION 0-04% at 60W

at 1kHz SIGNAL/NOISE RATIO 90dB FREQUENCY RESPONSE 10Hz-45kHz—3dB SUPPLY VOLTAGE

\pm 35V

SIZE 114 50 85mm

Price \pounds 14.40 + \pounds 1.16 VAT P&P free.

HY200 120 Watts into 8 Ω

The HY200 now Improved to give an output of 120 Watts has been designed to stand the most rugged conditions such as disco or group while still retaining true Hi-Fi performance.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—Integral heatsink—No external components

APPLICATIONS: Hi-Fi—Disco—Monitor—Power slave—Industrial—Public Address

SPECIFICATIONS

INPUT SENSITIVITY 500mV

OUTPUT POWER 120W RMS into 8 Ω LOAD IMPEDANCE 4-16 Ω DISTORTION 0-05% at

100W at 1kHz.

SIGNAL/NOISE RATIO 96 dB FREQUENCY RESPONSE 10Hz-45kHz—3dB SUPPLY VOLTAGE

\pm 45V

SIZE 114 100 85mm

Price \pounds 21.20 + \pounds 1.70 VAT P&P free.

HY400 240 Watts into 4 Ω

The HY400 is I.L.P.'s "Big Daddy" of the range producing 940W into 4 Ω It has been designed for high power disco address applications. If the amplifier is to be used at continuous high power levels a cooling fan is recommended. The amplifier includes all the qualities of the rest of the family to lead the market as a true high power hi-fidelity power module.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—No external components.

APPLICATIONS: Public address—Disco—Power slave—Industrial

SPECIFICATIONS

OUTPUT POWER 240W RMS into 4 Ω LOAD IMPEDANCE 4-16 Ω DISTORTION 0-1% at

240W at 1kHz

SIGNAL NOISE RATIO 94dB FREQUENCY RESPONSE 10Hz-45kHz—3dB SUPPLY VOLTAGE

\pm 45V

INPUT SENSITIVITY 500mV SIZE 114 x 100 x 85mm

Price \pounds 29.25 + \pounds 2.34 VAT P&P free.

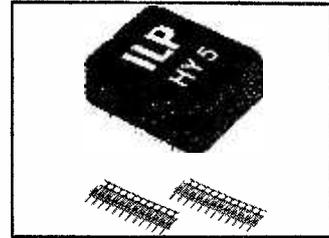
POWER SUPPLIES

PSU36 suitable for two HY30's \pounds 4.75 plus 59p VAT, P/P free.

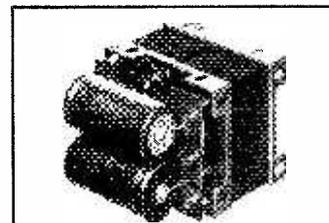
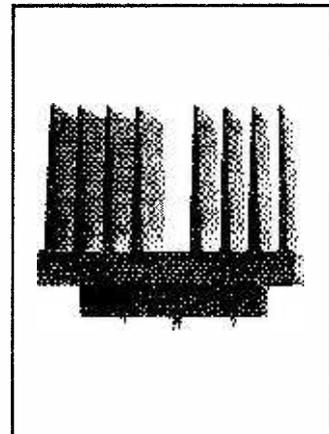
PSU50 suitable for two HY50's \pounds 6.20 plus 77p VAT, P/P free.

PSU70 suitable for two HY120's \pounds 12.50 plus \pounds 1.00 VAT, P/P free.

PSU90 suitable for one HY200 \pounds 11.50 plus \pounds 0.92 VAT, P/P free.



**Available
June '76**



TWO YEARS' GUARANTEE ON ALL OF 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 _____

RATION CARDS

It is suggested that we have had an excellent supply of electronic components at extremely cheap prices, but that this will cease. Components will become that "precious" commodity just like water to the man in the desert. In the coming years prices will rise sharply and wastage will be a serious consideration for all hobbyists. Some people in the retail trade are hinting at component shortages, an event not uncommon in the professional/industrial electronics field.

Semiconductors are a good example. First there was a boom in semiconductors, and in IC's in particular. Larry Curry of SGS said at that time, "When will this bonanza cease?" But it didn't cease, and IC manufacturers, in order to keep pace with the huge and growing demand for the product, laid down more and more production lines. They ploughed huge sums of money into the business—all of it invested in plant and personnel. Then came the slump. Millions of dollars were left standing idle in the form of machinery and other capital equipment which was suddenly not needed anymore.

Today, if there is a shortage, very few manufacturers indeed are prepared to invest vast sums in capital equipment in order to meet increased demands. They did that last time—and it cost them a fortune. Today, when a demand grows, it merely means a longer and longer wait for the customer, with delivery times stretching out into months.

One professional component distributor said recently that there was a 9 month delivery on some types of capacitor. On certain other capacitors the waiting time for delivery was 18 (eighteen) months.

We cannot get round the problem by simply importing. Most countries will satisfy the demands of their own countrymen first (with the possible exception of Britain!).

German suppliers are well known for this. Certainly they will sell you components. But let there be a shortage in Germany and they will immediately switch all their production sales (including those items promised to you!) to home market sales. After all, they still get paid for their product, but by selling it at home they are helping their German manufacturing friends to complete instrumentation and equipment which is often to be exported.

So shortages are coming and many are here. Prices of those components are rising too—and will rocket up far higher before too long.

If components really do get short, and I suggest that they will, could we see the introduction of component "ration books"? During the last, war food was rationed because it was in short supply. Your ration book was stamped or a "coupon" was cut out when you'd had your share. Can the same thing happen in electronics? Will shops introduce their own rationing system?

Before you even mention Black Market (Psst—wanna buy a BC109 for a quid guv'nor?) remember that I said component prices will soar. On the Black Market the cost would be even higher.

Constructors of the future will have to think twice about exactly what they are going to build. In Practical Wireless we are running a series which uses a solderless "plug-in" breadboard to construct circuits. Because the components are plugged in they can also be unplugged afterwards and thus used again and again. So at least we are guiding the home constructor towards some saving and economy in components.

In the meantime, hang on to that "junk box". In later years the sale proceeds could see you nicely through your old age!

LIONEL E. HOWES—*Editor*

NEWS...

Careers for the future

THE theme for next year's IEETE's education conference, EASCON '77 will be career opportunities for young people as technician engineers and technicians in electrical and electronic engineering. The IEETE hope that by arranging a programme to attract careers advisers from schools and local authorities, they will play an important role in formulating and expressing the purpose of education standards the country needs.

The conference is to be a one-day event held in two separate centres. These two centres are (1) North Staffordshire Polytechnic, Stafford, on Monday, 4th April. (2) South Thames College, Wandsworth, on Wednesday, 6th April.

Further details may be obtained from *The Conference Secretary, IEETE, 2 Savoy Hill, London WC2R 0BS. Tel: 01-836 3357.*

Bury club

CONTINUING on the educational theme, just a short note here to inform readers in the Bury area that the local Radio Society meets every second Tuesday of each month. Meeting place is the Mosses Community Centre, Cecil Street, Bury, Lancs.

Also at the same address, and meeting every Tuesday are classes for Morse and the R.A.E. Any further information may be obtained from *The Secretary, John Clifford G4BVE, 10 Arley Avenue, Bury, Lancs.*

Tandys latest

NO doubt many readers have seen the adverts for Tandy Stores and may wish to know exactly what the stores sell. To satisfy this need, Tandy have recently launched their new 1977 Catalogue which is now available in all of their 160 outlets throughout the UK. What's more—its FREE.

Shown on the next page, this new catalogue must be one of the most comprehensive available to

the general public, and covers just about everything that is mains or battery powered, has a section for the home constructor, and



further sections of educational kits, calculators, aerials and speaker units.

Two new models that are included for the first time are the Tandy Music Centre which features an AM/FM stereo tuner, cassette deck, record deck and amplifier, and the Tandy Stereo Cassette Decks which are complete with Dolby circuitry. The Music Centre carries a price tag of £177.50, while the cassette decks range from £99.95 to £159.95.

Tandy Corporation, Bilston Road, Hollyhead Road, Wednesbury, West Midlands WS10 7JN.

HiFi in '77

THE 1977 edition of *HiFi Year Book*, now published, contains 500 pages and details of just about everything in the world of HiFi.

The book comprises 27 sections, from Amplifiers, Headphones, Surround Sound, Speakers and Receivers to Tape, Unit Audio and Pickups. Also amongst the sections is a directory listing hundreds of HiFi dealers, and additional articles on various HiFi subjects.

HiFi Year Book can be obtained

Practical Wireless, January 1977

from newsagents and booksellers at £3 a copy, or for £3.40, inclusive of postage and packing, from *General Sales Department, IPC Electrical-Electronic Press Ltd., Room 11, Dorset House, Stamford Street, London SE1 9LU. Telephone 01-261 8643.*

RSGB states its mind

IT has become apparent that many readers have strong feelings concerning the introduction of CB into this country. PW has been publishing many letters on this subject and we were pleased to receive a communication from the RSGB explaining their position on this rather delicate subject. We print below the complete letter received and hope that it makes the Societies' position clear to our readers.

The Society is aware of the numerous items that have appeared on this subject in various journals both as correspondence and as feature articles. It is apparent that much of this material has been generated by those who will profit financially from the introduction of the facility rather than potential users.

The Society is often asked to state its policy on a citizens' band. It is somewhat difficult to offer an informed opinion on a matter concerning which nothing definite is known. Understandably no guide lines are available from the administration regarding the various possibilities and it is in this context that the following statement is made.

The matter of a citizens' band is under continual consideration by the Society's Telecoms Liaison Committee and the Council approves its present views which are:

(a) The RSGB exists to safeguard the interests of its members and of the Amateur Service in the UK. The Amateur Service is a defined service in the Radio Regulations (Geneva 1976) and is accorded world wide status in the same way as the professional services. A citizens'

facility exists only where a national administration is prepared to set aside spectrum space for this use.

- (b) While the RSGB may have no direct interest in a citizens' band facility by its present articles of association it must, in the interests of its members, take heed to developments likely to affect the Amateur Service.
- (c) The major consideration affecting the introduction of any new facility is the ability of the administration to exercise complete and effective control. Anything less is not acceptable.
- (d) The RSGB is not opposed to the introduction of a short range personal communications facility provided that its location in the spectrum and the equipment used are suitable. The 27MHz band as used in the USA and some European countries is probably one of the most unsuitable frequency bands that could be envisaged. There are three main reasons:
- (i) its proximity to the amateur 28MHz band and the consequent availability of high power equipment together with the ease of illegal operation in this band,
 - (ii) the existence of long distance propagation during part of the sunspot cycle, and
 - (iii) the interference to television receivers, particularly those operating in Band 1.
- Having regard to equipment now available it would appear that a vhf or uhf fm service with power limitation, crystal control and type approved apparatus could be suitable.
- (e) Location of a citizens' band within an existing amateur service allocation is not acceptable to the RSGB. Further, if this facility is eventually allowed it ought to be located in a part of the spectrum remote from any amateur allocation to prevent illegal operation in an amateur band such as is now experienced in the USA.

an oscilloscope CALIBRATOR

J. THORNTON LAWRENCE (R. Tech. Eng.) GW3JGA

AN oscilloscope draws a graph of voltage against time. On some older and on most new oscilloscopes the voltage (Y axis) and the time (X axis) are calibrated in precise units of voltage and time per centimetre of deflection. The X time base can be calibrated by displaying the output of a signal generator or crystal calibrator, but the calibration of the Y amplifier and attenuator requires a square-wave generator giving a square-wave of known amplitude.

The Oscilloscope Calibrator to be described provides a square-wave of known amplitude which is switchable over the range 1mV to 5V peak-to-peak. The switching is in a 1-2-5 sequence which matches the usual oscilloscope input attenuator ranges. The square-wave output is approximately 1kHz in frequency and is also suitable for setting up the input attenuator frequency compensation and oscilloscope probe adjustments.

For uncalibrated oscilloscopes, the Calibrator will enable the Y gain to be set correctly for the range in use. The Calibrator is also useful in measuring stage gain in amplifiers and checking, by substitution, the output voltages of other equipment.

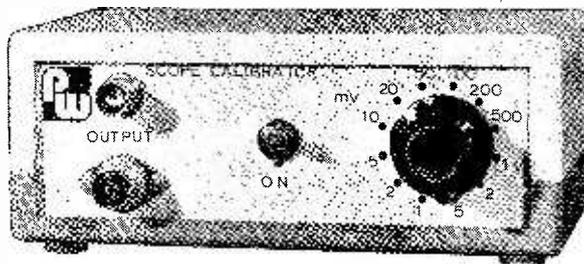
CIRCUIT

The circuit consists of a two-transistor multivibrator and a switched attenuator. The addition of a 'disconnect' diode, D2, to the standard multivibrator circuit enables a good clean square-wave output to be obtained at the collector of Tr2. PNP transistors are used to generate a conventional positive-going output waveform. The switched, two stage, attenuator provides a variable amplitude output at the BNC and Belling-Lee co-ax sockets. The complete circuit is shown in Fig. 1.

The astable multivibrator base timing components C2, R3 and C3, R4 each give a half cycle time constant of approximately 500µs and thus a square-wave output of 1ms period (1kHz frequency). The recharge of C2 is through R2 and the recharge of C3 is through R5, the 'disconnect' diode D2, allowing the collector of Tr2 to fall instantaneously to 0V when Tr2 is switched off, thus giving the clean square-wave required. A zener diode regulator is included to stabilise the supply voltage to the multivibrator.

ATTENUATOR

The output attenuator is arranged in two stages, the first section providing outputs of 5, 2 and 1V, 500, 200 and 100mV. The second section providing an attenuation of 100:1 and giving outputs of 50,



20, 10, 5, 2, and 1mV. The two sections are arranged on two 1-pole 12-way switch wafers, S2, and gives an overall range of 5V to 1mV peak-to-peak. Ideally the resistors in the attenuator should be 1% types but in the interests of economy and availability, 2% metal oxide types are used.

CONSTRUCTION

The main part of the circuit is built on a PC board, but the attenuator resistors are wired on the switch directly, as shown in Fig. 2. The PC board is mounted on the attenuator rotary switch pillars and the

★ components list

Resistors			
R1 22M		R6 3kΩ	
R2 4.7kΩ	All 5%	R7 1kΩ	
R3 150kΩ	carbon	R8 510Ω	
R4 150kΩ	film	R9 100Ω	All 2% metal oxide (Dorran)
R5 10kΩ		R10 100Ω	
		R11 100Ω	
		R12 500Ω	
		R13 3kΩ	
VR1	1kΩ skeleton pre-kt		
Capacitors			
C1	100µF 16V		
C2 and C3	4.7nF polyester or polystyrene		
Semiconductors			
D1	BZV55-C5V6 (5.6V 400mW)	Tr1	BC214
D2	1N4148	Tr2	BC214
Miscellaneous			
S1, Single pole on-off miniature toggle. S2, comprising shafting unit (Dorran 327-425), 2 off 1-pole 12-way wafers (327-440), 4 off spacers (327-557), BNC socket, Belling-Lee socket, knob for S2, PCB from PW Readers PCB Services, see ad. Verobox 75-1238D from Vero Electronics Ltd, Industrial Estate, Chandlers Ford, Hants SO8 3ZR. PP8 battery (9V) and connectors.			

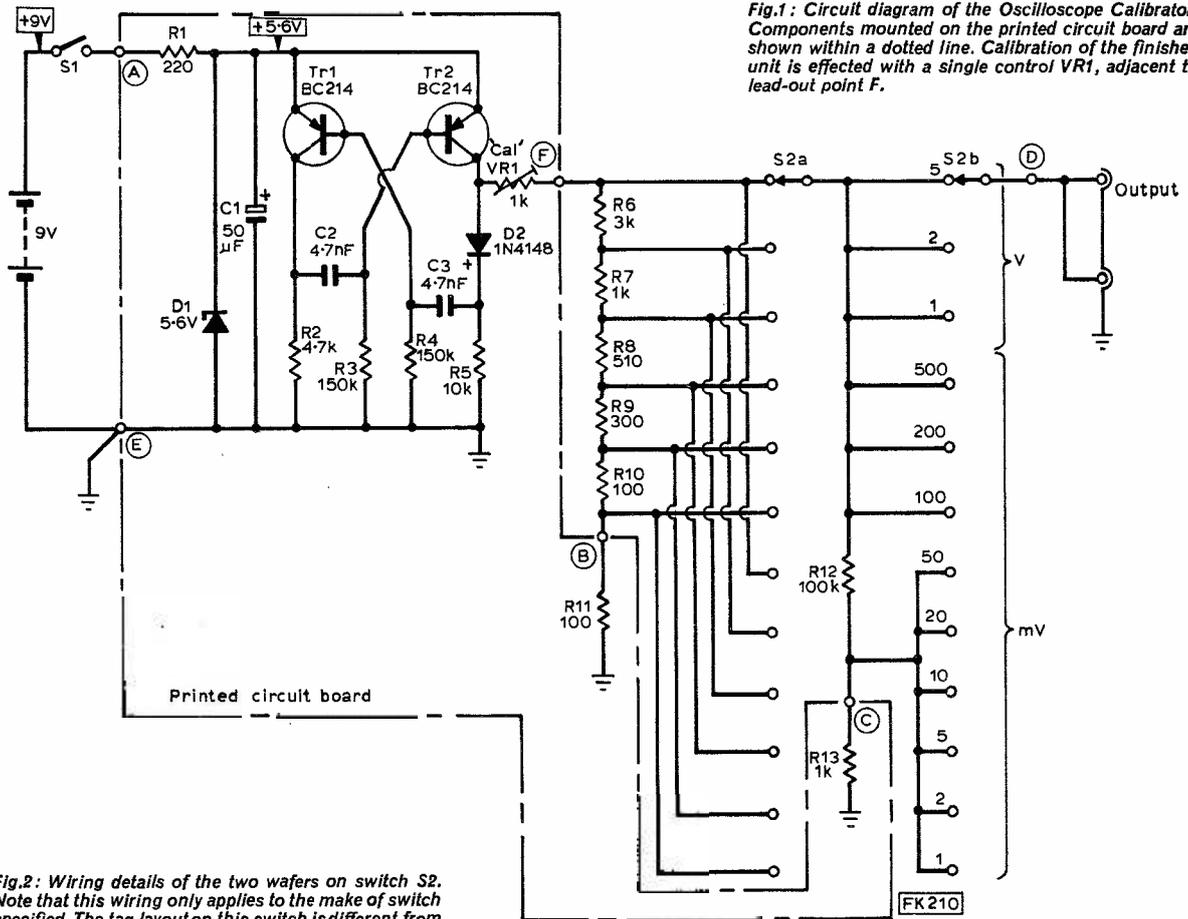
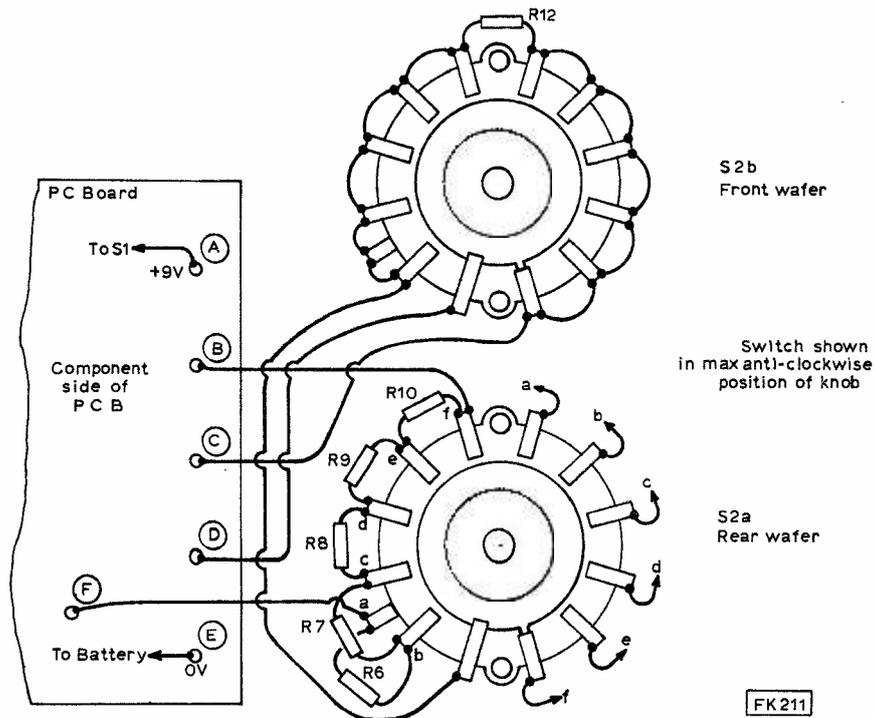


Fig.1: Circuit diagram of the Oscilloscope Calibrator. Components mounted on the printed circuit board are shown within a dotted line. Calibration of the finished unit is effected with a single control VR1, adjacent to lead-out point F.

Fig.2: Wiring details of the two wafers on switch S2. Note that this wiring only applies to the make of switch specified. The tag layout on this switch is different from that on conventional 1-pole 12-way wafers which can be used provided the wiring diagram is followed. Do not forget the connections a-a etc.



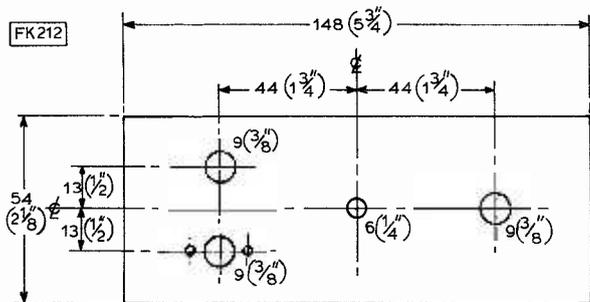


Fig. 3: Suggested layout for the front panel on the Oscilloscope Calibrator.

switch itself is mounted on the front panel. The front panel drilling is shown in Fig. 3.

The Calibrator is housed in a Verobox along with the PP6 battery. The battery is held in position with a small pad of plastic foam material, cut to size.

The PC board and component layout is shown in Figs. 4/5, including the connecting wires to the remaining components and switches.

CALIBRATION

With any calibrator, there is the usual problem of its own calibration, but in this circuit it can be easily carried out using a high resistance DC voltmeter. The base and emitter of Tr1 are temporarily shorted together to stop the multivibrator running whilst leaving Tr2 conducting. With the output set to 5V and a 20kΩ/V meter (Avo 8 etc.) connected across the output, adjust VR1 to give a reading of 5V on the meter. With the short on Tr1 removed, the output will be a square-wave of amplitude 5V peak-to-peak. This completes the calibration.

Fig. 4: The foil layout of the printed circuit board is given here full size. The centres of the fixing holes for the switch may need modifying if a switch different from that specified is used.

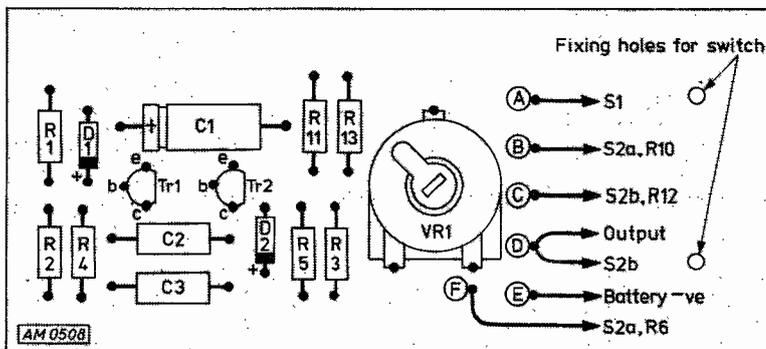


Fig. 5: Layout of the components on the PCB. The output lead D should go to both sockets which are connected in parallel.

ACCURACY

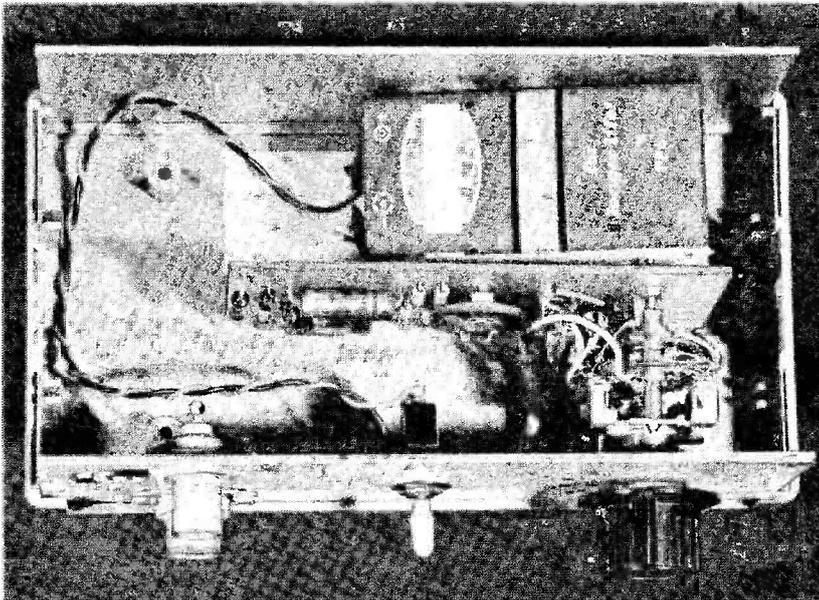
The accuracy of the Calibrator is dependent on a number of factors, the accuracy of the meter used for calibration, the accuracy of the attenuator resistors and the loading on the output. In order not to load the output unduly, the output of the Calibrator should not feed into an impedance of less than about 100kΩ. Providing this is observed and the setting-up is carried out carefully the output voltage inaccuracy should not exceed about ±5% of range and will probably be considerably better than this.

CALIBRATING A SCOPE

1. Set the oscilloscope to its most sensitive basic range, usually 10mV/cm or 100mV/cm. (If the oscilloscope has a X10 or X100 pre-amplifier, leave the setting on X1.)
2. Set the Calibrator to a range which gives about 2cm peak-to-peak display. Using the time base controls, lock the timebase to display 2 to 4 cycles.
3. Adjust the Oscilloscope SET GAIN control to give the correct amplitude of display, e.g. oscilloscope 100mV/cm, Calibrator 200mV, display 2cm p-p.

If, due to the frequency response of the oscilloscope, the top and bottom edges of the displayed square-wave are not absolutely flat, ignore any 'overshoots' and use the main horizontal portion of the displayed waveform.

4. Check the Y sensitivity of the oscilloscope at all positions of the input attenuator/gain control using a deflection of 1cm, or 2cm if greater viewing accuracy is required.
5. Adjustment of the Oscilloscope input attenuator compensation can be carried out successfully



Top view of the finished Calibrator. The PCB is bolted to the switch which can be wired to the PCB before it is fixed to the front panel, leaving only the wiring to the output socket, on-off switch and battery.

Output Setting	dB change
5V	8
2V	6
1V	6*
500mV	8*
200mV	6*
100mV	6*
50mV	8
20mV	6
10mV	6
5mV	8
2mV	6
1mV	6

Example:— Initial setting 1V, input to amplifier for 1V output is 50mV. Gain = 6* + 8* + 6* + 6* dB = 26dB.

using the Calibrator, but this should only be done by the method given in the maker's Service Manual.

Where the Oscilloscope does not have a calibrated Y input, the Calibrator may be connected temporarily and the oscilloscope 'Y gain' control set to give a specific deflection. The signal to be measured is then connected and its amplitude estimated against the previous deflection.

AMPLIFIER GAIN

The Calibrator can also be used for checking the approximate gain of audio and wide-band amplifiers. For this test, the oscilloscope is first connected to the Calibrator and the oscilloscope Y sensitivity set for a known deflection, e.g., 1V/cm. The oscilloscope

is then connected to the output of the amplifier under test and the input of the amplifier is connected to the Calibrator.

The Calibrator output is adjusted to give the same amplitude of signal on the oscilloscope. The amplifier gain can then be estimated by noting the two output settings and adding together the individual decibel (dB) equivalents between the two settings, as shown in the table. 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, King's Reach
Tower, Stamford St., London, SE11 5LS.

**PLEASE MENTION
PRACTICAL WIRELESS
WHEN REPLYING TO
ADVERTISEMENTS**

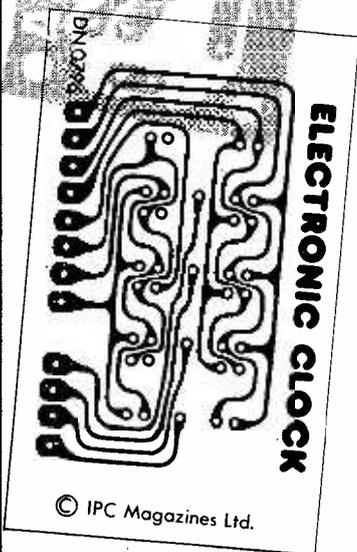
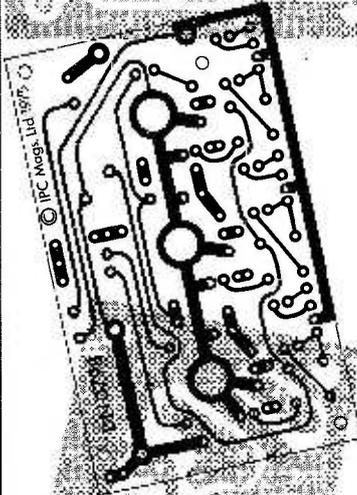
PCB SERVICE FOR READERS

All boards, except SRBP, are glassfibre, drilled and roller-tinned

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 P/P	
Sep 75	Electronic Clock (set of three)	DN0795/6/7	2.40+15	<input type="checkbox"/>
Dec 75	Random Number Selector	DN0793A	0.98+12	<input type="checkbox"/>
Dec 75	Sound-To-Light Display	DN0798	1.15+12	<input type="checkbox"/>
Dec 75	12V PA System	DN2/JM	0.98+12	<input type="checkbox"/>
Dec 75	Disco System, Amplifier (2 required)	each AM0421	4.40+22	<input type="checkbox"/>
Dec 75	Disco System, Light Modulator	AM0423	3.50+22	<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"/>
Mar 76	CMOS Crystal Calibrator	AM0438	1.19+12	<input type="checkbox"/>
Apr 76	DF Receiver (set of two)	DN4/JM DN5/JM	1.92+15	<input type="checkbox"/>
Apr 76	Wobblulator	AM0443	1.08+12	<input type="checkbox"/>
Apr 76	Auto. Slide Synchroniser	AM0441	2.33+15	<input type="checkbox"/>
June 76	Dig. Freq. Meter (set of 4)	4X A004	3.17+15	<input type="checkbox"/>
Jul 76	Transistor Tester	A002	3.08+18	<input type="checkbox"/>
Jul 76	Disco Preamplifier	A003	0.65+12	<input type="checkbox"/>
Aug 76	Cassette Player Power Supply	A001	0.65+12	<input type="checkbox"/>
Sep 76	Jingle Machine	A005	2.30+12	<input type="checkbox"/>
Sep 76	Capacitance Meter	A009	2.59+14	<input type="checkbox"/>
Sep 76	Octavia AF Source	A010	1.30+12	<input type="checkbox"/>
Oct 76	Jingle Machine, Mains Unit	A006	2.08+12	<input type="checkbox"/>
Oct 76	Digital Car Clock (set)	A001/2/3	2.58+12	<input type="checkbox"/>
Oct 76	Interwipe	DN8JM	0.80+12	<input type="checkbox"/>
Oct 76	Video-Writer (set)	D002/3/4/6 A007	21.44+50	<input type="checkbox"/>
Oct 76	Hazard Flasher	D005	0.76+12	<input type="checkbox"/>
Nov 76	Low Level Battery Indicator	A016	0.40+12	<input type="checkbox"/>
Nov 76	Electronic Thermostat	A017	1.30+12	<input type="checkbox"/>
Nov 76	Cirtest Probe	A018	0.48+12	<input type="checkbox"/>
Nov 76	Burglar Alarm	A019	0.50+12	<input type="checkbox"/>
Nov 76	DFM Pre-scaler PCB A015 will be added to set of four DFM boards at no extra cost.			<input type="checkbox"/>
Dec 76	Chromachase	A021	5.70+22	<input type="checkbox"/>
Jan 77	Oscilloscope Calibrator	A023	1.25+12	<input type="checkbox"/>
Jan 77	Icelert	A020	1.45+12	<input type="checkbox"/>
Jan 77	Polyphon, motor and main boards	A025/4	7.90+20	<input type="checkbox"/>
	Polyphon, tune disc, blank, SRBP	A008*	0.90+15	<input type="checkbox"/>



Post and packing is for one board or set of boards. 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



ACCESS welcome.

No.....

Send card number only.

for £..... made payable to READERS PCB SERVICES LTD.

NAME.....

ADDRESS

..... Post Code

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

'ICELEERT'

BLACK ICE WARNING



IAN HICKMAN

WITH the approach of winter and the possibility of icy roads, the author considered the advisability of fitting an alarm to his car to warn of the danger of "black ice". A thick covering of frost on the road is easy to see, but where the road is already wet before the temperature falls, the water can freeze as a transparent glaze not easily noticed, with maybe alarming results for the unwary driver.

My filing system divulged a faded photocopy showing a circuit diagram and the following notes:

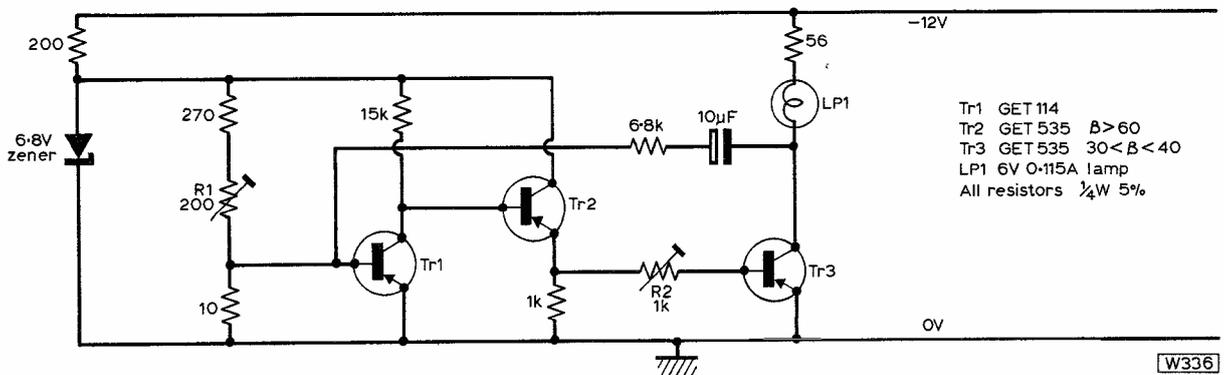
"On a windless night with a clear sky, ice can form on the road surface when the temperature 2 feet above ground level is 2°C. On a windy night with cloudy sky, ice only forms when temperature drops to 0°C. This circuit causes the lamp to start flashing when the temperature drops to 2°C, and to stay permanently lit when it drops to 0°C.

With Tr1 on a heat sink at 0°C, R1 is adjusted so that the lamp is lit but on the verge of flashing. Raise heat sink temperature to 2°C and adjust R2 so that the lamp is out but on the verge of flashing. Repeat these two adjustments as above, since the controls slightly interact.

Except for the dash mounted lamp, the circuit should be installed in a metal box forming a heat sink for Tr1 and mounted at the front of the vehicle exactly two feet from the ground. It should be mounted so that it is in a free flow of air and not likely to receive heat either conducted or radiated from the vehicle."

The circuit is reproduced as Fig. 1. Readers with the appropriate old transistors lurking in the junk box may care to experiment with it. It is an exceedingly ingenious example of what can be done with a very few components, but (although I haven't tried it out) calculations show that it is five times more sensitive to variations in the 12V supply than the circuit which forms the main subject of this article. The requirement for a heat plate capable of being set to within a degree Centigrade is also somewhat impractical.

Fig. 1. Circuit diagram of a simple alarm. Simple to make but not to calibrate.



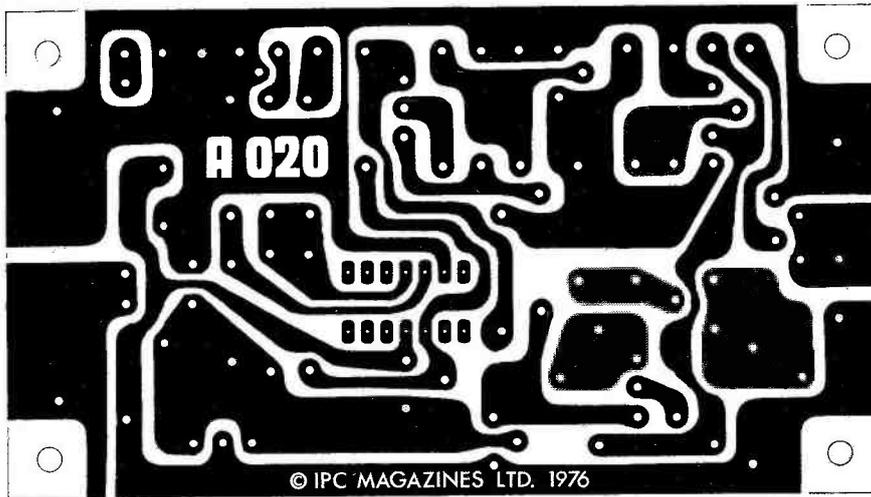
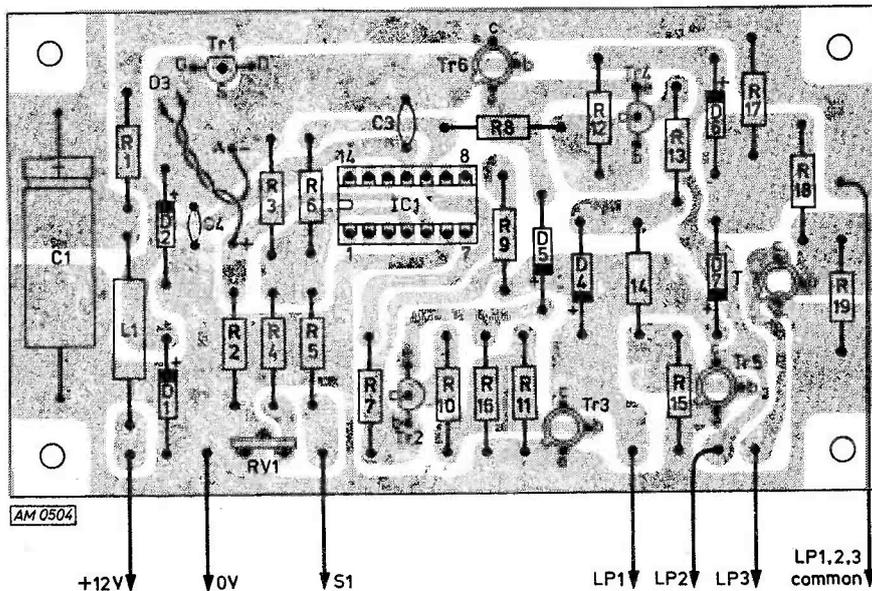


Fig. 3. The pattern on the etched board, shown full size, for the sensing/control unit. The lamp unit does not have a printed board.

Fig. 4. The component locations on the board. Note that although the IC is drawn for a 14 pin device, the 8 pin item can be used if holes at 1, 2, 7, 8, 13 and 14 are not used.



Press-button S1 provides a means of checking the operation of the circuit. When depressed, it injects a current at the junction of R3 and R4 via R5, gradually decreasing as C2 becomes charged. This has the same effect as temporarily increasing the voltage drop across D3, i.e. it simulates a temporary temperature reduction. Therefore, the red lamp will light, followed in turn by the amber lamp and finally returning to green. This not only shows that the circuit is functioning but, as explained earlier, provides a qualitative guide as to how near the temperature is to freezing.

The network L1C1R1D1 protects the circuit from disturbances on the 12V supply. Electrically, a motor car is a fairly hostile environment, with the wiring subject to "spikes" and "surges". The former are

due to high rates of change of current in the inductance of the wiring and may reach several hundred volts for a few microseconds. Surges of many tens of volts, lasting for several milliseconds, are also a hazard. These are limited by R1 and D1, whilst the spikes are tamed by L1 and C1.

Construction

Most of the components are non-critical and generally similar alternatives may be used. However, it is very important that the unit's accuracy should be maintained or it could indicate no ice when ice is present. Therefore, the following components should be as listed:— Tr1, D2, R2, 3, 4, 6, D3, 5. For the same reason, the unit should be recalibrated each autumn (see next section).

★ components list

Resistors	
R1	4.7kΩ
R2	5.6kΩ*
R3	560Ω*
R4	4.7k, 5.6kΩ or 6.2kΩ as required*
R5	27kΩ
R6	82kΩ*
R7	10kΩ
R8	10kΩ
R9	1MΩ
R10	4.7kΩ
VR1	1kΩ (preferably Cermet)
* metal oxide	
Capacitors	
C1	100μF, 25V
C2	22μF, 12V
C3	0.01μF, 12V disc ceramic
C4	0.01μF, 12V disc ceramic
Semiconductors	
Tr1	2N555
Tr2	BC214L
Tr3	BC109
Tr4	BC214L
D1	16V, 1W Zener e.g. 1N4745
D2	6.8V Zener, e.g. BZY88C6V8
D3	1N916
D4	1N916
D5	1N918
D6	1N916
D7	1N916
IC1	741 op. amp.
Tr5	BC109
Tr6	BC109
Tr7	BC109
R11	10kΩ
R12	1MΩ
R13	2.2kΩ
R14	2.2kΩ
R15	3.0kΩ
R16	470Ω
R17	5.6kΩ
R18	3.3kΩ
R19	3.3kΩ
R20	1kΩ

Miscellaneous
Switch, S1, single pole change-over. Lamps, LP1 to LP4 14V, 0.7W. SRBP tube for D3. Box to suit mounting position. 5 core connecting cable (or 5 separate leads) low voltage, low current. L1, 250μH suppression choke.

Before fitting the lid to the box, Red Hermetite or similar waterproof gasketing should be smeared round the lip of the lid. This material is not an adhesive and is non-setting, permitting access at a later date should this be required.

The indicator unit can be mounted at any convenient position near the dashboard. Red, amber and green L.E.Ds (each in series with a 1kΩ resistor) can be used for LP1, 2 and 3 if desired. Due to their lower light output, the indicator would then need to be mounted well within the driver's field of view.

Calibration

This should be carried out outdoors on a cold day, so that the components are at a low temperature. This will ensure that the very small influence which components other than D3 have on the accuracy is quite negligible.

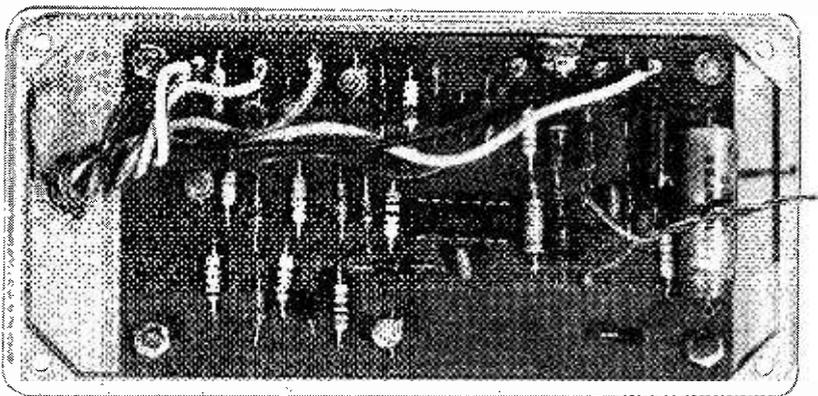
D3 is cooled to 0°C in a mixture of crushed ice in water. After stirring well with the sensor probe to ensure D3 is exactly at 0°C, adjust VR1 so that the red lamp just comes on. Remove the sensor probe and warm slightly. Check that on replacing in the ice mixture and stirring, several seconds elapse before the red lamp comes on. Readjust VR1 if necessary to achieve this.

This completes the calibration, as the temperature at which the amber lamp comes on is fixed by the gain of IC1 and the voltage across D5, at a little over 2°C.

Installation

The completed sensing unit, with D3 fixed at the end of a paxolin tube, mounts behind the radiator grille with the diode projecting through.

The 12V supply to the sensing unit can conveniently be picked up at the dashboard from the supply to accessories controlled by the ignition switch. For example, it can be wired in parallel with the supply to a car radio, in which case it can share the latter's line fuse.



Photograph of the inside of the author's prototype probe box. The wires used were from Crescent Radio and were ideal for the author's Max, the probe box being fitted behind the grille on the off-side and the probe pointing through. Other box sizes and fixing methods may be needed for other cars.

C3 and C4 should be mounted close to IC1, though if the printed circuit board of Fig. 3 is used, this is assured anyway. A good quality low leakage capacitor should be used for C2.

The p.c. board mounts in the box with VR1 adjustable via a hole in the lower edge. This hole also acts as a breather, to prevent condensation becoming trapped within the box.

As the circuitry of the ice alarm is completely isolated from the car chassis, it is equally suitable for fitting in cars with positive or negative earth systems.

Take care to connect in the correct polarity! Reverse polarity will burn out R1, as D1 will protect the rest of the circuit by turning on in the forward direction. Pw



NEW! For home constructor FREE BLOB BOARD!

Worth 30p



BLOB BOARDS

Circuit diagram to circuit board in minutes. Layout circuit plan on .1" graph paper. Select Blob Board, lay components out with leads on copper strip. Blob of solder onto lead and your circuit is complete. Blob Boards normally half price of competitive boards. Roller tinned to solder components directly. No drilling or mounting. Modifications in seconds. Blob Board is re-usable.

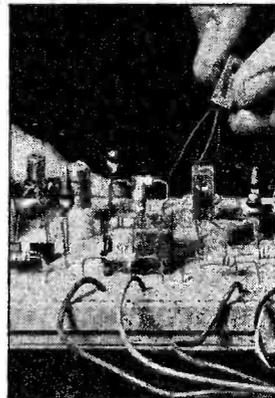
Blob Boards are circuit boards designed exclusively for the home constructor and prototype engineer and are normally half the price of competitive boards. Blob Boards are roller tinned for ease of soldering, most require no cutting or breaking of contact rails, HALF PRICE AND RE-USABLE. That is NEW!

Blob Board .1" or .15" All approx. inch sizes	1 off	3 off	Dip Blob Boards	1 off	3 off
ZB1V 2.5 x 5	£0.30	£0.75	ZB11C 4.5. x 3	£0.36	£0.90
ZB2V 2.5 x 3.75	£0.23	£0.57	ZB21C 4.8. x 3.2	£0.40	£0.96
ZB3V 3.75 x 5	£0.46	£1.14	ZB41C 4.75 x 7.5	£0.85	£2.13
ZB4V 10 x 6	£1.51	£3.78	ZB81C 9.5 x 7.5	£1.70	£4.26
Discrete Blob Board	1 off	3 off	Sample pack: 1 off ZB1V + 1 off ZB8D + 1 off ZB21C normally £2.32 only £2.00 + free Blob Board.		
ZB5D 3.6 x 2.4	£0.20	£0.51	Many other sizes and patterns available add 30p post + 8% VAT to all orders.		
ZB6D 2.4. x 7.3	£0.42	£1.05			
ZB7D 4.9 x 7.3	£0.69	£1.75			
ZB8D 9 x 7.5	£1.62	£4.05			



S-DeC

Take an S-DeC, take a small stock of components. Plug components into S-DeC, no soldering, make a radio receiver, light operated switch, 3 stage amplifier. When circuit is made unplug components and use them again to make a morse practice oscillator, LC oscillator, binary counter and any other discrete circuitry. See Practical Wireless for new series of S-DeC projects. S-DeC + step by step instructions to build above projects and 3 more + which components to use + free control panel for mounting switches, lamps etc. + free Blob Board. S-DeC only £1.98 + 37p (VAT + post) send only £2.35.



T-DeC

If you are using IC's to build circuits use T-DeC for 1 chip circuits and U-DeC A for 2 chip circuits. Draw circuit on graph paper, plug IC into Adaptor and plug into DeC. No soldering, no bent leads, no wasted IC chip. Lines on DeC show contact rails, plug discrete components in. Cross overs, connections are made using different coloured leads. Circuit completed and working unplug components and use for next circuit. No soldering, no damage to components. Use your DeC and small stock of components over and over again. T-DeC send £4.30. U-DeC "A" send £4.60. Adaptor send £2.30.



DRILL-SAW GRIND-BURR BRUSH-POLISH

PB announce a precision British built drill for the home constructor. Works better than most bigger drills and can be used for fine detailed work. Drills through any circuit board, need to break copper strip simply grind it off.
9000 RPM Drill + 20 Assorted tools £11.20 (+VAT + post) Send £13.00.
9000 RPM Drill only £5.22 + post + VAT send £6.00.
Multi-purpose Drill stand £10.60 + Post + VAT send £12.00.

POT LUCK

Off cuts of fibre glass circuit board 5 sq. ft.	£1.50.
Double sided fibre glass p.c.b. 5 sq. ft.	£2.00.
Ferric chloride 5 litre mix	£2.00.
Negative developer 1 litre	£1.50.

Add £0.75p. to all above for Post + VAT.

PB Electronics Scotland Ltd.
57 High Street, Saffron Walden, Essex. CB10 1AA.
For leaflets and further information please send stamped addressed envelope.

Mr. Trader please exchange for 1 Blob Board ZV1V worth 30p.
Trade enquiries please contact Banbridge, London.
Mr. John Evans Tel: 01-228 92221

30p

GREENWELD

443 Millbrook Road Southampton
SO1 0HX Tel: (0703) 772501

All mail order and callers (OPEN 9-6 MON.-SAT.) to this address please
—callers only to 21 Depford Broadway, SE8 (Tel. 01-852 2009), and 38 Lower
Addiscombe Road, Croydon (Tel. 01-885 2850).

TRANSMITTER/RECEIVERS
Redifon G410 Tx/Rx 2-16MHz, 4 Xtal channels (no xtals) or ext. VFO. USB/LSB/CW/AM. Brand new chassis containing PA & Driver sections (no valves—needs Z789 & 2 6146, £10 extra). Complete front end, but 3 PC boards missing. Supplied with separate PSU 12 24V input (state which). Tx O/P 100W. £40-90. Tx/Rx only, £32; PSU only, £16. Circuit diagrams supplied.

Redifon G450 Low Power Transmitter (Exciter), SSB/AM/CW 100mW output. Fully tunable 1.5-30MHz (Needs ext VFO). 10 switched channels xtal controlled (no xtals). All transistor construction. Standard mains supply voltage 240V 50Hz. Brand new units. Needs SSB filter. £40-90.

BUMPER BARGAIN PARCEL
25 kilos—yes, 30v. Starting several stores to make room for new goodies, mountains of miscellaneous items too time consuming to list, so we're disposing of it in this manner. You'll get a great variety of components and make-up units, contents too varied to describe, but excellent value at only £8-80.

716 BARGAIN PARCEL
Hundreds of new components—pots, switches, resistors, capacitors, PC Boards with semiconductors, loads of odds and ends. Amazing value at only £2-99.

CHASSIS OFFER
Limited quantity of these chassis containing the following:- 4x 2N 1613, 8 x Z84, 44 multitrans trim pots, 2 x 18 way rotary switches, stacks of resistors, capacitors (inc tant) etc etc. Only £3-50.

FIBREGLASS PCB
Large quantity of offcuts, all usable pieces, 200-80 ins, single sided, double sided or mixed £1-40.

TRANSFORMERS
All have mains primaries: 6-0-6V 100mA 95p; 9-0-9V 100mA £1-00; 12-0-12V 100mA £1-05; 6-3V 1 1/2A £1-95; 6-0-6V 1 1/2A £2-30; 9-0-9V 1A £2-55; 12-0-12V 1A £2-85; 12V 5A £3-35; 12V 8A £4-35; 30-0-30V 1A £3-80; Multitapped types: 0-12-15-20-24-30V 1A £3-20, 2A £4-50. Bell transformer in white case 0-8-12V 1A £1-80.

VEROBOARD
100 sq ins good size offcuts, all 0-1, all 1-5 or mixed 30, 17 1/2 x 3 1/2 x 0-1 £2. Pins -1 or -15 single or double sided 40p/100.

NEW 44 page CATALOGUE FREE with orders over £2. (Send 10p if under, or 20p stamps for just catalogue).

DEVELOPMENT PACKS
50V ceramic plate capacitors, 5% 10 of each value 22pF to 1000pF, total 210 caps. £2-70.

CR25 carbon film 1/3rd watt resistors, 5%, 10 of each value 10 ohms to 1M Total 610 resistors £6-00. Electrolytics, wire ended 25V working 10 each of: 1, 2, 2, 4, 7, 10, 22, 47 and 100mf. 70 capacitors for £3-20. 400mW zeners 5% 10 each 3V to 30V, 280 in all. Only £14-00.

1 watt Metal Film resistors, 5% 10 off each value 27R to 10M, £12 series. Total 600 resistors £16-00. Polystyrene capacitors, 160V 2 1/2% 10 off each value from 10pF to 10,000pF. Total 370 capacitors £12-50.

COMPUTER PANELS
Large quantity always available: 31b asstd. £1-75; 71bs £3-65; 561b £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.
7400 IC pack—20 74 series IC's on panels £1-20.

SEE PRACTICAL ELECTRONICS FOR INDIVIDUAL COMPONENT PRICES
All prices quoted include V.A.T. and UK/BPO postage. Most orders despatched on day of receipt. S.A.E. with enquiries please.
Send 10p for Multimeter catalogue—free on request on orders over £3. Official Orders accepted from Schools, etc. (Minimum invoice charge £5). Export/Wholesale enquiries welcome. Surplus components always wanted.

MULTIMETER MODEL LT22

IDEAL CHRISTMAS GIFT!!



Probably one of the lowest priced meters featuring a mirror scale, overload protection and 20000 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 0-50uA-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. £12-20.

VEROBXES & CASES

Case type 1410, 205 x 140 x 40mm £2-99
1411, 205 x 140 x 75mm £3-25
1412, 205 x 140 x 110mm £4-28

Plastic Boxes—Professional quality, two tone grey polystyrene boxes with threaded inserts for mounting PC boards.

1 Type 2518, 120 x 65 x 40mm £1-85;
2520, 150 x 80 x 50mm £2-20; 2522,
188 x 110 x 60mm £2-85; Slotted front
type: 220 x 174 x 100/52mm £5-20.

COMPONENT PACKS

400 asstd. carbon resistors £1-35
100 W1rewounds 2-15W £1-99
200 Miniature resistors, 1/2, 1 and 1 1/2W, mostly carbon film £1-28
200 poly, mica, ceramic caps £1-10
100 Polyester, -01-2-24F £1-80
200 miniature electrolytics, but many unmarked so only £1-00

5V 12A REGULATED POWER SUPPLY

Brand new boxed fully stabilized PSU, complete with instruction manual. Load regulation 0-15%. Thermal & Electronic overload protection. Only £24-00.

PC ETCHING KIT Mk II
Contains 11b Ferric Chloride, 100 sq ins copper clad board, DALO Quick Dry Etch resist pen, abrasive cleaner, 2 miniature drill bits, etching dish and Instructions. £3-65

FERRIC CHLORIDE
Anhydrous technical quality in 11b double sealed packs, 11b £1-00, 31bs £2-16; 101bs £5-50; 1001bs £29-00.

RELAYS

Miniature Plug-in types: 1250 ohm 4c/o 40p; 700 ohm 4c/o 50p. PO 3000 type 550 ohm with 6 heavy duty c/o contacts (Ex-squid) 75p; 10 for £4-90. 6 1/2" easily removable reeds in 3580 ohm coil 50p; Plug In relay, B7G Base 17mm dia x 42mm long 10k coil 1c/o contact 40p, Omron MK3P plug in relay, 230V AC coil, 3 sets 100A/c contacts. £1-20. Same with 12V coil £1-20. Bases 30p.

REED INSERTS

Min. type, body length 1", 10 for 50p; 100 £3-50; 1000 £25-00.

CRYSTAL FILTER UNIT

Chassis 210 x 115 x 30mm containing 24 way witch, 24 HCUV xtal holders, 24 beehive trimmers, + board with 4 BFI15, R's C's etc. £3-50.

SPECIAL OFFER OF PLUG-IN MODULES

Large quantity just arrived, several diff types. Case size 77 x 50 x 50mm, either octal or 11 pin base. Send SAE for full list of types and circuits. Type R. Contains 6A, 200V SCR, 4 x 5A 300V diodes, 24V reed relay, C, R etc. Octal base. With circuit. Only £1-00 each, 10 for £8-00. Type Bp: 5 BC184, C426, min. R's and C's 85p. Panel with 2 6A 400V triacs, 700C, 2N1711, 100V 1A bridge, 2 pots, 1 preset, zeners, R's, C's etc. Only £1-50

CMOS WITH DISCOUNTS!

Any mix: Discount 10% 25+, 25% 100+, 33 1/3% 1000+



C US 4 CMOS!

4000	0 20	4039	3 09	4081	0 24	14505	4 38	'E' LED Displays
4001	0 20	4040	1 19	4082	0 24	14506	0 57	DL-704E 0 3" 70p
4002	0 20	4041	0 83	4085	0 80	14507	0 60	DL-707E 0 3" 70p
4006	1 21	4042	0 93	4086	0 80	14508	3 08	DL-728E 2 x 0 5" 1 80
4007	0 20	4043	1 12	4089	1 74	14510	1 51	DL-727E 2 x 0 5" 1 80
4008	1 07	4044	1 04	4093	0 89	14511	1 74	DL-750E 0 6" 1 50
4009	0 60	4045	1 56	4094	2 08	14512	1 03	DL 747E 0 6" 1 50
4010	0 60	4046	1 48	4095	1 16	14514	3 47	Red Leds
4011	0 20	4047	1 01	4098	1 16	14515	3 47	0 1" 15p
4012	0 20	4048	0 60	4097	4 15	14516	1 51	0 2" 15p
4013	0 60	4049	0 69	4098	1 22	14517	4 02	Clock Chips
4014	1 12	4050	0 60	4099	2 03	14518	1 39	AV-51224A 3 50
4015	1 12	4051	1 04	40101	1 76	14519	0 57	MK50253 5 50
4016	0 60	4052	1 04	40102	2 16	14520	1 39	Soldercon Pins
4017	1 12	4053	1 04	40103	2 16	14521	2 77	100 80p
4018	1 12	4054	1 29	40104	2 26	14522	2 15	1000 4 00
4019	0 60	4055	1 46	40107	0 56	14526	2 15	2500 8 75
4020	1 24	4056	1 46	40108	6 18	14527	1 76	DIL Sockets
4021	1 12	4057	29 81	40109	2 21	14528	1 22	8 Pin 12p
4022	1 07	4059	6 20	40181	4 30	14529	1 72	14/16 Pin 15p
4023	0 20	4080	1 24	40182	1 73	14530	0 95	Red Acrylic Filter
4024	0 67	4081	25 60	40194	2 26	14531	1 74	For LED displays
4025	0 20	4082	10 10	40257	2 26	14532	1 39	157 x 92 x 3mm 70p
4026	1 32	4083	1 22	4700	1 75	14534	8 15	Push Switches
4027	0 60	4086	0 69	7083	4 25	14536	4 00	Type SW9 15p
4028	1 00	4087	4 13	14180	1 18	14537	13 17	Op-Amps
4029	1 27	4088	0 24	14181	1 18	14539	1 24	CA330
4030	0 60	4089	0 24	14182	1 18	14541	1 62	(COS/MOS) 1 00
4031	2 46	4070	0 85	14183	1 18	14543	1 82	CA3140
4032	1 19	4071	0 24	14174	1 08	14549	4 10	(BI/MOS) 85p
4033	1 55	4072	0 24	14175	1 04	14552	1 50	741 Minidip 25p
4034	2 11	4073	0 24	14184	1 17	14553	4 66	
4035	1 21	4075	0 24	14180	8 51	14554	1 57	
4036	3 09	4076	1 71	14501	0 20	14555	1 01	
4037	1 06	4077	0 65	14502	1 38	14556	1 01	
4038	1 20	4078	0 24	14503	0 75	14557	4 65	

Terms: C.W.O. Add VAT to all prices at 8%. Post etc. U.K. 25p + 2p = 27p per order. All orders processed same day. Official Govt. Varsity, Poly etc. orders (written or telephoned) welcome.

GREENBANK ELECTRONICS (Dept. WIP)
94 New Chester Road, New Ferry, Wirral, Merseyside
L62 5AG Tel: 051-645 3391

Your career in Electronics?

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. Full details will be gladly sent without any obligation.

BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, WD17

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

NAME _____

ADDRESS _____

(Block caps please)



CHROMACHASE 4

PART 2

WILLIAM BEAN

Last month's issue covered the general outline, the circuit operation and most of the construction.

This month we complete the article by describing the Programme and Mode options and operation, the testing and, finally, offer some display ideas.

PROGRAMMES

The unit can drive lamps, or banks of lamps, in groups of four. Within that group it can energise a single lamp (called 1 for reference) a pair of lamps (either 1 and 2 or 1 and 3) or three lamps (1 and 2 and 3). No provision is made for all lamps on or for all lamps off.

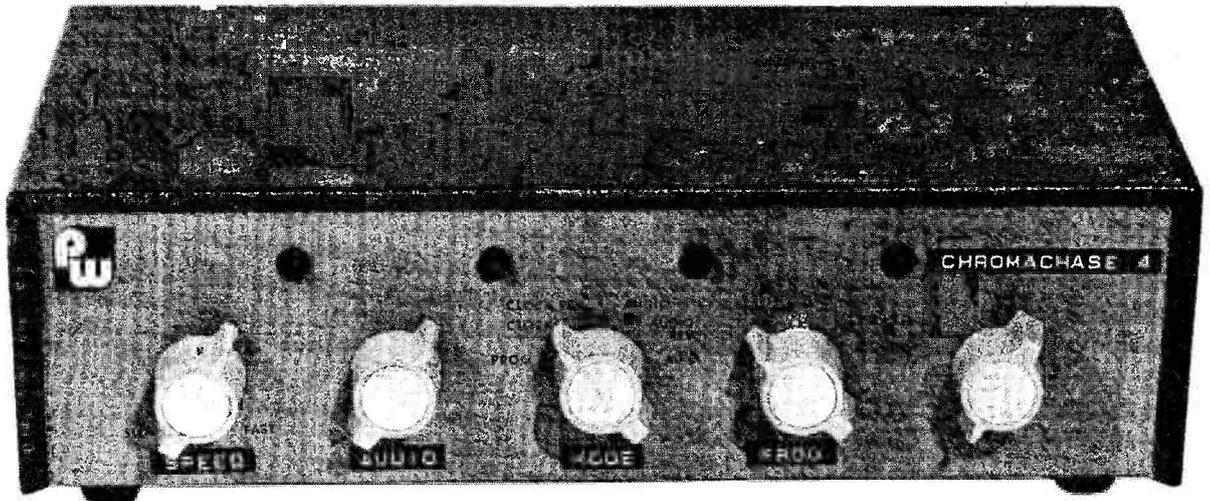
These four alternatives comprise the "Programme", and one or other of them is selected by S2a and S2b. Selection can be made at any position of the mode switch but will only be entered into the register in the "programme" position.

S2 is wired such that it puts combinations of 0V onto pins 4 and 5 of IC4. Pin 3 of IC4 is permanently connected to 0V. This ensures that at least one lamp is always on.

The conditions at the input pins 9 and 10 decide which way the register progresses and, whilst they remain constant, a pulse on pin 11 will cause it to shift in the selected direction.

As mentioned earlier, the outputs of the register are at QA, QB, QC and QD (pins 15, 14, 13 and 12) and the logic levels on those pins will progress one position in the selected direction for each clocking pulse. For instance, if 1 lamp is the selected programme, the unit will start with a logic 1 on QA and logic 0 on QB, QC and QD (i.e. 1000). At the first clock pulse on pin 11 the outputs become 0100, the second pulse gives 0010, the third 0001 whilst the fourth brings 1000 back to restart the cycle. If a reverse mode is operating the sequence would be 1000, 0001, 0100, 0100 and 1000.

Photograph of the author's unit to show the front panel lettering for the various controls and switches. Letraset was used for the small lettering and adhesive punched tape for the larger. Dry transfers of the Letraset type will last longer if sprayed with a protective covering.



MODE SELECTION

The "Mode Selection" switch, S1, can select 1 of 6 possible operating conditions. Perhaps the simplest position to start with is position 2, "Clock". Switch S1 grounds pins 9 and 10 of IC5. This prevents any audio pulses being fed to the clocking input of IC4. S1b grounds pin 1 of IC2 and thus prevents the clock pulses on pins 2 and 13 from operating the reversing sequence. The output of the internal clock, on pin 6 of IC5, is able to pass through the two gates of IC1 (pins 1/3 and 5/6) and will drive the register. S1a also grounds pins 9 and 12 of IC1 which prevents reversal of direction following IC4 reaching the ends of its cycle. Under these conditions the lamp programme will continue to cycle in the same direction.

In position 3, "Clock Reverse", the inhibits on the audio drive are still applied, as is the inhibit on pin 1 of IC1, but the inhibit on pins 9 and 12 of IC1 are removed. Now the register will progress at each cycle a pulse is fed back to either pin 10 or pin 13 of IC1 which can pass through the two gates of IC2 (pins 9 or 10/8 and 5/6) and toggle IC3 which, in turn, will change the direction of IC4. The lamp sequence will now alternate, first forward then back.

Position 4, "Audio", removes the inhibit on pins 9 and 10 of IC5 and applies it to pin 1 of IC1. This allows the output of Tr9 to drive pins 12 and 13 of IC5 and hence the clocking input of IC4. It prevents the internal clock input on pin 2 of IC1 from driving pin 5. The inhibits on pins 9 and 12 of IC1 are reapplied and the inhibit on pin 1 of IC2 remains.

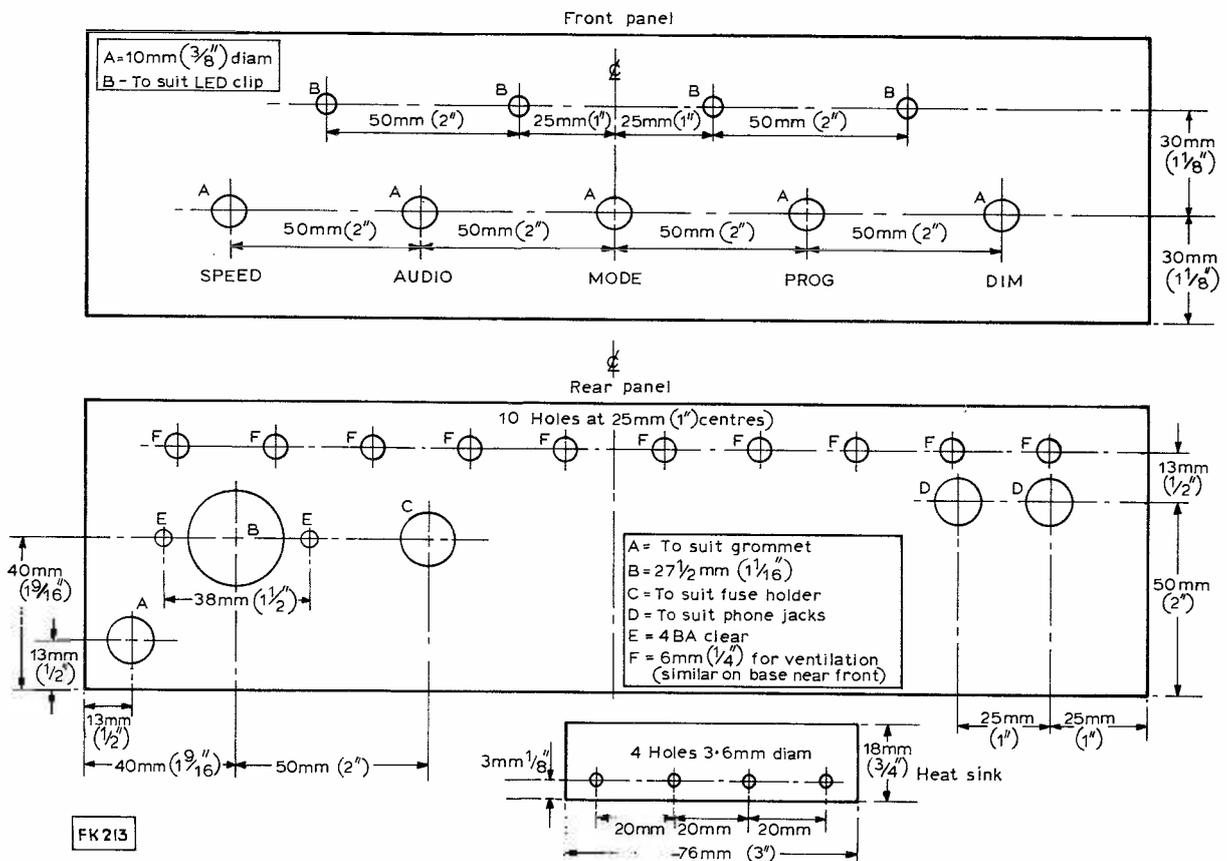
These prevent the reversal of IC4 as in position 2. Now each pulse from Tr9 of sufficient amplitude to trigger IC5 will cause the lamp sequence to move one position but always in the same direction.

Position 5, "Audio Reverse", maintains the inhibitions on pin 1 of IC1 and on pin 1 of IC2 but removes them from pins 9 and 12 of IC1. Thus the lamp sequence progresses one position at each audio pulse but the sequence will reverse at the end of each cycle.

In position 6, "Auto", the inhibits on pin 1 of IC1 remains and the clocking pulses for IC4 are still derived from the audio input. The inhibits on pins 9 and 12 of IC1 are reapplied, preventing the end of cycle reversing procedure but the inhibit on pin 1 of IC2 (from S1b) is removed. This allows the internal clock pulses to pass through all the gates of IC2 (pins 2/12, 11/8 and 5/6) to toggle IC3 and reverse the display direction. This can give rise to a completely random display by selecting one lamp only on the programme and adjusting the audio level and internal clock rate. Several combinations of level and rate will give the effect and its a case of "try it and see".

Position 1, "Programme", applies a 0V level to the preset and clear inputs of IC3 which conditions IC4 to accept the control levels selected by the programme switch. The programme information cannot be entered at any other position of the mode switch.

Fig.6. The drilling details for the front and rear of the case specified. Also shown is the detail for the triac heatsink.



The Experimenter

From Continental Specialities.

US Patent Design No 235554.



The Experimenter is not so much a new breadboard, practically a new way of life! Says Ronald J. Portugal (President, Continental Specialities Corporation.)

**No soldering.
No spoilt devices.
No fuss.
No fiddling.
No wasted time.
Now you can put circuits together as quickly as you think them up.
Just plug your devices in, pull them out, plug them in again, as many times as you want.**

Two Versions.

Experimenter 600.

The world's first breadboard specially designed for 0.6 pitch devices. It gives you all the fan-out you need for complex MSIs, Micro-processors, Memories, Displays etc., (40 pins or more) with plenty of room for other components alongside.

Experimenter 300.

This one is designed to be ideal for 0.3 pitch DILs, any kind, from 6 pins up. Excellent fan-out. (You can also use it for 0.6 devices, though for these the 600 version is recommended.)

Apart from ICs, both versions take TO-5 transistors, diodes, LEDs, capacitors, resistors; any component with lead size between .015 and .032 inch diameter. And for interconnections you use standard solid hook-up wire.

Unique Construction.

Each version of the Experimenter gives you 94 five-contact terminals, arranged in two rows of 47, plus two integral bus-strips for Ground and Power, with 40 contacts on each.

That's 550 contacts in all! (See diagram).

All terminal strips are recessed into the bottom of the plastic body, and covered with a stick-on vinyl backing, so you have no insulation problems.

The contact rows are numbered 1-5-10 etc. and A-B-C--J lengthways, so each position is clearly defined. The bus-strips are labelled X-Y, each end.

The plastic body is rigid, strong and longlasting, with a recessed screw-hole at each corner, and all four edges have a special quick-locking lip so that you can build rigid arrays of two or more boards.

The Domino Theory.

See how the Experimenter boards fix together, side by side, end to end, or at right-angles, to give unlimited scope for circuit building, planning, extending, rearranging.

You can mix 0.3 and 0.6 DILs in any arrangement you like.

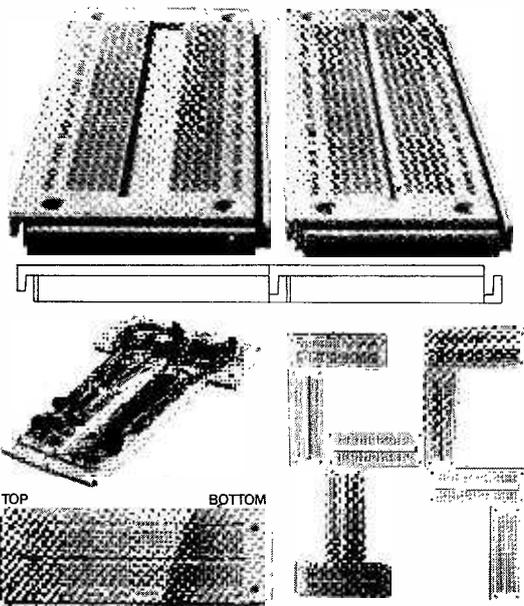
And all your displays can face the way you want them.

And look at these prices!

Experimenter 300, £7.20, Experimenter 600, £7.90. All made to top CSC professional quality, and every one is fully checked before dispatch.

Free Catalogue!

Page after page of fascinating CSC products. Just write and ask.



Easy to Buy.

There's no problem buying from USA.

Just send name, address (block letters please), quantity of each required, and a perfectly normal UK bank cheque, made out in Pounds Sterling, to Continental Specialities Corporation.

Or you can use an International Money Order, from any Post Office. We also accept your American Express Card or Access number.

Then we post by return airmail, and you should receive the goods within 2-3 weeks.

Dealer enquiries invited. Note that any UK taxes or duties chargeable are solely the responsibility of the buyer.

Name.....
Address.....
.....
.....
Please send me.....(qty). Experimenter 300 @ £7.20 each,
and.....(qty). Experimenter 600 @ £7.90.
I enclose cheque/imo for £.....(total). Amex/Access No.....



Continental Specialities Corporation, 44 Kendall St., PO Box 1942, New Haven, Conn. 06509 USA. Telephone: 203-624 3103.

LOCK-OUT SUPPRESSOR

It is possible that a condition could occur, particularly at switch on in a mode other than "programme", where all the outputs of IC4 are at logic 0 and this could cause a lock-out of the sequence. To overcome this effect a simple lock-out circuit, Tr10 and its associated components, has been included. If the condition did occur at any time the LEDs would all be off. This would result in no current flowing through D14 and hence no volt drop across it. This, in turn, would cut off Tr10 and the collector would fall to ground potential and, in so doing, would apply a logic 0 to the preset and clear inputs of IC3. IC3 would condition IC4 to accept the programme selected, one at least of the LEDs would light, current would flow through D14, Tr10 conducts, the preset and clear inputs of IC3 rise to 5V and the system proceeds normally.

WOUND COMPONENTS

The pulse transformers, T2, 3, 4 and 5, are wound with 28 standard wire gauge, enamelled copper wire onto a ferrite rod. No particular grade of ferrite is specified and the author has tried various without finding any significant differences. The cut rod is first covered with insulation tape and then 25 turns of wire are wound on. A second layer of tape is added, this time of double thickness. The secondary winding of 25 turns is added and a third covering of tape. The windings should go as close to the ends of the rod as practical but be spaced evenly along it.

Both ends of the first winding should be brought out at one end of the ferrite rod. The ends of the second winding should both terminate at the other end of the rod. Either winding may be used as the primary.

The suppression coil is also wound on a section of ferrite rod but consists of 20 turns of 14 standard wire gauge, enamelled copper wire. Since this item is connected to the live main it is suggested that at least 4 thicknesses of tape be used both under and over the winding. Again, wind evenly over the full length of the rod.

GENERAL ASSEMBLY

A drilling diagram is given as Fig. 6 and is suitable for the case listed. Even if the case differs from the one the author used the hole sizes and locations could still be used. On full load the Triacs get quite warm and cooling holes have been included to assist convection.

Before drilling the holes for the LEDs, check the size of the mounting washers, they do vary.

The PCB is mounted into the box on $\frac{1}{2}$ in x 6BA spacers but any convenient height, from $\frac{1}{4}$ in to $\frac{1}{2}$ in will do. If screws larger than 6BA are used there may be problems with the hole sizes in the board.

The wiring to the International Octal socket used for connecting the lamps can be on any suitable pin numbering, the author used pins 7 and 8 in parallel for the neutral and pins 1, 2, 3 and 4 for the line connections.

The mains into the unit is below the board and, to prevent any pulling on the connections, it is desirable to fix some form of cable retainer to the lead before the board is installed. The line input goes to S3, on the back of VR3, and it is better to wire the two switch sections in parallel, to ease the current switching problem, rather than switch both line and neutral.

The "mic" and "aux" inputs will probably require some form of attenuator network, particularly if the input is taken off the speakers or is stereo. The arrangement of a suitable network, with values of resistance for differing inputs, is given as Fig. 7. In the prototype unit the components were mounted directly onto the jack sockets. If only mono is to be used then the jack socket can be mono and one resistor can be omitted.

SENS	RA
100mV	22k
1 Volt	220k
10 Volt	2.2 Meg

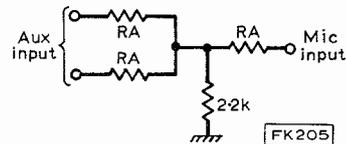
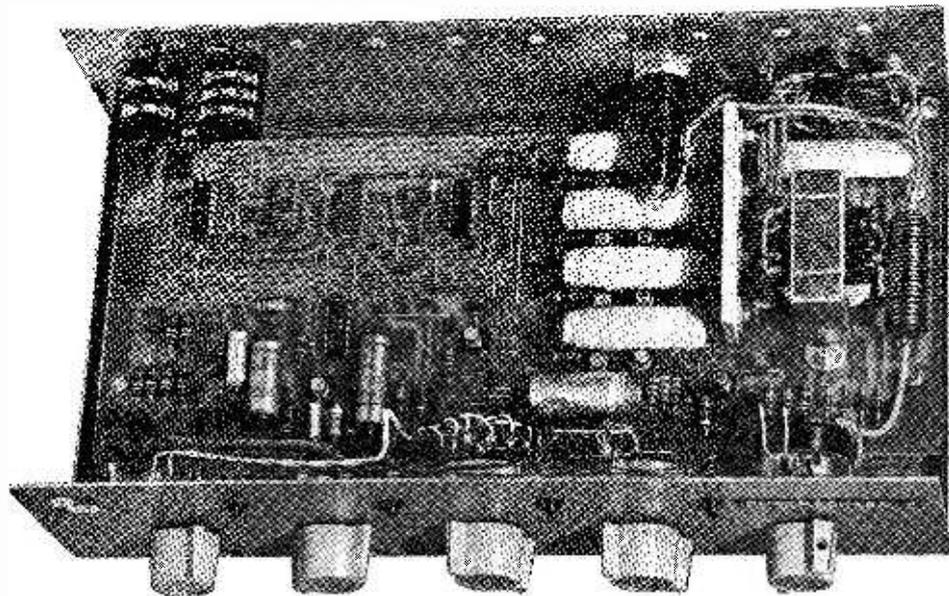


Fig. 7. The values of attenuator resistors and their interconnections.



Photograph of the inside of the prototype unit. Note that there is room to fit a standard fuse holder for 14" fuses. The four pulse transformers are shown as the white rectangles just to the right of the centre. The suppressor choke is to the right of the mains transformer and, in this unit, is not covered with tape.

SAFETY NOTE

This unit will have mains potentials at various points both above and below the board. If it is required that work should be done whilst the mains is on, e.g. fault finding on the logic, it is advisable to remove the link connecting the Triac heat sink to L1. This will reduce the mains hazard above the board to the switch, the power supply transformer and L1.

No fuse is included in the lamp drive circuits since it is assumed that the mains plug will be fused. If it is not, then a fuse should be included in the unit.

TESTING AND USE

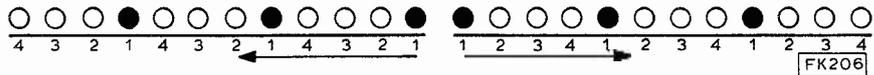
Before applying the mains, set up the following conditions: Dim Switch, S3, off: Speed Control, VR1, to maximum (fully clockwise): Mode Switch, S1, to "programme" (fully anti-clockwise): Lead from the Triac heat sink disconnected from the choke, L1: a volt meter for 5V DC connected between 0V and junction of D15 and R34 (negative to 0V).

Switch on at S3. The meter should read 5V. If it doesn't, switch off and look for faults. If it does, then proceed.

Select the various programmes and check that the LEDs give the correct indications in all positions. The display will be static in this position of S1.

Select any programme, but one lamp is probably best, and put the mode switch to position 2, "clock". The single lamp should progress along the chain. Don't be alarmed if it runs backwards, it only indicates that the toggle, IC3, has come on in the reverse mode. Check that altering the speed control alters the switching rate of the LED.

Fig. 8. Diagrammatic representation of the simplest lamp display.



Switch the mode switch to "clock reverse". The display should now reverse when it gets to the end of the line and continue to run backwards and forwards.

Switch to "audio" but without any audio input. The display should be static. Add an audio signal, if possible something with irregular loud passages, and the display should cycle in one direction. Alter the gain control and check that it affects the progression rate.

Switch to "audio reverse" and check that the display does reverse correctly.

Switch to "auto" and observe that both the audio input and the internal clock affect the display. This is more tricky and an audio input with a regular beat is probably best together with a fairly slow speed setting.

When all is correct, switch off the mains, reconnect the lead from the heat sink to L1, connect a lamp display and switch on the mains again. The lamp display should follow the patterns of the LEDs. Remember that the dimming control is at minimum immediately after switching on.

Check that the dimming control does cover the range from almost off to fully on. Check that the lamps repeat all the combinations given above.

DISPLAYS

The simplest display is probably a line of four lamps. Expansion is easy, just connect further groups of four in parallel with the first and the patterns chase each other along the chain. An effective variant is to reverse half of the chain, then the lamps will meet and disappear into the centre, or start in the centre and "fall off" the ends (see Fig. 8).

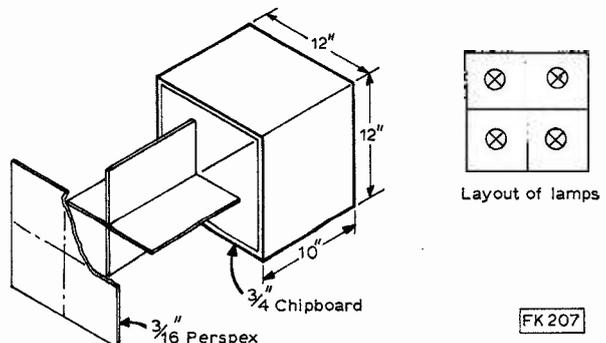
The December cover shows two blocks of four lamps arranged in two squares, each having coloured lenses in identical quarters. This has been found particularly effective and the outline dimensions are given as Fig. 9. To minimise the costs of a coloured display, ordinary pearl lamps have been used and a coloured gel has been stuck to the clear perspex front panel. A further point on economy is to use aluminium cooking foil as a reflector inside the sections. This has two advantages, first it allows lower wattage bulbs to be used with lower current consumption or more displays and, secondly, it assists heat dissipation. A word of warning on metal foil. Be very careful to leave a space around the bulb holder, the foil could slip and become lethal.

It is advisable to connect an extra socket on the display, wired in parallel with the input. This greatly assists extending the display and saves multi-sockets on the control unit.

The lamp units require 6 way cable to operate and, again to save expense, it is probably cheaper to use three core flexible mains lead, doubled up, rather than to locate 6 core cable of the right current carrying capacity. This will result in non-standard use of the core colouring scheme so, again, take care.

The bulbs used in our cover display were 60W. They were quite bright enough and even on full load the display box didn't get overheated. Dw

Fig. 9. The outline dimensions of the box used in our cover display. The coloured film is not shown. If used it can be stuck to the perspex front with any suitable adhesive.

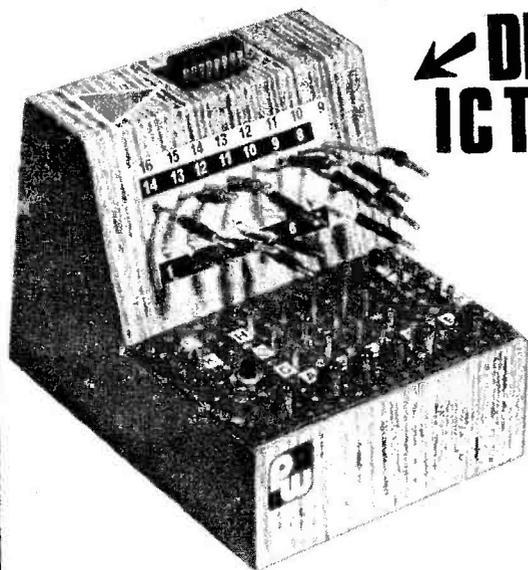


CHECK IT!
WITH OUR

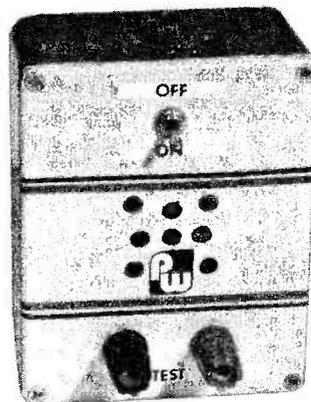
IN NEXT MONTH'S
PRACTICAL
WIRELESS

TEST GEAR QUARTET

Circuit faults can be simple or complicated so you will need test gear ranging from this Audible Continuity Tester to our Tester for Digital IC's. In between we have an indispensable duo, an FET Voltmeter and a Transistor Tester. All four are cheap to construct and all deserve a place in your workshop.



← **DIGITAL IC TESTER**



AUDIBLE CONTINUITY TESTER →

plus
F. E. T. VOLTMETER



↑ **TRANSISTOR CHECKER**

ON SALE IN JANUARY

electronic POLYPHON

M.J.HUGHES M.A., C. Eng. MIERE

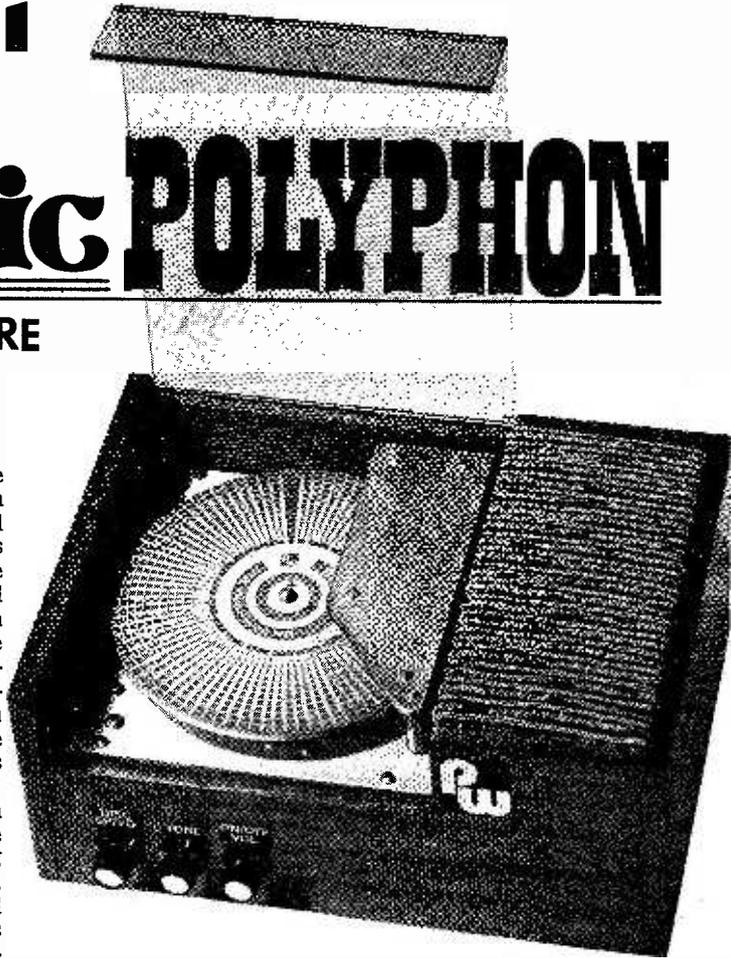
MANY years ago, before the advent of juke boxes, public places of entertainment often used sophisticated coin-operated musical boxes to amuse their patrons. These instruments were called "Polyphons" and comprised a large diameter brass disc with raised studs running round concentric tracks which actuated reeds to make a musical box sound when the disc was rotated. The discs were interchangeable so one had a large number of tunes to select from. These beautiful instruments have, of course, gone out of fashion although a few still remain in good working order. Those that find their way to antique shops can fetch prices of several hundreds of pounds.

This project describes how to make a modern version of this instrument using electronics for tone generation but retaining the concept of a rotating disc to give the instrument a degree of authenticity. Instead of a brass disc we are using a circular printed circuit board having 12 concentric tracks of contacts and pick-up wires select the notes that are programmed in binary code. Apart from the fun and satisfaction in making the instrument itself, which represents a very attractive novelty in any household, there are hours of fun to be had in programming your own discs of tunes—this is simply done by cutting contacts with a knife on the standard contact discs that can be obtained from the PW Readers PCB Service. Later in the article we will give the "Cutting Programme" for two popular tunes.

Design Outline

The overall system is shown in block schematic form in Fig. 1. A variable frequency master oscillator drives an organ "Top Octave" tone generator which produces the twelve notes of a chromatic scale. After buffering (to convert their levels to those of standard TTL) these notes are fed to two identical circuits. Each circuit operates on one of the two notes which can be played simultaneously.

Initially we have to select the note of the octave which has to be played and this is done by using a data selector integrated circuit which is capable of selecting one of sixteen input lines by applying a 4 bit binary code to the data select inputs. Because we only need to select one of twelve signals there is some redundancy here and the four unused lines are held at a permanent 0V level. The binary codes of the 4 bit number are allocated to notes of the scale as follows:



Binary code				Note selected
MSB			LSB	
8	4	2	1	
0	0	0	0	No note
0	0	0	1	C# (Bottom)
0	0	1	0	D
0	0	1	1	D#
0	1	0	0	E
0	1	0	1	F
0	1	1	0	F#
0	1	1	1	G
1	0	0	0	G#
1	0	0	1	A
1	0	1	0	A#
1	0	1	1	B
1	1	0	0	C (Top)
1	1	0	1	No note
1	1	1	0	No Note
1	1	1	1	No note

The binary code to select the note is carried on a set of four contacts on the rotating disc—these occur on four of the concentric tracks. If a contact to ground is present on the disc it represents logic level "0" but if one is not present it represents "1". These contacts are represented in Fig. 1 by the switches on input lines 8, 4, 2 and 1. Due to mechanical tolerances it would be impossible for the pick-

★ components list

Resistors		Capacitors		Semiconductors			
R1	2.7kΩ 1/4W 10%	R66	1MΩ	C1	1,000pF (polystyrene)	D1-D4	1N4148 (4 required)
R2	2.7kΩ	R67	330Ω	C2	0.1μF (polyester)	D5	7V, 400mW zener
R3	560Ω	R68	4.7kΩ	C3	10μF, 12V	BR1, BR2	DIL 1A bridge rectifiers, type 7533 (2 required), available from Marshalls.
R4-R15	33kΩ (12 reqd.)	R69	1.8kΩ	C4	0.1μF (polyester)	Tri-Tri4	BC148 (14 reqd.)
R16-R27	2.2kΩ (12 reqd.)	R70	100Ω	C5	10μF, 12V	Tri5	BFY51
R28-R30	1MΩ (3 reqd.)	R71	47kΩ	C6	0.047μF (polyester)	Tri6	BC148
R40-R55	10kΩ (6 reqd.)	R72	100Ω	C7	0.1μF (polyester)	Tri7	BFY51
R46	220Ω	R73	10kΩ 1/4W	C8	0.1μF (polyester)	IC1	NE555
R47-R52	10kΩ (6 reqd.)	R74	470Ω	C9	0.1μF (polyester)	IC2	AY-1-0212
R53	220Ω	R75	4.7kΩ	C10	0.047μF (polyester)	IC3-IC4	74150 (2 required)
R54	4.7kΩ	R76	100kΩ	C11	0.1μF (polyester)	IC5	7474
R55	10kΩ	R77	1.2kΩ	C12	0.1μF (polyester)	IC6-IC7	7400 (2 required)
R56	3.9kΩ	R78	2.2kΩ	C13	0.1μF (polyester)	IC8	7414
R57	1MΩ	R79	12kΩ	C14	0.047μF (polyester)	IC9-IC10	74174 (2 reqd.)
R58	890Ω	R80	2.2kΩ	C15	100μF, 18V	IC11-IC12	NE555 (2 reqd.)
R59	4.7kΩ	VR1-VR5	5kΩ horiz. sub min. presets (5 required)	C16	500μF, 18V	IC13	LM380
R60	1.8kΩ	VR6	25kΩ log (ganged with SW1)	C17	2,200μF, 18V	IC14	2012 (12V regulator)
R61	100Ω	R7	10kΩ	C18	3,300μF, 18V	IC15	2805 (5V regulator)
R62	47kΩ	VR8	100kΩ	C19	1μF (polyester)	IC16-IC17	NE555 (2 reqd.)
R63	4.7kΩ			C20	0.22μF (polyester)		
R64	10kΩ						
R65	8.2kΩ						

NOTE: Apart from R73 Sub min. resistors should be used (1/4W).

Miscellaneous
 LS1, 8Ω loudspeaker, 8" x 2 1/2". T1, Mains transformer, dual 12V at 1A secondaries, (Douglas type MT-71-AT). M1, low voltage, DC motor (Rotax type EM135P, from Aircraft Ltd., 4 Chatterton Road, Bromley, Kent). PCBs, main and motor board, coded discs. (Readers PCB Service—see ad). 1 metre of organ contact wire. (Maplin Electronic Supplies). Circuit board pins. SRBP for pick-up head. Loudspeaker grill material. 3 knobs: Grommet, Cable clamp, 8 stand-offs, 8BA x 1/4", DIL Sockets or Solderon strip sockets 5 x 8 pin, 5 x 14 pin, 3 x 18 pin, 2 x 24 pin.
 Aluminium turntable, Base plate, Pick-up arm, Bracket for controls, Arm support. (Any or all of these items, except the base plate, available from James & Martin Electronics Ltd., Boyers Yard, St. Albans Farm, Staines Road, Feltham, Middx.)
 Perspex lid, (Vialjar Laboratories Ltd, Regulus Road, Croydon Airport, Croydon, Surrey).
 Cabinet and loudspeaker panel.

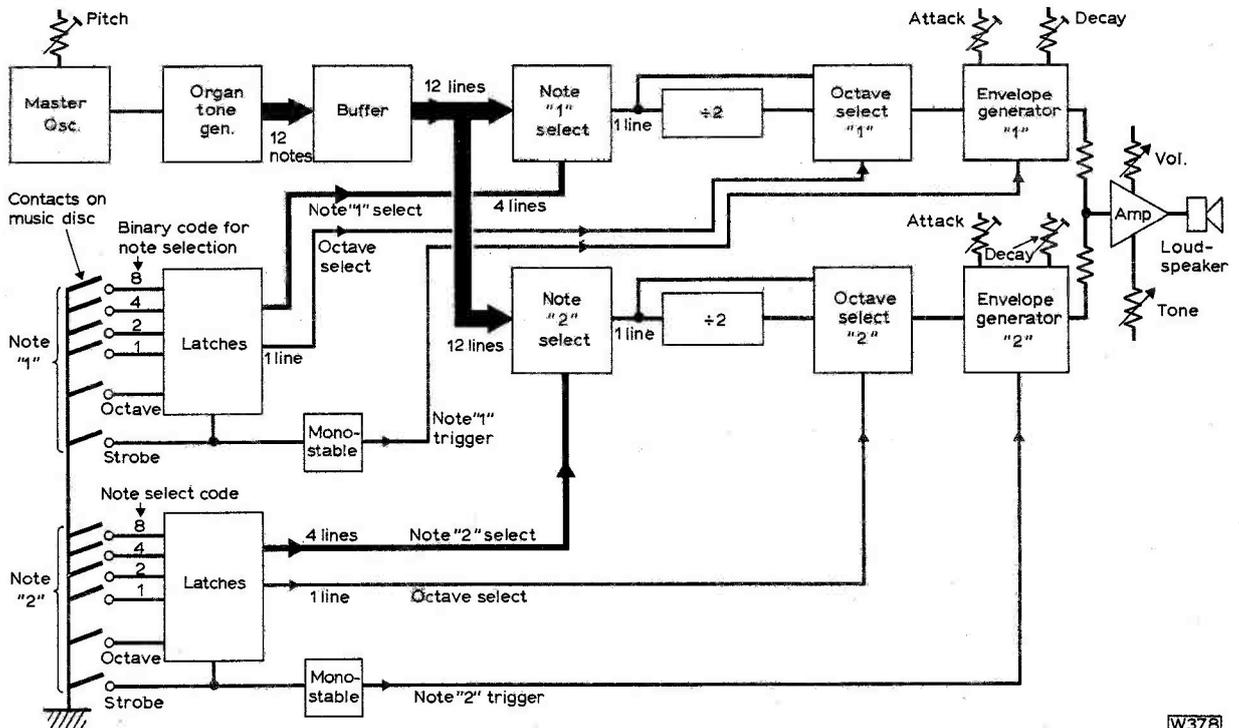


Fig. 1. Simple Block Diagram.

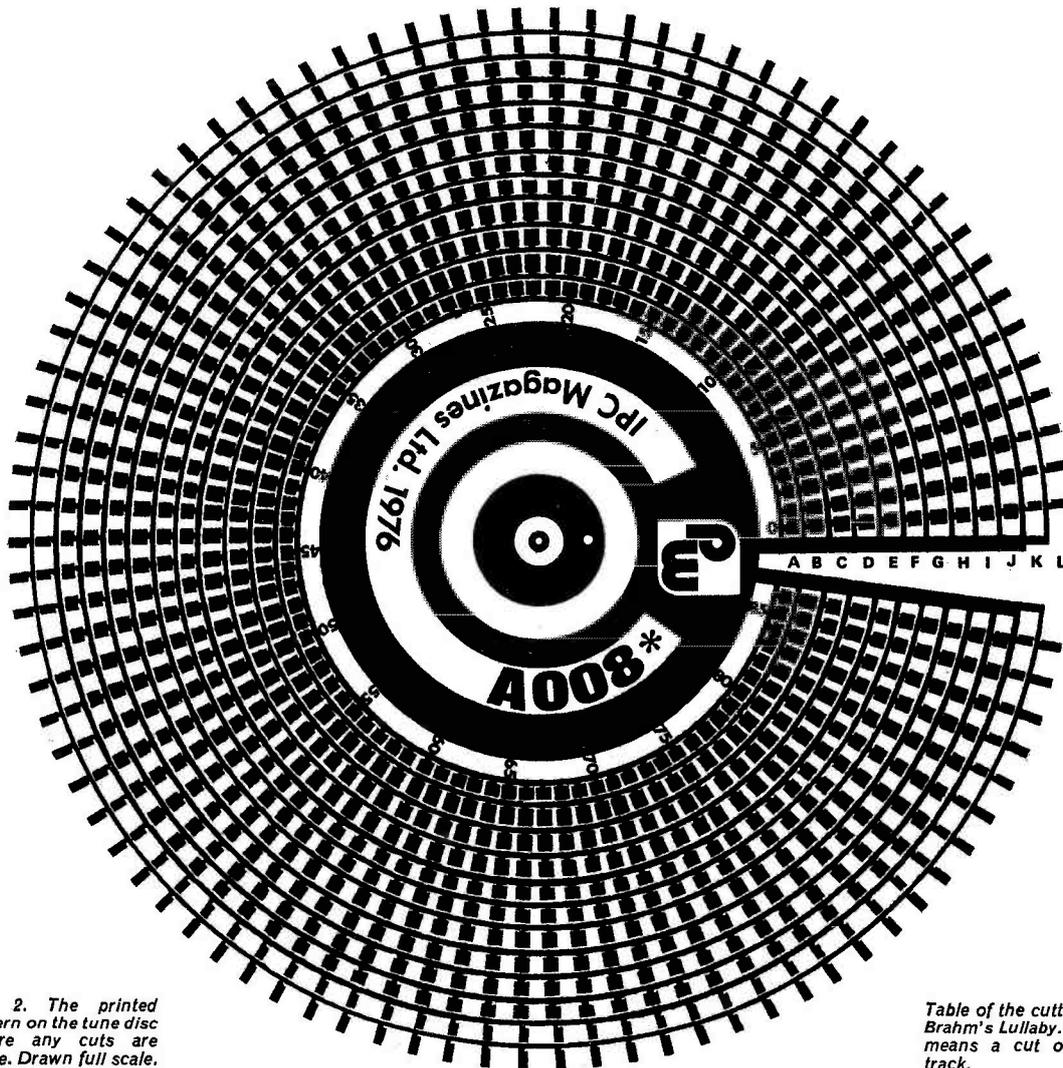


Fig. 2. The printed pattern on the tune disc before any cuts are made. Drawn full scale.

Table of the cutting for Brahm's Lullaby. An 'X' means a cut on that track.

up wires on the disc to sense the right code by taking up the prescribed condition in exact time coincidence therefore we have to use an extra contact on the disc, which is always slightly delayed after the code is set up, to tell the system to accept the code. We call this the STROBE and it is used to trigger a latch which holds the binary code until such time as it is changed. The output of this latch is fed direct to the data selector.

Having selected the right note of the octave the output signal from the data selector is split into two paths; one path goes via a binary divider which converts the note to an octave lower, the other path by-passes the divider but both meet up again in the "Octave Select" stage. Here we can determine whether we want the selected note to be in the higher or lower octave. The control signal for this also comes from a track of contacts on the disc through the latching stage. A "0" will pass the higher octave and a "1" the lower octave.

The selected note in its correct octave is now fed to the envelope generator which forms the square

wave into a signal with a fairly sharp rate of attack and a long rate of decay which closely approximates to the waveform obtained from a "twanged" reed. The shape of the envelope is initiated by the same strobe signal from the disc which we have already discussed; the only difference is that we need a very short pulse in this instance and this is obtained by applying the strobe to a monostable stage.

The output from the envelope generator is the note we have selected in the form we require; it only remains to amplify it and pass it to a loud-speaker. Before doing this we have to mix it with the second note when simple chords are required.

The diagram clearly shows that this second note is generated and selected in an identical manner. This, therefore, accounts for the twelve tracks on the disc. To help our explanation we have designated numbers "1" and "2" to the two notes and when it comes to programming a tune on the disc it will be easier if you use Note "1" to select the melody line and Note "2" for any accompaniment or "counterpoint" melody.

Notes Req.		Strobe		Notes								Octave	
1	2	1	2	1				2				1	2
		L	K	J	I	H	G	F	E	D	C	B	A
tE		0				x							
tE		1				x							
tG	E	2				x	x	x					x
"	"	3	x	x									
"	G	4	x							x	x	x	
"	"	5	x	x									x
tE	"	6		x		x							
tE	"	7		x		x							
tG	E	8				x	x	x					x
"	"	9	x	x									
"	G	10	x							x	x	x	
"	"	11	x	x									
tE	"	12		x		x							
tG	"	13		x		x	x	x					
tC	E	14				x							x
"	"	15	x	x									
tB	"	16		x	x		x	x					
"	"	17	x	x									
tA	G	18				x				x	x	x	
"	"	19	x	x									
tA	D	20				x							x
"	"	21	x	x									
tG	B	22				x	x	x					x
"	"	23	x	x									
tD	"	24		x			x						
tE	"	25		x		x							
tF	D	26				x							x
"	"	27	x	x									
tD	B	28				x				x	x	x	
"	"	29	x	x									
tD	"	30		x									
tE	"	31		x		x							
tF	D	32				x							x
"	"	33	x	x									
"	B	34		x						x	x	x	
"	"	35	x	x									
tD	"	36		x									

Notes Req.		Strobe		Notes								Octave	
1	2	1	2	1				2				1	2
		L	K	J	I	H	G	F	E	D	C	B	A
tF	"	37		x		x		x					
tB	D	38				x		x	x				x
tA	"	39		x				x					
tG	B	40				x	x	x		x		x	x
"	"	41	x	x									
tB	G	42				x		x	x				x
"	"	43	x	x									
tC	E	44				x	x						x
"	"	45	x	x									
"	G	46		x								x	x
"	"	47	x	x									
C	"	48		x	x	x							x
tC	F	49		x		x	x						x
"	"	51	x	x									
"	A	52		x								x	x
"	"	63	x	x									
tA	"	54		x				x					
tF	"	55		x		x		x					
tG	E	56				x	x	x					x
"	"	57	x	x									
"	G	58		x									x
"	"	59	x	x									
tE	C	60								x	x		x
C	"	61		x		x	x						x
tF	D	62				x		x					x
"	"	63	x	x									
tE	G	64				x							x
"	"	65	x	x									
tD	F	66						x					x
"	"	67	x	x									
C	E	68				x	x						x
"	"	69	x	x									
"	"	70	x	x									
"	"	71	x	x									
"	"	72	x	x									
"	"	73	x	x									

Tune Blanks

The design for the master disc is shown in Fig. 2. Note that initially all the contacts are linked through a narrow shoulder into their respective track busbars and that all the busbars are linked together and thence to the solid copper region in the centre of the disc. A thirteenth contact rests on this central area linking all contacts to a common ground. A contact is programmed to represent logic level "1" by cutting through the conductor at the narrow shoulder. Pull-up resistors on each of the contact wires ensure that a "1" is assumed when no contact to ground is made.

The disc is designed to rotate in a clockwise direction and you should note that the contacts on the two outer tracks are slightly narrower than the rest. These are used for the strobe signals which must occur slightly AFTER the formation of the binary codes for the notes (hence their narrowness).

The tracks are designated A (inner track) to L (outer track) and the following table shows the relationship of the tracks to the binary codes for the two notes:

TRACK	DESIGNATION	
A	Octave Select	Note 2
B	Octave Select	Note 1
C	Bit 1 (LSB) for	Note 2
D	Bit 2	Note 2
E	Bit 4	Note 2
F	Bit 8 (MSB)	Note 2
G	Bit 1 (LSB) for	Note 1
H	Bit 2	Note 1
I	Bit 4	Note 1
J	Bit 8 (MSB)	Note 1
K	Strobe for	Note 2
L	Strobe for	Note 1

If the constructor wishes to make his own discs it is important to remember that they MUST run

"True" and the centre holes must be drilled with great care. Tolerance of the positions should be within ± 0.01 in. In practice we have found that plain copper left "as etched" is the best surface for the contact wires to run on.

Contact Comb

The pick-up wires have to be specially shaped with a fairly high degree of accuracy and this presents the part of the project which needs most skill and care. The material is gold-plated beryllium copper cut into lengths of approximately $2\frac{3}{4}$ in.

The separation between the pick-up wires has to tally exactly with the pitch separation of the tracks on the disc which is $\frac{1}{8}$ in between the 12 major contacts but the common ground pick-up is separated from the rest by $\frac{1}{4}$ in. To mount the wires we suggest that you cut fine slots in a blank piece of SRBP with a fretsaw blade and drill a small hole behind each slot as shown in Fig. 3a. Next, using a pair of pliers, put a precise 90° bend about $\frac{3}{4}$ in from the end of each of the contact wires. The short end is passed through the hole and the long end should pass over the slot. When all are in position another thin piece of SRBP should be glued and clamped over the top of the wires (using fast-setting epoxy resin) while at the same time ensuring that the longer ends of the wires push down slightly into the slots you have cut (see Fig. 3b). This ensures their correct position.

Use a needle file to elongate the holes in the SRBP mounting block as shown in the diagram—these are needed for adjustment later.

The next step is to form the contact ends. This is best done by clamping all the wires between two metal strips (Meccano strips will do) about $\frac{1}{4}$ in from the front end of the SRBP mounting. Although the distance is not critical it should be exactly the same for each wire. Give a downward bend through approximately 70° , Fig. 3c, so that each wire is bent by the same amount and then remove the metal clamp.

Finally replace the clamp $\frac{1}{2}$ in from this bend. The actual distance will depend on the clearance

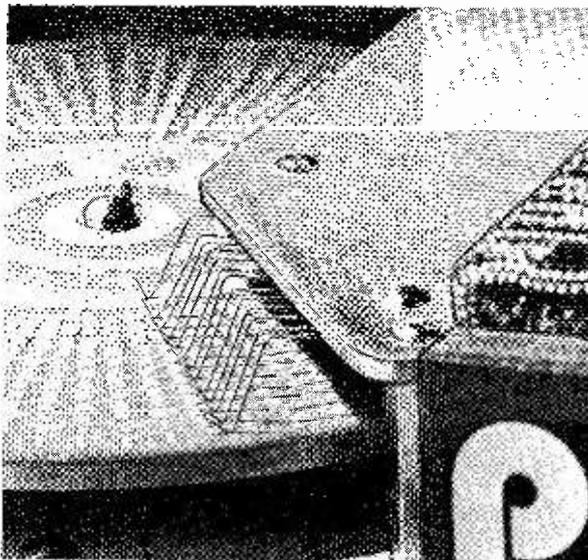
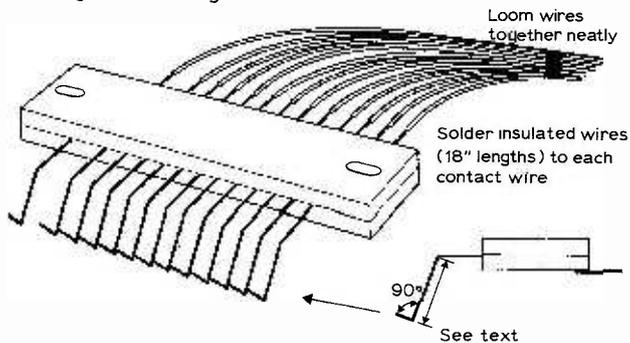
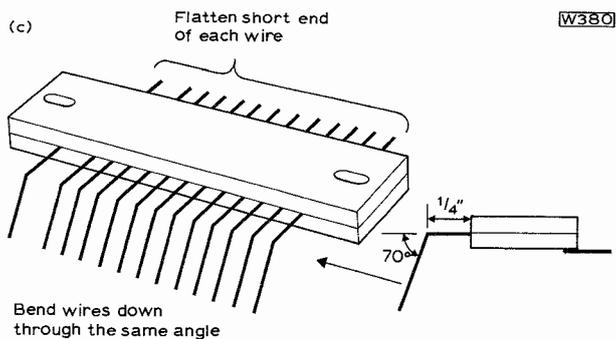
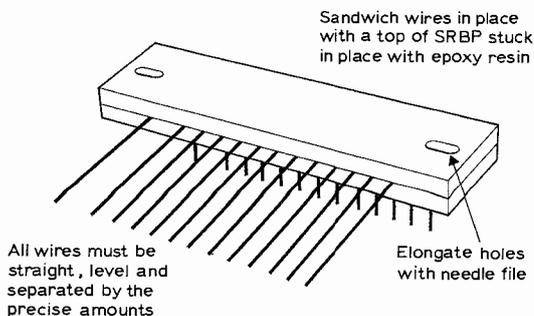
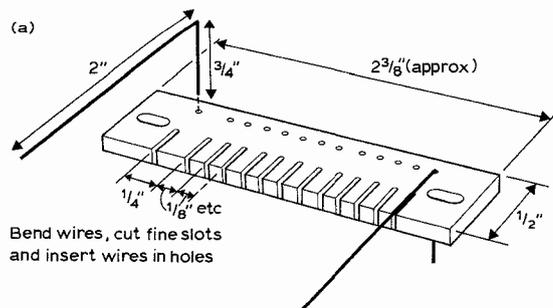
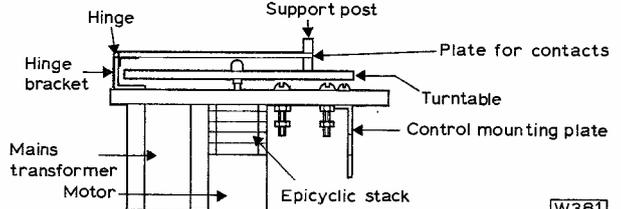
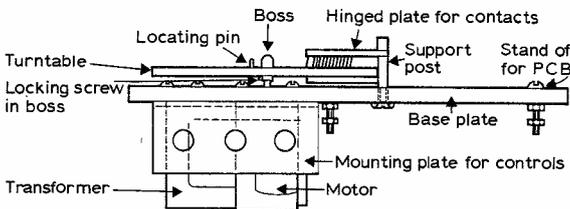
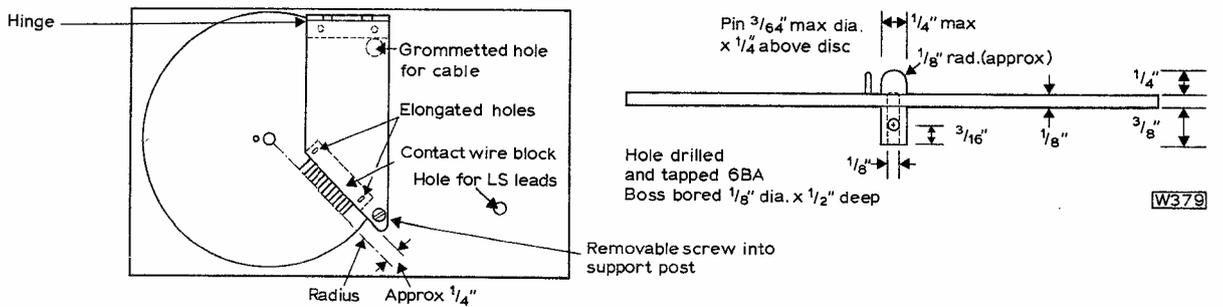


Fig. 3. The various stages involved in making the Contact Comb. Before tightening the cable ties (3d.) bend the cable along the arm.

Photograph of the Contact Comb on the disc. Note that the actual connections are on a radius and that the arm is parallel to the radius

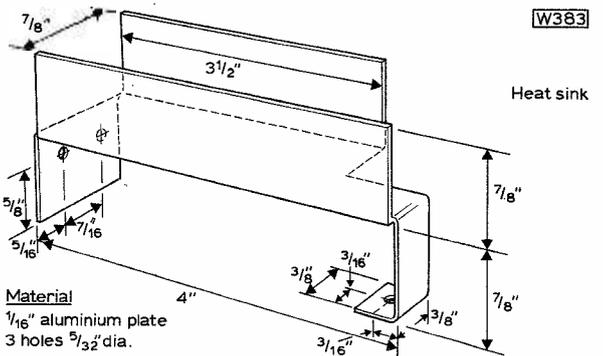




between the top of the disc on the turntable and the height of the contact mounting block when it is assembled under the hinged arm of the deck and whatever this distance happens to be you must allow a bit more to ensure that the wires are under their own spring tension when they are pressed down on the disc. Once you are satisfied that you have the right distance the ends of all the wires should be bent upwards through 90°. The clamp can now be removed and the excess length of each wire cut off about 1/8 in from the last bend.

You should now have a set of pick up wires that are all identical in length, angle and alignment. The 3/4 in tail of each which protrudes through the hole you initially drilled should be flattened and an 18 in length of fine flexible insulated wire should be soldered to each and these wires neatly bound together to form a flexible cable as shown in Fig. 3d.

Fig. 4. The general assembly of the major mechanical parts to the base plate.



Contact plate bracket
A = 6BA clear
B = 3/8" dia.

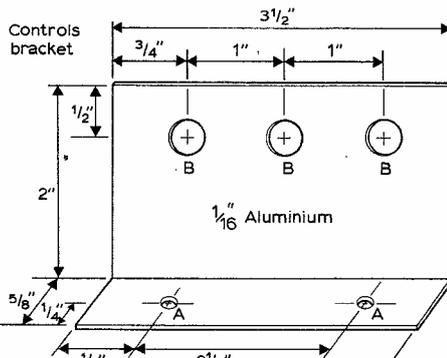
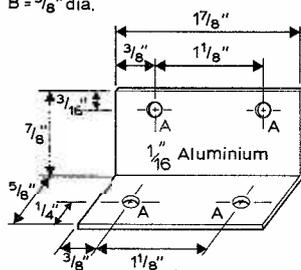


Fig. 6. Details of the Heatsink for ICs 14 and 15.

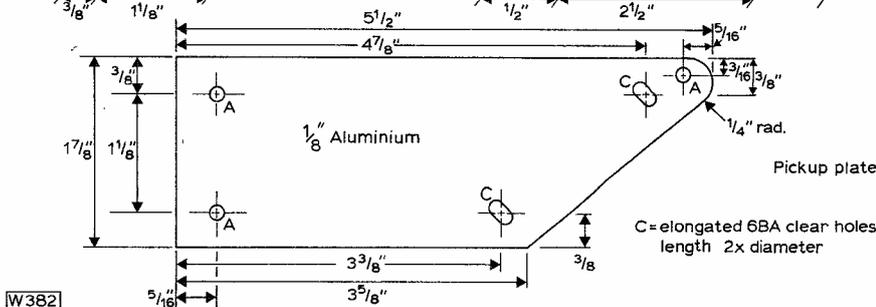


Fig. 5. The two brackets required, one for the variable controls and the other for the contact arm, and the contact arm itself as used on the prototype.

W382

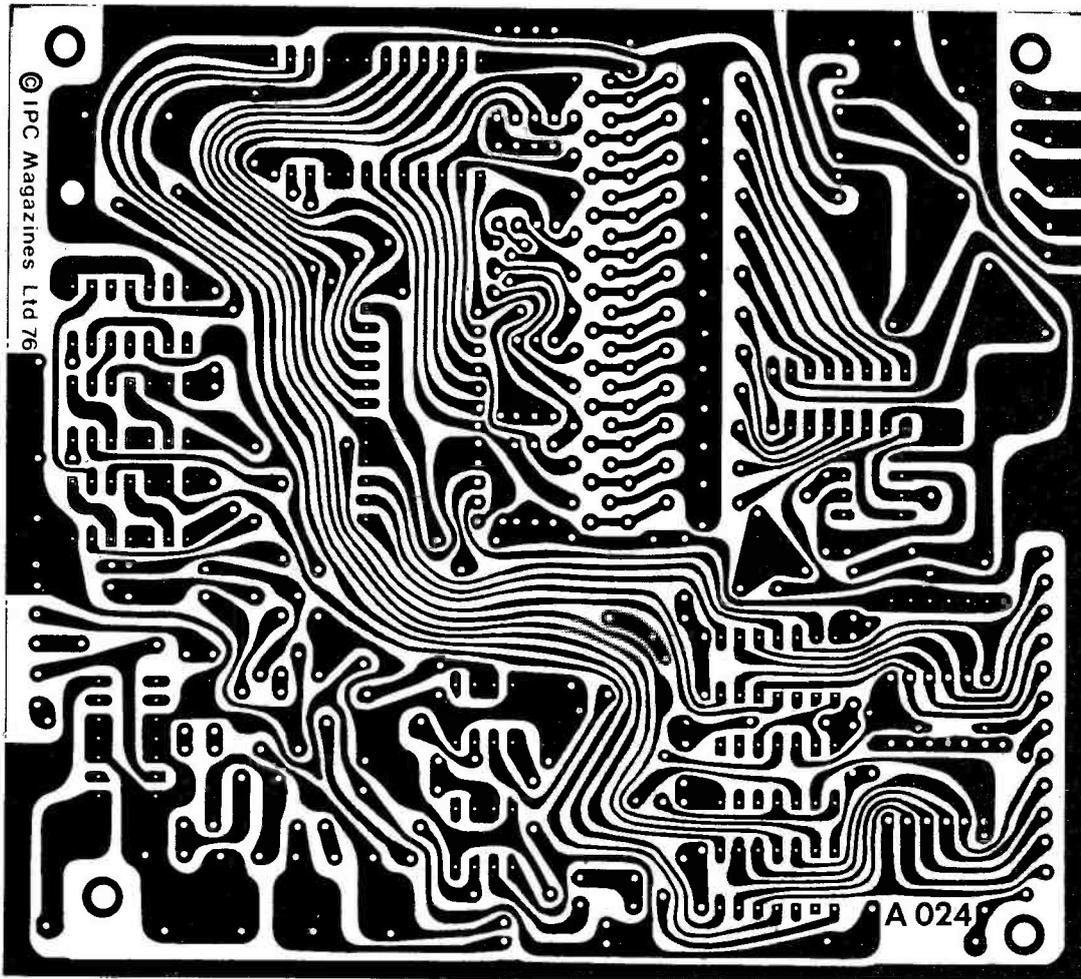


Fig. 7. The printed wiring pattern for the main electronics board, drawn full size, which will be required irrespective of the motor used.

General Assembly

You should now concentrate on the mechanical assembly of the rest of the deck shown in the detailed drawings of Fig. 4. Note that the hinged arm is cut at an angle on its front end and this angle should be parallel to a radius from the centre of the motor shaft but set back approximately $\frac{1}{4}$ in—this is to ensure that the contact points of the pick-up wires will fall EXACTLY on a radius when the block is fixed in place under it. Note also that the fixing holes for this are elongated in a direction at 90° to those in the block—again for adjustment but in the other plane (see Fig. 5). A grommetted hole is provided in the base plate near the hinge for the leads from the pick-up wires to pass through. Try assembling the mechanical parts, put an uncut disc on the turntable and then make sure you can adjust the pick-up wire block so that the wires all make contact with the twelve tracks exactly on a radius. When you are satisfied that this is possible the unit

can be dismantled and all the metal parts polished and varnished prior to final assembly.

Before starting assembly of the boards it is necessary to make a heat sink for the voltage stabilisers. Details of this heat sink are given in Fig. 6. Having completed the critical mechanical assembly a start can be made on the electronics. The main board contains all the circuitry except for the manual controls and the motor speed control unit.

The wiring pattern for this board is given as Fig. 7 whilst the component positions and orientations are shown on Fig. 8. The order of assembly isn't important except, of course, the heat sink for IC14 and IC15 must be last. It is suggested that the ICs are bolted loosely to the heat sink before inserting the leads into the board holes. This will avoid deforming the leads in the event that hole positions in the board and the heat sink don't line up exactly. Don't forget to tighten the nuts after assembly and before the board is fixed into the box.

The second board holds the components required to drive the motor. This too is a printed wiring board and the track pattern is shown as Fig. 9. There are very few components on this board but capacitor C18 is large and will need to be inserted last. To conserve space, we had to remove the corner of the board to assemble the motor. A portion of the board has been left blank so that those using a similar box shape and size can do likewise. The posi-

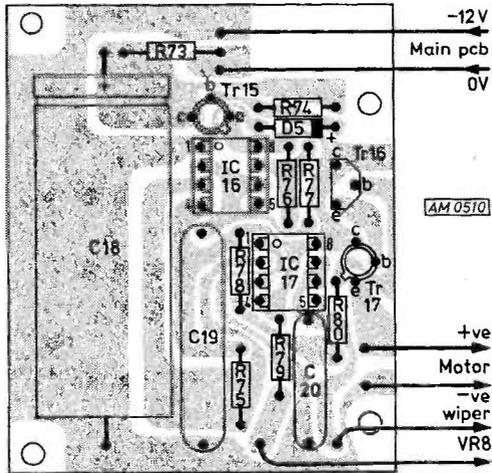
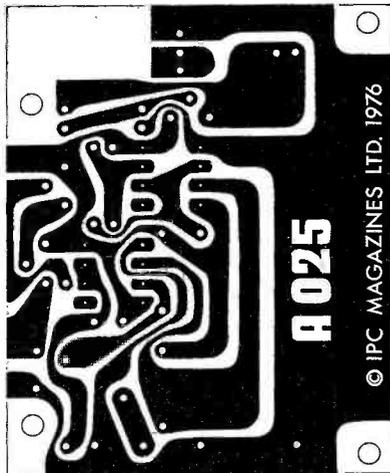
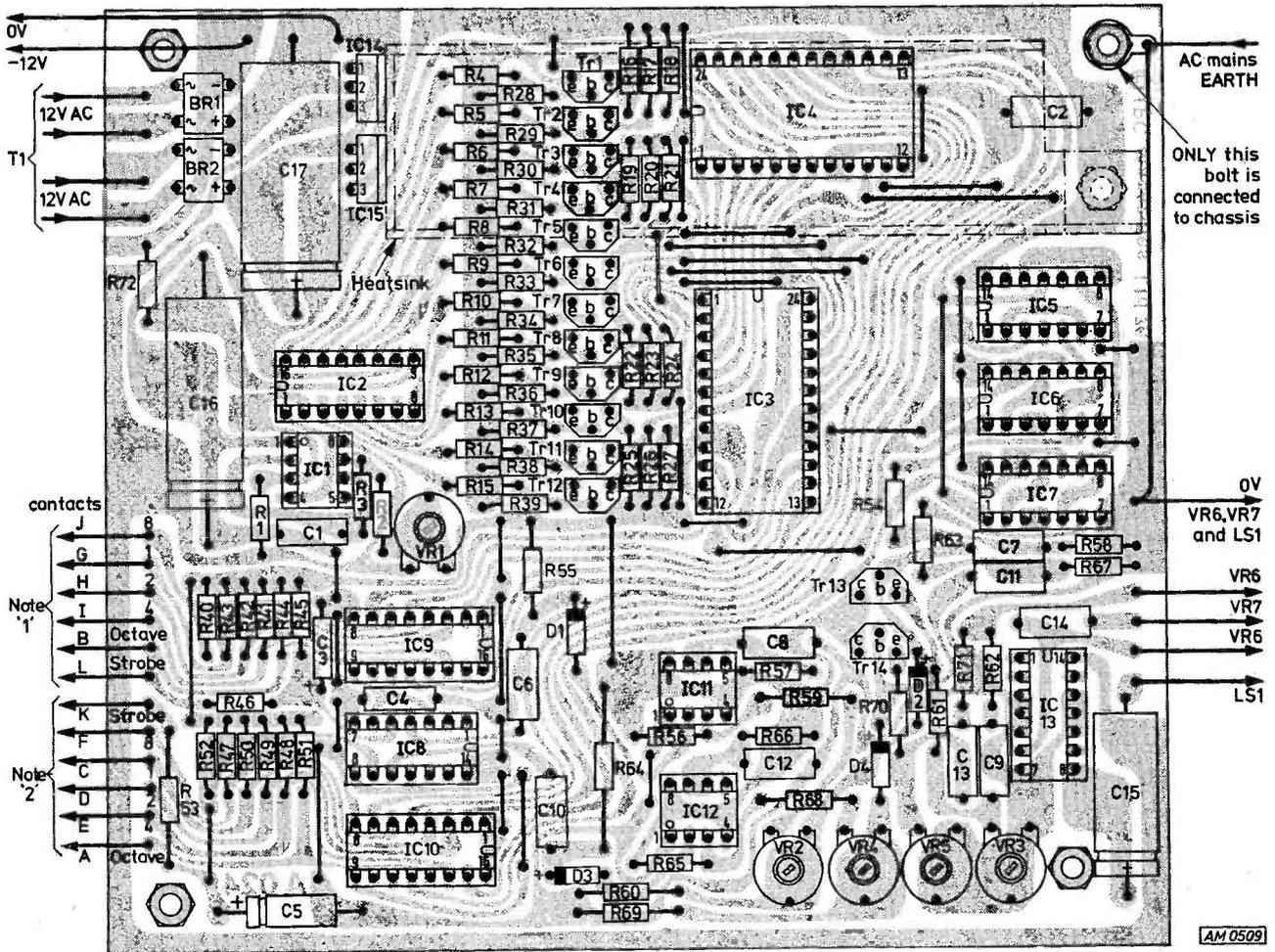


Fig. 8. The overlay for the main electronics board showing locations and orientation of the components.

Fig. 9. The wiring pattern and component overlay for the motor board. Note this circuit and board pattern are designed for the motor specified. Other motors may require other control circuitry.

tion of the components and of the section to be removed is detailed in Fig. 9.

The packing density on these boards is high and the track patterns and solder lands are close together. It is, therefore, essential to use a miniature soldering iron and care should be taken to avoid solder bridges across conductors. Equally, care must be taken when inserting retaining screws for the heat sink or for mounting the board in the case.

The two boards, the motor, the transformer and

the bracket for the manual controls can be assembled on to the base board for testing but the control bracket will need to be released in order to fit the base plate into the box.

Our next issue will include the outline drawings of a suitable box and of the Perspex lid. It will also explain how to programme your own tunes. A full explanation of the functioning of the electronics will be given.

HOTLINES

Quite illogical

One of the problems with electronics is that just as you start to get really familiar with some technology or device, another generation comes in to replace it and you have to start all over again.

This could well be the case for all of us when new devices I'm hearing about come on the market. The area is logic. We all know that there are two basic states "on" and "off" or '0' and '1' etc. Just to confuse the issue, I hear that a semiconductor company is planning to introduce devices which are called "Multi-level logic". In other words many different levels of logic and not just '0' and '1'.

The first devices will handle four levels (so I'm told) which will correspond to 0, 1, 2, and 3. But already other more complex devices are in the laboratory—even though the first "simple" ones are not yet on the market! One such research is devoted to a decimal logic with ten levels.

There are, in theory, many advantages to be had from such multi-level systems which, until now, had existed only in the realms of theory. Great density for a given size chip should be one bonus to be had. If and when these devices are for sale on the hobbies market, they will offer a tremendous scope for experimentation since they will provide a flexibility which is just impossible with "ordinary" two-state logic.

Power to the people

Ever been into a shop to buy some batteries for a calculator or tape recorder? Aren't there a lot of different types about these days—all with different numbers and all 'claiming' to last longer or give better performance.

Perhaps the deciding factor of what you buy in the battery line will hinge on the success of two manufacturers; one German and the other Japanese. Both have launched a range of Lithium batteries and some amazing advantages are claimed. "High energy density" is one desir-

able feature attached to these components. What does it mean in real terms?—a question I put to one of these manufacturer's representatives.

The answer is that when they say "High energy density" that's exactly what they mean. In real, down-to-earth facts it means up to ten times greater than standard dry cells. One application for these batteries has already been found. They are to be used in pacemakers and in that equipment should last for some ten years before renewal is necessary. Doubtless a variation on the saying "More power to your elbow?". Speaking about batteries and power sources reminds me of a solar development which sounds interesting. An American manufacturer is to market a complete "power package". The basic kit comprises four rechargeable nickel-cadmium batteries plus a small bank of solar cells. The cells are connected up together to form a $3\frac{1}{2} \times 3\frac{1}{2}$ in panel and this is used to charge the cells. In strong sunlight, the cells give 6V at some 60mA which is ample to charge up the batteries.

The price for the basic kit (in the U.S.A.) is equivalent to around £23. Dare I say they are almost certain to cell well?

Technological bloodhound

Among the newer technologies in electronics can be found the I²L devices, or injection logic as they're called. They first entered the arena with no real general application although this is radically changing. The latest area into which I²L has installed itself is in working with a gallium-arsenide smoke detector.

Understandably, the U.S. authorities are quite strict on reliability in such devices. For example, one authority lays down that battery-operated smoke detectors have to work for 12 consecutive calendar months. They must also have the capability of triggering a horn when light is obscured by smoke to the tune of a mere 2%. Such equipment must also be capable of giving a 7-day warning when battery power

is failing past a certain point and finally should be able to sound a horn for four hours.

In the device I'm talking about (called an MCC 158) the injection logic is essentially a reliability watchdog. If the sensor is not working properly, or if there is any malfunction in the following amplifier—or when the battery gets 'low', the I²L devices will sound the alarm horn intermittently.

It is interesting, too, how complexity had built up. For example MCC 158 drives a system which takes a very quick peep at the smoke for only 50 millionths of a second every five seconds—a sort of precision 'sniffing' of the atmosphere. It does seem an incredibly short time, but then I suppose it nose what it's looking for!

Marked cards

One of the problems for a forger is the watermark built into the very fabric of the paper in our currency. You cannot really change it or obliterate it without arousing suspicion and yet it must be there for the note to be valid. Again, the watermark is quite easy to detect with the naked eye simply by holding the note up to the light.

A British company has now managed to do almost the same thing but with magnetic materials. Conventional magnetic striping of cards, tickets etc is straightforward and this company has succeeded in encoding the stripe with what amounts to an electronic watermark.

The process encodes small cross sectional areas of the magnetic stripe and, more importantly, in such a way that these codings cannot be altered or erased by electromagnetic influences at the surface of the stripe.

One can envisage a north pole card and a south pole card drawing their bearers closer and closer together, which may explain why many of London's computers look a little drawn!

The logo for Ginsberg, featuring the name in a stylized, cursive script with a thick underline.

PW 'Easybuild'

VIDEO-WRITER

PART 6

M. J. HUGHES M.A., C. Eng. MIERE

This month's section completes the design detail of the remaining circuits on the counting board D004. It covers the Cursor Generator, the Video Mixing, the Keying Information and the Character Stepping requirements.

CURSOR GENERATION

We now turn to the Cursor Generator and Video stages shown in Fig. 26. The Cursor is used to show where on the screen the next character will appear when a key is depressed. All we need to do is indicate the position of the character cell in question. We already know that the Address Coincidence signal (generated by the Comparators) designates the position on the screen pointed to by the Address Register so this signal is obviously going to be the starting point in producing the Cursor.

It must be remembered, however, that all displays of our video data are delayed by one character cell width. To ensure that the Cursor illuminates the correct part of the screen we must also delay the Address Coincidence signal by one character cell. This is done in exactly the same way as before—by using a D Type flip flop (IC48a) triggered by Q23. See Fig. 27. The delayed Address Coincidence signal appears at pin 5 provided the clear input of the flip flop (pin 1) is held at logic level "1". If we clamp this clear input to ground with S1 we will stop any output from the flip flop and this conveniently provides our "Cursor Extinguish" signal.

To make the cursor an interesting shape we AND the delayed Address Coincidence with Q21 and Q30 (from IC50a) and this combination of signals produces a chequered pattern. We have chosen Q30 instead of Q30 because it makes the cursor stand one row of picture points HIGHER than a character and is thus easier to see when it is being stepped "over the top" of other characters on a full screen.

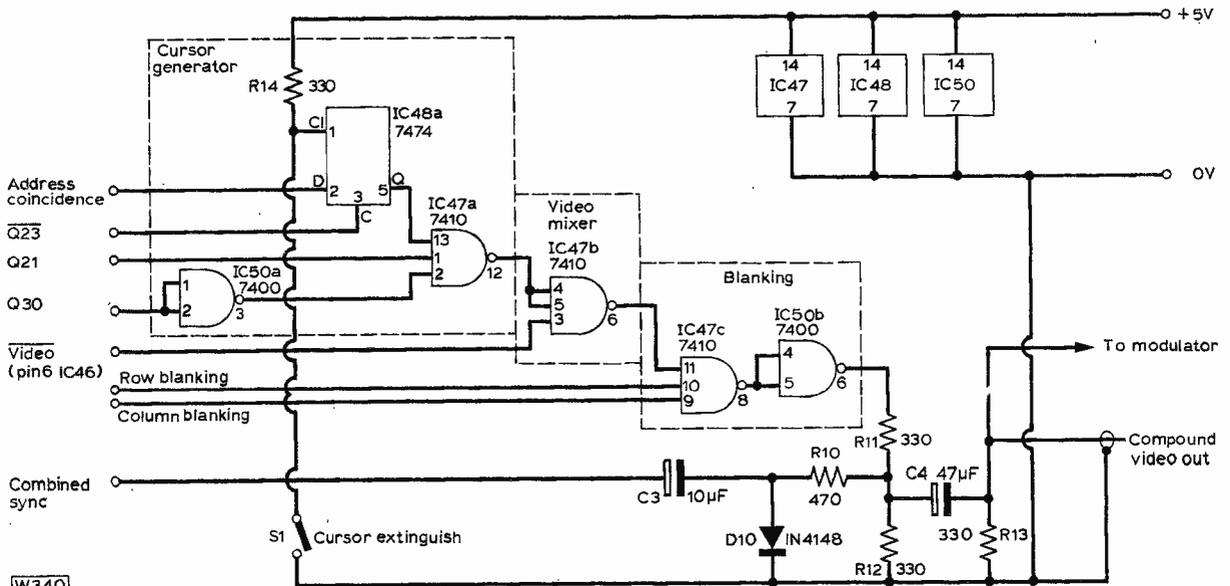
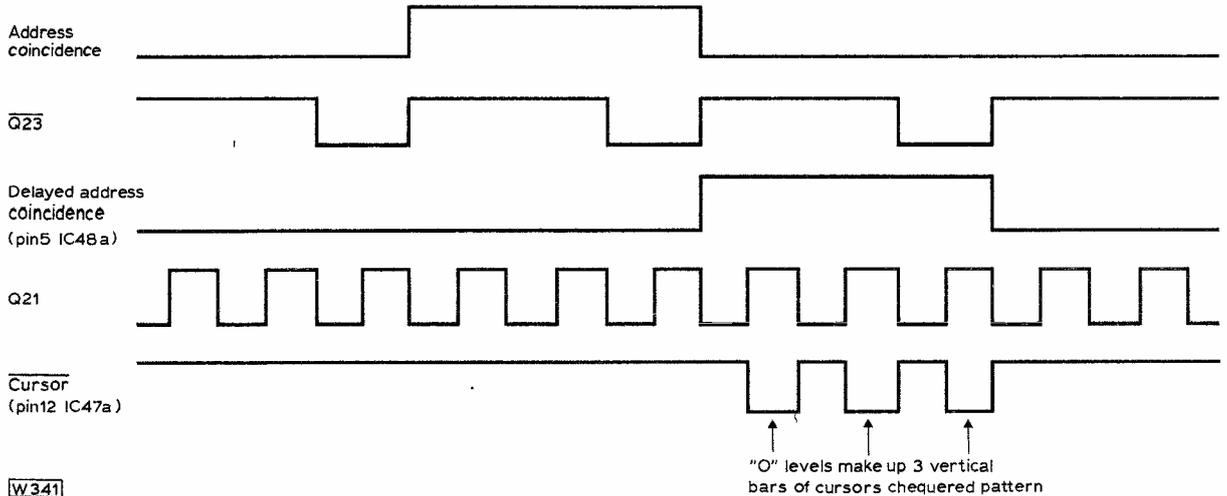


Fig. 26. The Cursor and Video Output circuitry.



W341

VIDEO MIXING

The Cursor and Video signals are ORED together in IC47b which we have called the Video Mixer and the combined signal is fed to IC47c and IC50b where it is ANDED with the Row and Column Blanking signals. The blanking operation ensures that we have well defined margins at the top, bottom, left and right of the screen (see Fig. 28).

To complete the video stage it only remains to combine the video signal with the TV sync pulse train which was produced by the sync generator board. This is carried out by the passive resistor circuitry and the compound output is taken across R13. The video level so produced is somewhat greater than the normal 1V peak to peak but the output impedance is higher than the standard 75 ohms. When fed into a standard monitor the 75 ohms termination will drop this signal level to normal values.

Several commercial makes of video monitors as well as a Sony U Matic video cassette recorder have been driven with complete success by the output of the Video Writer. If you follow our recommendation of using the Heathkit Portable TV as a monitor this output can also be fed straight to the modification point mentioned in Part 1. For those who do not have monitors and for applications that need the output routed to several displays over a large area we suggest that a UHF modulator be used to feed into the aerial socket of any UK standard television receiver.

Fig. 27. The wave patterns required to provide the three vertical bars of the cursor. To provide the three horizontal bands the output Q30 is 'anded' with this.

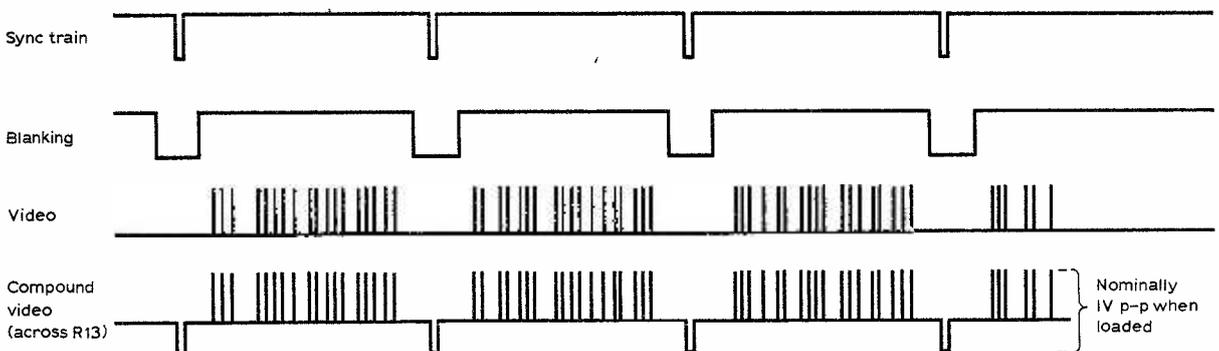
In the first prototype the video signals from C4 were fed directly to the input of a Crofton Modulator. In the second prototype a *Practical Wireless* design was used which gave a significant improvement in resolution due to its wider bandwidth capabilities.

KEYING IN INFORMATION

We must now deal with the keyboard interface and Write generator. These are shown in Fig. 29. All seven data bits and the strobe from the keyboard are required in this stage.

The seven bits are needed because we have to detect the non-writing control functions. These are Forward/Reverse, Cursor Step, Carriage Return and Line Feed. These keyboard codes are detected by ICs 51 to 54 respectively but you will also note that the Strobe signal feeds these same gates. This is necessary so that the gates do not output any signal until the keyboard data is stable. All but the Cursor Step signals are fed to the Address Registers.

Fig. 28. This drawing shows the principle of combining the Sync, Blanking and Video signals to produce the final Compound Video output.



W342

We have to generate a Write command every time we press a "Writing" Key of the keyboard but NOT when we activate any of the above control functions. It is a fact that whenever these four codes are generated bits 4, 6 and 7 are always "1", "0" and "0" respectively and this combination does not occur for any of the codes of writing characters. We only need to detect this specific condition of bits 4, 6 and 7 to generate an inhibit signal for our Write generator.

This set of three signals is detected by IC55a and you will note that we do not wait for the Strobe in this case. This is rather important because we have to know that we have a non-writing control function BEFORE any decisions are made within the logic to generate the Write signal and the latter is carried out on receipt of the Strobe pulse's rising edge. IC55b is driven by the writing inhibit signal and when such a signal exists the strobe is blocked by the latter gate.

We need to generate our Write signal when we reach the correct address for the position on the screen in question and this is, of course, recognised by the Address Coincidence signal. We also have to make sure that the writing instruction—which makes the Read/Write input of the RAMs go to level "0"—is produced within the valid address period and it must be prevented from overlapping between two address locations. See Fig. 30.

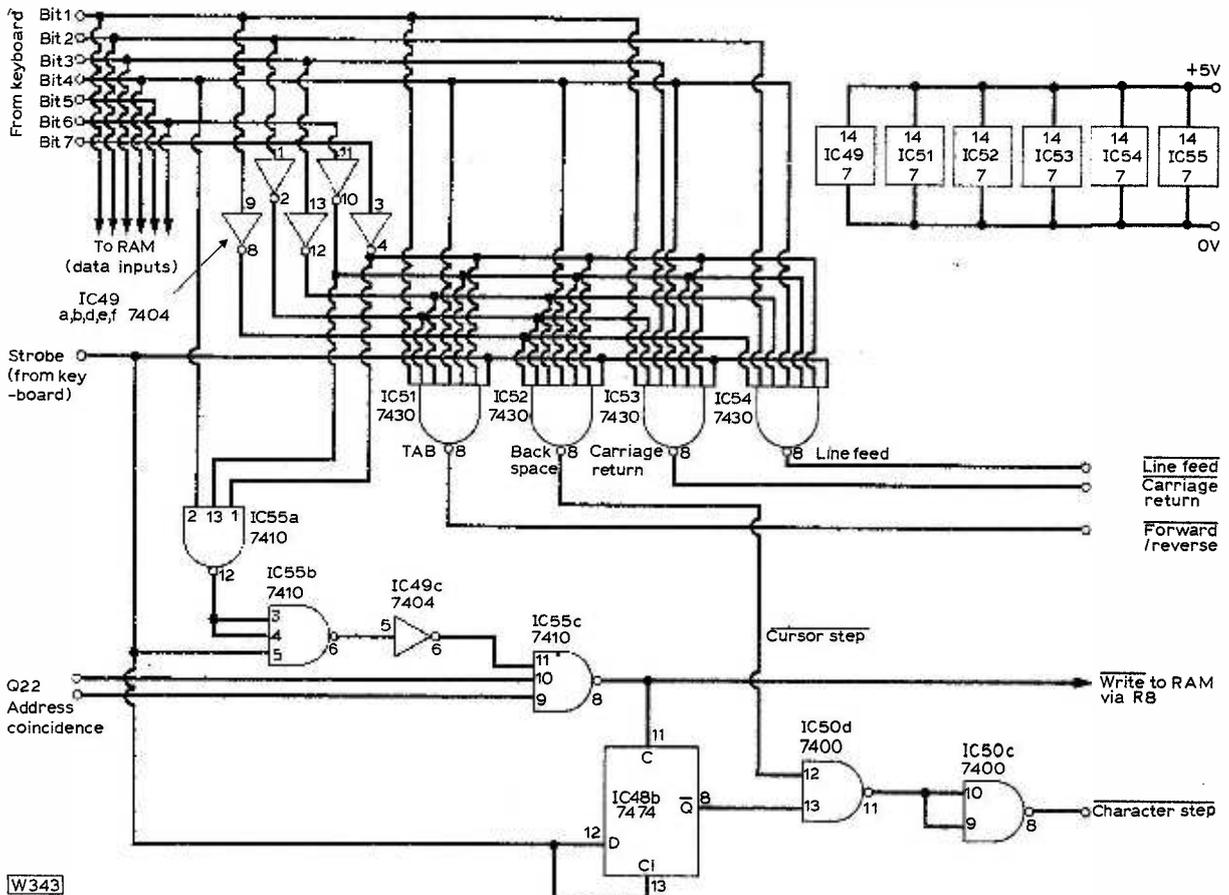
To prevent any ambiguity caused by an overlap (which could be introduced by propagation delays) we bring into play the Q22 signal which gives a pulse in the middle of a cell address and is well away from the edges (as far as time is concerned). The Strobe, Q22 and Address Coincidence are NANGED by IC55c and the output of this gate goes to "0" when all the signals are high. This gives the Write signal which is fed to all the RAMs via R8.

CONTINUOUS WRITE

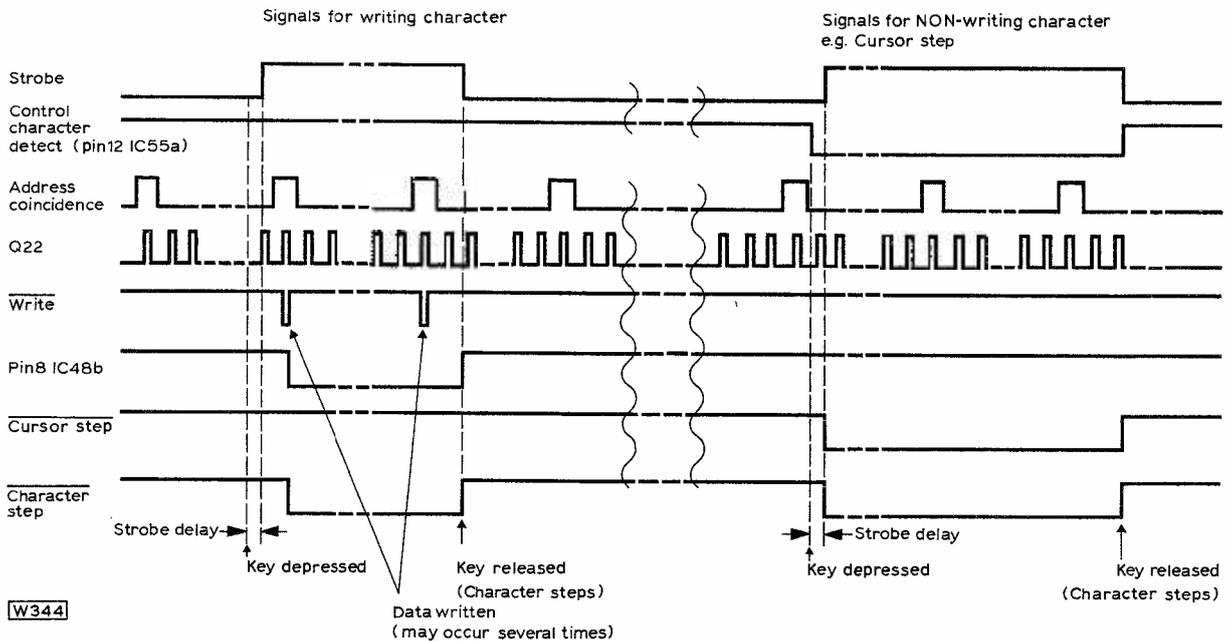
There is frequently a requirement to carry out a rapid "ERASE" of all data in the memory. It would be possible to do this by using the spacer bar to type through every one of the 512 character positions—thus writing a "space" code in to every memory location. This would be a very time consuming and tedious job and the circuit enables a very rapid erase by using the "Continuous Write" button (S3). When this button is depressed a logical "0" is forced on to the Write inputs of the RAM chips and puts them into a permanent Writing state. This overrides the normal Write input signal (hence the reason for R8 which prevents shorting the output of its driving gates to ground when S3 is pressed).

Continuous writing means, in effect, that whatever data is being applied to the Data Input pins of the

Fig. 29. The Keyboard Interface circuitry for detecting the non-writing control codes and for generating the writing signal when necessary.



W343



W344

Fig. 30. The major waveforms used to generate the Write and Character Step signals. The time axis is not to scale but note that it is Q22 that occurs within Address Coincidence which gives the Write signal. The Strobe and Control Character Detect signals are asynchronous (i.e. are generated by manual operation of the keyboard). The fact that several Write pulses occur during a key depression does not matter. It simply means that the same data is rewritten into the same address location.

RAMs is written into EVERY memory location in one single Addressing scan (i.e. within the time of a single TV Field). The screen is "Filled" with 512 repeats of the single character that was selected. For erase purposes one would, in practice, depress the spacer bar key and while it is depressed give a quick touch to the "Continuous Write" button. The result is a screen full of spaces or, in other words, a blank screen.

Alternatively it is possible to select any other character, or symbol, and fill the screen in a similar manner. This is a useful facility if the unit is to be used for display advertising when a patterned background might be required.

CHARACTER STEP

There is only one more signal to account for; this is Character Step which, if you remember, increments the Column Address Register each time a writing key or Cursor Step is depressed. It is important that the register is not incremented during a writing pulse otherwise we would get double characters on the display; we also have to make sure that it is not incremented by any of the control functions (with the exception of Cursor Step).

The D Type flip flop (IC48b) ensures that these conditions are fulfilled for writing codes and the Cursor Step signal is ORED with this in IC50d. The inverted character step command is then available at the output of IC50c from where it is fed to the input of the Column Address Register.

KEYBOARD VARIANTS

It is assumed that the keyboard unit will provide positive logic output signals for the seven data bits (i.e. +5V signals to represent "1" and near 0V for "0" and that the strobe signal is activated a milli-second or two after the data has been set up. The

Strobe must also go from 0V to +5V after this delay period.

It is understood that there are a number of "surplus" keyboards on the market which will be perfectly adequate for this project but there may be one or two variants in their output parameters. It would be impossible to cover all eventualities within the printed circuit of our keyboard interface so it is recommended that modifications to the output signals from the keyboard unit to bring them into line with the input requirements of the keyboard interface should be carried out on an extra board.

The modifications required for one such keyboard unit will be described later together with an alternative method of entering data for those who do not wish to purchase a keyboard. Pw

There have been some errors on the PCBs reported to us. Although these errors were incorporated into our prototype it performed all the functions we required of it. For completeness the amendments should be added. Details are:

1. Board D002, IC10, pins 10 and 11 should be connected (as Fig. 13).
2. Board D003, IC37, pin 4 should be connected to pins 8, 9, 14 and 15 (as Fig. 21).
3. Board D003, IC33, pin 11 should be linked to IC34 pin 3.

In our next issue, available early January, we will cover the General Assembly of the boards and the keyboard into a suitable case and will describe the modifications required to use another keyboard.

S-DeCnology



DAVID GIBSON



THIS MONTH

'Christmas Pudding Saver'

IT is rumoured that many a Christmas pudding suffered an undignified fate in certain unspecified workhouses—but at least they were cooked.

This Christmas, as those in the past, will find many a pudding ruined and there is a common cause. A saucepan is usually half-filled with water. The pudding, in its basin, is then put into the water and the pan is heated until the water boils. The water is then left to simmer i.e. just boiling, for a period of hours depending upon the size of the Christmas pudding undergoing the cooking.

The 'common cause' referred to earlier is that of inadvertently letting the pan boil dry with a resulting burnt and ruined pudding—and possibly a saucepan also.

This month's S-DeC project is a little more complex than the Guardian Angel shown in the last issue, but only by virtue of using a few more components. Exactly the same principles apply—simply plug the components into the S-DeC holes shown on the circuit diagram (duplicated on the layout diagram), and you should have no problems.

Too little water

The circuit basically senses when there is too little water in the saucepan. If this happens, an alarm is triggered. In this circuit, in the interests of simplicity, a lamp flashes repeatedly. A further reason for using a lamp is that the lamp bulb used for the last project may also be used for this one—as can all three transistors. The only additional components are two $10\mu\text{F}$ capacitors, 5 resistors and a potentiometer.

Although the application suggested here is typically seasonal, other applications are suggested later on.

The circuit comprises a free running multivibrator

(transistors Tr1 and Tr2) which feeds a lamp driving transistor Tr3 via the $4.7\text{k}\Omega$ resistor.

The multivibrator, when it is running, will produce a series of pulses at Tr2 collector. However, notice the dotted lines marked "probe" which plug into S-DeC holes 14 and 19.

The probe consists of two conductors separated by a small gap. Two bare wires about half an inch long and $\frac{1}{4}\text{in.}$ apart will work for a prototype, or perhaps two adjacent tracks on a printed circuit board.

Driving pulses

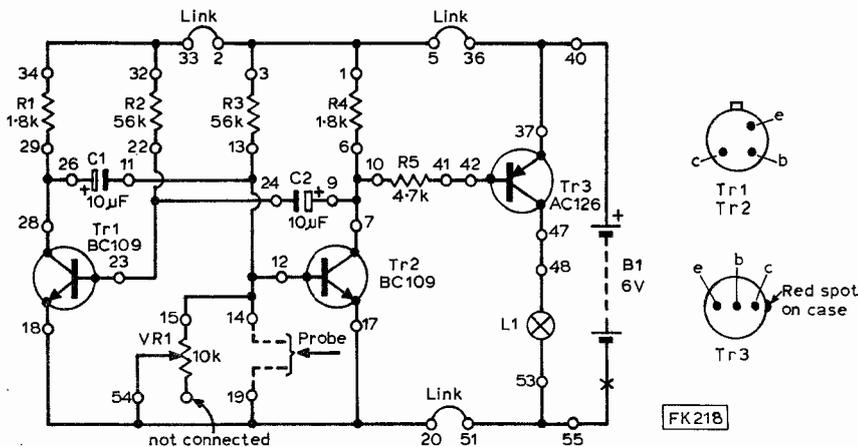
If one ignores the potentiometer for a moment, a break in the base circuit of Tr2 caused by the probe will allow the multivibrator circuit to function and produce the driving pulses at Tr2 collector. These in turn will pulse Tr3 on and off which in its turn causes the lamp to pulsate.

If we now dip the ends of our probe into a fluid such as water, then the base of Tr2 will be grounded by the resistance of the water. Because the resistance is low, it will stop the Tr1/Tr2 multivibrator from pulsing and thus the lamp will stay out.

The Christmas Pudding saver can now be appre-

you will need

R1	$1.8\text{k}\Omega$	C2	$10\mu\text{F } 12\text{V}$
R2	$56\text{k}\Omega$	Tr1	BC109
R3	$56\text{k}\Omega$	Tr2	BC109
R4	$1.8\text{k}\Omega$	Tr3	AC126
R5	$4.7\text{k}\Omega$	L1	6V 60–100mA cycle bulb
VR1	$10\text{k}\Omega$		lin. pot.
C1	$10\mu\text{F } 12\text{V}$	B1	6V or 9V battery
One S-DeC, materials for probe, and wire for links			



Circuit diagram of the Christmas Pudding Saver, the second project in the S-DeC series. Components used last month can be used again in addition to a few extra ones.

FK 218

ciated. The probe is simply lowered into the saucepan until the probe ends are about half an inch from the bottom of the pan. The probe could be clipped onto the side of the saucepan—perhaps using a ballpoint pen clip arrangement. When there is water in the saucepan, the alarm lamp will stay extinguished. Immediately the water boils down to less than half an inch the multivibrator will start to function and its pulses will flash the alarm lamp.

Correct polarity

Note that Tr1 and Tr2 are both silicon transistors of the n-p-n type. But Tr3 is a p-n-p transistor and hence it is wired up with its emitter going to the positive rail and not the negative rail like Tr1/Tr2.

Another important point is the polarity of the two capacitors. They must be connected the right way round i.e. the positive leads being plugged into S-DeC holes 26 and 9 respectively.

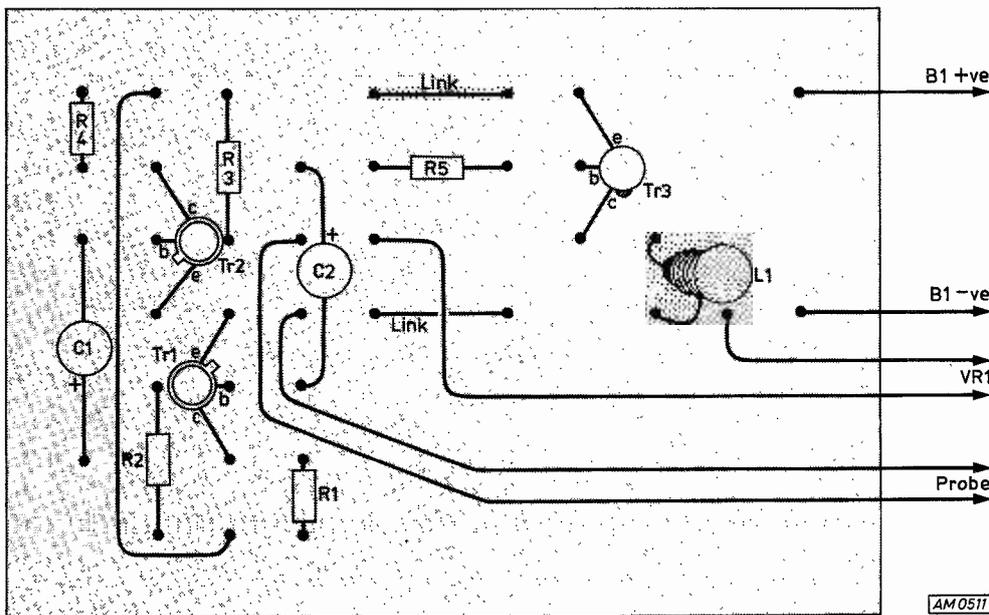
Referring to the circuit diagram, there are three link wires shown. These are simply pieces of wire which connect one S-DeC hole to another. The three

links are shown in thick lines and connect hole 33 to 2, 5 to hole 36, and hole 20 to hole 51 respectively. The best wire to use for the S-DeC is solid-cored wire which can be inserted and withdrawn many times. The manufacturers do market a little packet of links which comprise a connecting wire with a tiny plug at each end.

The potentiometer has three connections but only two are used; the centre tag and the left hand one viewed from the rear of the component. This variable resistor was included because it allows adjustment of threshold sensitivity at which the multivibrator will function. This is useful since different fluids will have different resistances (no—you can't use it as a wetness measuring device!).

Setting up

In setting up the Christmas Pudding Saver, simply plug in the battery to holes 40 (positive) and 55 (negative). The lamp should immediately start flashing. If it doesn't, adjust the potentiometer until it does. Then dip the probe into a glass of water. If



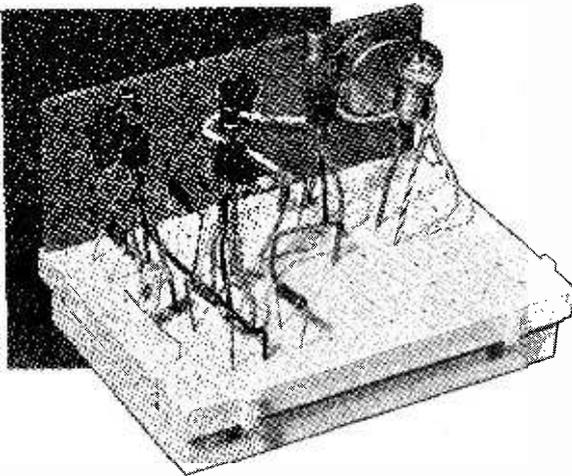
Full size drawing of the S-DeC giving the exact location of the components with respect to the numbered holes. As can be seen, three link wires are required, to enable the circuit to function.

the lamp does not go out, carefully adjust the potentiometer until it does. Now withdraw the probe and check that the lamp immediately commences flashing. If not, readjust the variable resistor slightly and the safety of your Christmas Pudding is assured!

A last point about the circuit. Do not use a battery voltage greater than 9V and don't use a bulb which has a current rating greater than 100mA.

Alternative uses

Now that the basic circuit has been explained, many readers will think of other applications. Basically, the circuit will sense when water drops below a certain preset level. Thus enthusiastic gardeners might use it to monitor the level in the



Rear view photograph of the completed Christmas Pudding Saver. The front panel is optional and provides a useful method of mounting the potentiometer.

water butt. Again, and in more festive spirit, it would make an excellent Pubometer. The probe could be housed in a ballpoint pen (suitably converted) which could clip onto the side of one beer glass at the local—clip it next to your thumb on the left of the handle. When your beer is getting low and you put your glass down, the lamp will start to flash showing that you're ready to be bought another drink!

Lastly, since the probe is essentially a kind of wet/damp sensor, it might be possible to bury the probe in a plant pot. When water is needed the lamp will flash.

Future projects

Having built the first two projects in this series you will appreciate just how easy it is to plug in components and get a circuit working. The same components will crop up again in other circuits in the series so all the projects are economical to build.

Next month's circuit is truly an international/multi-functional project. It can be used as a police car wailer, a wind speed indicator, and . . . well, buy *Practical Wireless* next month and find out!

TELEVISION

JANUARY

● TV PATTERN GENERATOR

Various patterns are required for checking and setting up colour receivers. This unit provides a crosshatch pattern for convergence and linearity, an eight-step grey scale to enable the c.r.t. drive circuits to be set up, and a blank white raster so that hum bars and other such faults can be examined. In designing the unit the two principal aims were independence and compactness. To meet the first requirement the unit contains its own sync pulse generator so that access to the receiver circuitry is not necessary. Meeting the second requirement means that the unit can be carried around conveniently without taking much space in the tool box. There are two outputs, a video one for use with CCTV equipment and a u.f. one for use with off-air receivers. The unit is based on the latest i.c. technology, using CMOS logic circuits.

● SERVICING FEATURES

The Decca Gypsy monochrome portable was first introduced in 1971. Complete circuit plus fault experiences from Barry F. Pamplin. On the colour side E. Trundle describes common faults on the ITT CVC1 and CVC2 hand-wired chassis. Plus more from Les Lawry-Johns on the Philips 320 chassis.

● VIDEO BLACK/WHITE SLICER

A simple video effect unit devised by A. Parr. This produces dramatic pictures which look like pen and ink drawings. The effect is achieved by slicing the video input signal so that the video output signal provided is at one of two levels only, corresponding to black and white. Can be used with the Effects Generator unit published in the April/May issues to give a form of keying.

PLUS ALL THE REGULAR FEATURES

TO.....
(Name of Newsagent)

Please reserve/deliver the JANUARY issue of TELEVISION (45p), on sale December 20th, and continue every month until further notice.

NAME

ADDRESS

.....
.....

Vagaries of VHF (Contd.)

Ron HAM F.R.A.S.*

OCTOBER

ALTHOUGH the author checks a number of specific radio frequencies at regular intervals each day, there are events which pass by unrecorded. Your reports are vital so that between us we can compile an account of unusual propagation which will be useful to the scientists of the future. It is always good to receive readers reports, even more so when no major disturbance has occurred during the period under review.

SOLAR ACTIVITY

Commander Henry Hatfield, (Sevenoaks, Kent. Gen. Sec. Brit. Astro. Assoc.) recorded several bursts of radio noise from the sun during the early morning of October 2nd before the author's radio

telescopes began their routine observation. The solar activity on October 3rd was confined to a single burst at 136MHz, while on days 11, 12 and 13 several bursts of noise were recorded, by the author, at both 95 and 136MHz.

Ionospheric disturbances were reported by the BBC World Service in the early hours of both the 7th and 8th and during the afternoon of the 10th. Robin Bellerby G3ZYE (Linfield Sx) noted the short skip "opening" on 10m which appeared to have an umbrella effect, because when Constance Hall G8LY changed the direction of her beam aerial it made little difference to the strength of incoming signals. 10m was open again toward Europe and the Middle East during the late morning of the 17th and at 1215GMT a strong signal was pounding into

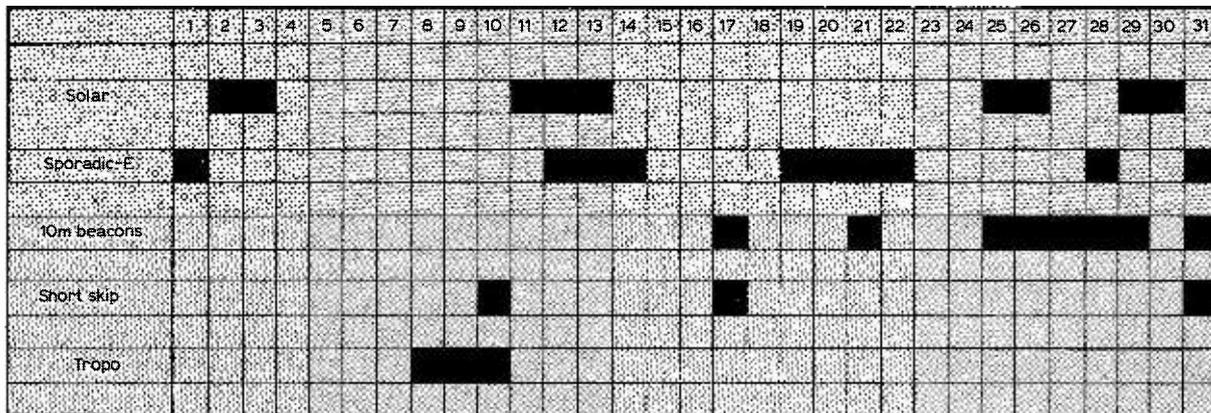


Fig.1: The black squares indicate days of activity affecting transmissions on the 10m and VHF bands.

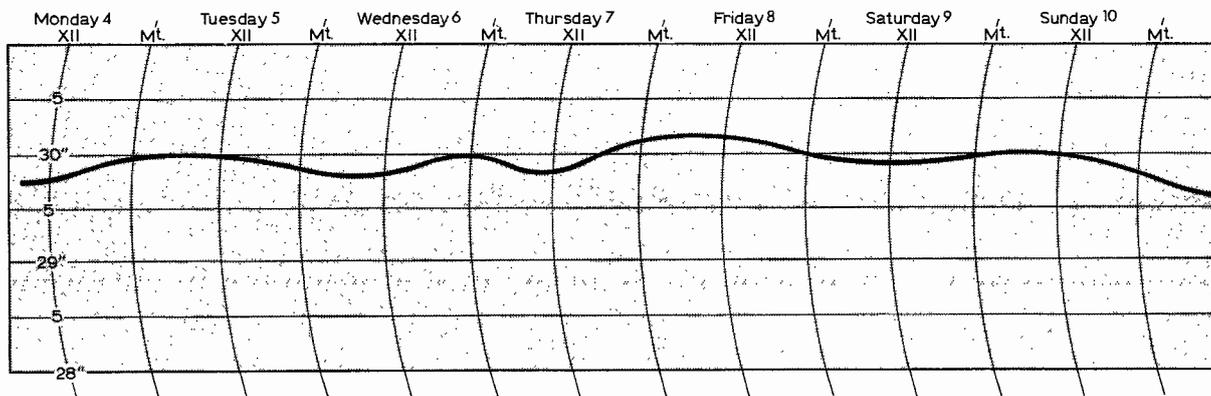


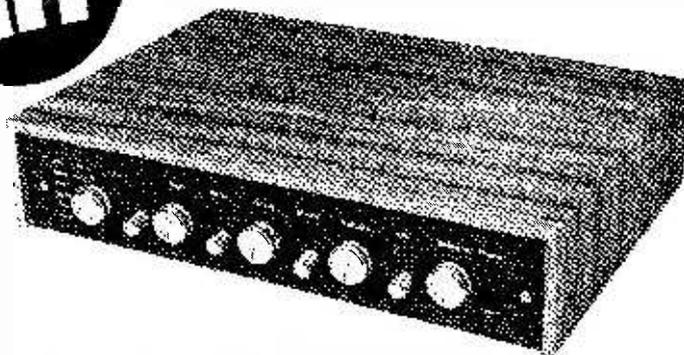
Fig.2: Barograph chart covering the period 4 to 10th October. On the 8th and 9th VHF signals were received from the Continent.

**SPECIAL
PRODUCT
REPORT**

R T V C

KIT

**30+30W
AMPLIFIER**



Having had one of the original ready-built Viscount amplifiers (14+14W) for a number of years and not having experienced any problems with it I was delighted to have the chance to assemble the kit for the latest in the line. This model is rated at 30+30W RMS output and is the only one of the range to have been made available as a kit. The facilities are the same as the Viscount IV. The purpose of this review is to assess the suitability of the kit for the constructor rather than to check out all the electrical specifications.

RT-VC consider that the constructor needs to be experienced to complete this kit successfully and I agree with them. A wrong connection could prove very expensive! Naturally RT-VC's caution is aimed at reducing the very high cost of after-sales servicing. Considering the excellent constructional and data sheet supplied with the kit the average constructor should have no difficulty in completing the amplifier satisfactorily. If, on receiving the kit, you feel that you are not up to building it then RT-VC will refund the full purchase money if the kit is returned untouched.

GETTING DOWN TO IT

There are only around twenty parts to check on opening the kit plus the usual nuts, bolts, etc. The most important item is the fully assembled and tested control unit which is really the whole amplifier except for the power supply, DIN sockets and cabinet! There are four pre-set pots on the unit which must not be touched. Incidentally, there are two speaker leads and an input lead supplied with the kit which is very thoughtful indeed. The 'experienced' constructor can be assumed to have the necessary few tools already plus a soldering iron.

The assembly instructions are very detailed indeed especially when one considers the line drawings and photographs supplied. I reckon that RT-VC's 'experienced' constructor ought to be able to do the job from these alone! After following the 36 steps outlined you will be ready to take in the copious notes on the testing, checking and installation of the amplifier.

CONSTRUCTIONAL NOTES

Construction took about four hours and no particular difficulties were encountered. The drawing of the paxolin panel for the power rectifiers can't make up its mind as to the hole sizes required but the answer is obvious on looking at the rectifiers. The mains transformer is supplied bolted to the chassis but ensure that the fixing bolts are really tight.

TECHNICAL SPECIFICATION

All silicon transistor stereo amplifiers using 20 transistors and 4 diodes.

Controls:—Pushbuttons for On-Off, Stereo-Mono, Scratch Filter, and RIAA-Flat Equalisation; Rotary selector for input facilities Magnetic or Crystal cartridge; Tape, Tuner, Microphone and Auxiliary; Individual controls for Treble, Bass, Balance and Volume; Neon power-on indicator; Tape Recorder Output provided.

Frequency Response:—25Hz to 25kHz plus-minus 1dB.

Distortion:—Less than 0.2% at 10W each channel operating in turn at 1kHz.

Power Output:—30W RMS per channel into 8Ω speakers or 20W RMS into 15Ω speakers. Two auxiliary switched mains sockets (2-pin).

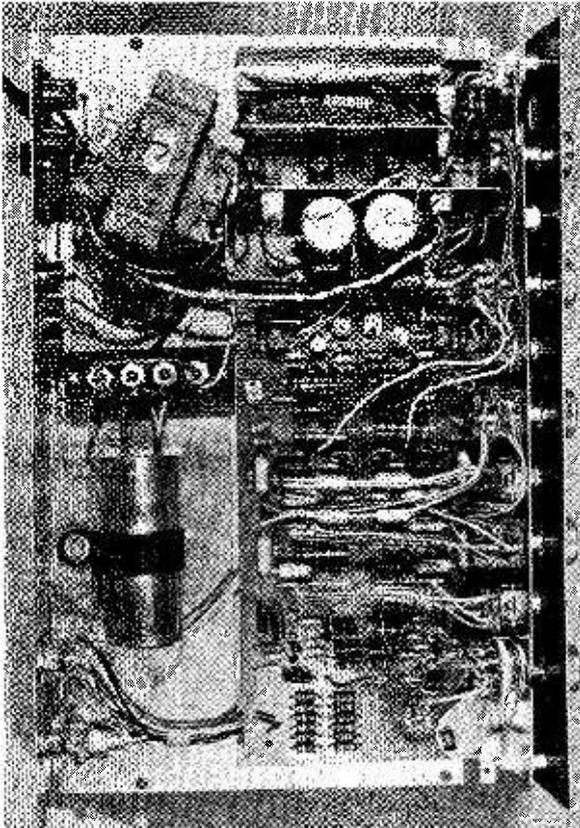
Size:—381mm long × 250mm deep × 75mm high. (15½ × 10 × 3in.).

Brief specification of the 30+30W stereo amplifier which can be assembled from the kit. The facilities are the same as on the Viscount IV amplifier. 30W speakers in chassis form are available from RTVC at £20 + £2.50 p/p each.

On removing the control unit from the chassis before beginning work note how it is fitted. It will go back the same way. A piece of cardboard is called for under the control unit but do not be tempted to make it bigger than the size given or it will obstruct the ventilation louvers in the bottom of the chassis. The input and speaker sockets are retained with washers (having internal teeth) and these are best fitted by going round and round the circle of teeth with the edge of the blade of a large screwdriver, pressing down until the socket is secured. Ensure each socket is orientated correctly.

Perhaps I was unlucky with my kit but the two spacers for the front panel were of different lengths so one had to be filed down until they were the same. The hole in the panel for the neon lamp was enlarged to take the lamp since it was found impossible to push the lamp back, as suggested by the instructions. Work from the back of the panel to avoid scratching the front.

The instructions call for the cutting away of a small area of the inside top of the cabinet to clear the mains transformer. This was an annoying task, having completed the amplifier and being impatient to try it out! A wax candle was rubbed



View underneath the finished amplifier. The single PCB carries the two channels from pre-amplifiers to the power amplifier stages and is supplied in the kit ready wired and tested. Little remains but to connect the PCB lead-out wires to the DIN sockets and power supply mounted on the chassis.

over the top of the transformer, the cabinet replaced and pressed down round the transformer which left a clear outline on the inside of the cabinet. A slightly larger area was then cut away with a chisel to a depth of about $\frac{1}{16}$ in. Having done all this it was suddenly realised that a couple of washers between the chassis and the cabinet at each fixing screw hole would have done the job just as well! The bottom edge of the panel projects down slightly but is still held in its slot in the cabinet.

Back to the wiring and note that in Fig. 1 of the instructions the arrows pointing to the two pink wires are slightly displaced downwards. The wires go to the mains sockets as will be apparent when following the written instructions.

CONCLUSIONS

For a stereo amplifier providing 30+30W output this kit is very cheap indeed and no-one who has ever handled a soldering iron need be afraid of tackling this project. The circuit diagram is excellent except that there are no values on it! It is a good exercise to put them on after the amplifier is completed, just for reference purposes. It was good to note that RF suppression components are fitted to the input transistors which should prevent the pick-up of signals from broadcast stations, taxi services and the like.

On connecting the amplifier to the existing domestic radio equipment it worked satisfactorily on all functions but since the existing speakers are rated at only 20W the temptation to 'turn up the wick' was firmly resisted! On the old 14 + 14W amplifier that was a small amount of cross-over distortion at low volume levels but this is noticeably absent in the new amplifier.

The complete kit costs £29 inc. VAT plus £2.10 for post and packing. Mail Orders only to RTVC Ltd., 21c High Street, Acton, London W3 6NG. Personal shoppers to 323 Edgware Road, London W2 (Half day Thursdays).

VAGARIES OF VHF—continued from page 781

southern England from the beacon station in Cyprus, 5B4CY on 28.180MHz. This beacon was heard again at 0930 on the 21st, early on the 25th and at lunchtime when there was deep fading.

Reference to Fig. 1 will show that the Cyprus beacon was heard for seven days between 21 and 31st. On each day at 0915 a signal varying between S2 and S9 was heard and on the 26th it was again audible at midday and during the afternoon. On the 31st this beacon was heard at 0830 and by 0930 many SSB signals on 10m were copied including G, 4Z4, CT, I, ZS2 and F.

SPORADIC-E

One cannot expect much disturbance to radio signals from sporadic-E during the autumn and winter months so it is worth making a special note that strong and frequent bursts of signal were received from the R1 television system (49.75MHz) during the early mornings on the 8 days indicated in Fig. 1. Periodically, strong bursts of signal were heard simultaneously from East European broadcast stations operating in the 4m band.

TROPOSPHERIC

There was little hope of VHF DX when large areas of low atmospheric pressure accompanied the badly needed rain which came between late September and the time of this report, Oct 22. However, there was a slight "lift" between midday on the 8th and midnight on the 10th which coincided with a rise, to above 30.0in and then a fall in pressure, Fig. 2. At midday on both the 8th and 9th the author heard strong signals from Continental broadcast stations between 95 and 100MHz, while Steve Whitt G8KDL (London) also keeping an eye on the barometer, noticed that when the 2m band opened up towards the Midlands and Wales on the 10th the "DX" signals were subject to fading and at times this was very rapid. Steve is keen on VHF propagation and is equipped to receive Band 1 TV, Band 2 FM, 2m amateur signals and Band 3 TV, a good way of checking for both sporadic-E and tropo disturbances because that lot covers from 40 to 200MHz!

Thanks also to Joosa Berden, G3RND for a copy of his barograph chart (same as Fig. 2) showing the sharp fall on the 10th and his report that conditions were good on both 2m and 70cm around 0800 on that day. Joosa, who has a good location on the Isle of Wight, has found that UHF is open longer and more often than 2m. His letter also contains details of his equipment and other observations which we will use at a later date.

*Faraday, Greyfriars, Storrington, Sussex RH20 4HE.

Readers experiencing unusual reception of stations on the VHF/UHF bands of the nature described by Ron Ham in the first two articles are invited to send brief reports to him at the above address. NOT to the Editorial offices!

If there is sufficient response a regular feature could be compiled for inclusion in PW—Editor.



AMATEUR BANDS

by Eric Dowdeswell G4AR

MORE than one reader has asked for my views on repeaters in the amateur bands. Obviously there are those that like 'em and those that don't! I don't! and I never have done. I do not consider them to be amateur radio as I understand it and I am quite convinced that they have been foisted upon the amateur community by outside interests. The results can be seen in the avalanche of costly black boxes now available to the repeater enthusiasts. Many of these sets contravene the terms of the amateur transmitting licence which requires that a station shall be able to receive as well as to transmit on a particular frequency. With a separation of 600kHz between transmit and receive frequencies needed for repeater operation the manufacturers are not going to fit crystals to receive on every transmit frequency. So to hell with the regulations here!

Incidentally, if a foreign amateur visits my shack he cannot operate my station without the prior permission of the Home Office, yet foreign amateur stations can and do access our unattended repeaters! Doesn't make sense, does it?

Steve Larkins of Wellingborough has modified his Pye superhet sufficiently to copy SSB and make some good catches on 20m. He and a number of others are studying for the RAE under G8LII so good luck to you all. John Higginbotham keeps the flag flying in Holyhead and although only 16 seems to have got himself a BRS number from the RSGB, or rather RS36901 to be exact. What's happened to the "British" part of British Receiving Station? Are we suddenly ashamed of the "British" part or is it too long for the RSGB's new data processor? John had a CR70A but is now looking for something a bit more advanced. Apart from the fact that John is on a full time electronics course at Bangor Tech he is studying for his RAE and having a go at the code as well! If you don't manage to send in any logs OM, we'll understand!

More on Geoff Watts, composer of DX News Sheet, mentioned all too briefly last month. He is in a bad way physically, attributable in some part to the

amount of work Geoff has put in on the News Sheet since 1962. He can still supply copies of his excellent prefix/country/zone list which is as up-to-date as any such list can be. It runs to 15 pages and is available from Geoff for 35p at 62 Belmore Road, Norwich NR7 0PU. The least we can do to help is to ensure that we each have a copy of this valuable listing. Overseas readers need to send \$1 or five IRC's.

Brian Le Lievre residing in Guernsey has a collection of sets including an Eddystone 840C, Yaesu FR50, Mohican, SW717 and has now acquired an RG39 thought to be circa 1941 but I think it may be quite a bit earlier than this. Any info would be appreciated. The set has six bands covering 95kHz to 26MHz and seven valves. Paul Barker has moved into a new QTH but is still in Sunderland but already feels that it is a better site even before he gets his aerials up again. At present a short whip has to suffice but nevertheless he has copied SSTV from several countries including the US.

Steve Cottis A8961 is back again bemoaning the fact that his local code class has collapsed due to lack of support. His hopes for a local RAE course have also gone the same way. Keep your pecker up OM and suggest you flog on by yourself until something gets organised. Steve finds 80m beginning to open up for the winter season and mentions the improved conditions on 10m during the RSGB's 21/28MHz contest. Was it really conditions, I wonder, or just the sudden extra activity! The latter, I suspect.

From Dublin an interesting letter from Andrew Grendon who has got the amateur radio bug after reading this feature and wonders where to start. A good question! Well, there is nothing like the RSGB's *Guide to Amateur Radio* at £1.17 inc. from 35 Doughty Street, London WC1N 2AE to get on with, coupled with a good second-hand communications receiver to get the feel of the bands. I don't usually advise beginners to build their own SW sets until they have had some experience otherwise they finish up floundering around, unable to find the bands and condemning all and sundry connected with amateur radio!

Having had many such letters in recent times, asking for information on amateur radio, I have now prepared a standard letter of reply, ready for the future. Typing out a lengthy and detailed answer each time gets a bit tiring. Such a letter, however, is very important indeed and may well determine whether the enquirer takes up amateur radio or not!

Practical Wireless, January 1977

Loudspeaker leads



**SPEAKER LEADS
MADE TO YOUR EXACT
REQUIREMENTS AT EX-FACTORY PRICES.**

- Fully moulded din plug.
- Any length cable from minimum 3 metres (grey and black polarised stripe).
- 100% British made.
- Price 19p per metre inc. VAT.
- Other moulded din, phono, plugs, sockets available — send S.A.E. for prices (give lead lengths required).
- Allow 7 days cheque clearance.
- Send cash/P.O./cheque + 25p P & P to:—

PLASTRONICS LTD.

Victoria Works, Water Lane,
Watford, Herts.



THE

"Manta"

CAPACITIVE DISCHARGE ELECTRONIC IGNITION UNIT

THE NEW, HIGHER RELIABILITY VERSION OF THE P.E. "SCORPIO MK III" IS NOW AVAILABLE IN KIT FORM!!

Our thousands of satisfied customers say:-

More miles per gallon (customers reports give 10%-25% saving—letters available).

An increase in overall performance—your 4 cylinder car feels like a 6 cylinder.

No more cold morning splutters—saves you even more petrol through less use of choke.

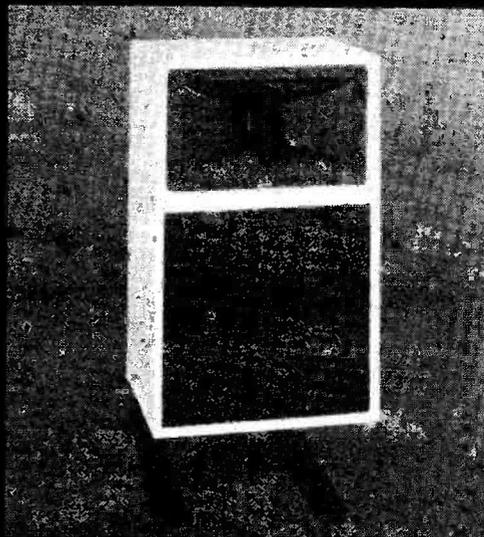
The price—a snip at only £16.50, fully inclusive of all parts, instructions, postage/packing, and V.A.T. (ready built unit available—£19.85 fully inclusive).

All parts to high specification, first quality and brand new. Construct this invaluable accessory, following our easy step by step instructions (also available separately, price 30p post paid). Send for our free interesting six page brochure—"Electronic Ignition—How it Works" (S.A.E. please) to:-

ELECTRO SPARES, DEPT. P.W., 187A SHEFFIELD ROAD, CHESTERFIELD, DERBYSHIRE S41 7JQ—Phone Chesterfield (0246) 36638

The DECCA LONDON LOUDSPEAKER ENCLOSURE

-Gets A Great Response.



The Decca London loudspeaker enclosure represents an important advance in the field of sound reproduction. It incorporates the Decca London Ribbon high frequency speaker with its unique 'attack' and 'transparency' of reproduction as well as a newly developed bass unit giving a total frequency response of 50-25,000 Hz from an enclosure of only minimal size. Use of a cabinet manufacturing technique which gives increased rigidity, has enabled the internal capacity to undertake the essential task of recreating a bass end to match the superb high frequency response. For looks and performance, the Decca London Loudspeaker Enclosure deserves a hearing. It is available in walnut, rosewood or white finishes.



For further details write to
Decca Special Products
Ingate Place
Queenstown Road
London SW8 3NT



on the 19 and 25m bands all through the day. The full log is as follows:-

- Radio Kuwait on 9555 at 1730
- Radio Free Europe on 15145 at 1715
- Vatican Radio on 15165 at 1500
- Radio Belgrade on 15240 at 1530

Steve Budd A8713 of Worthing also comments on the way that bands seem to improve when there is a contest on and mentions 10m in particular. As I have said before, if people would only send a CQ more often on seemingly dead bands, instead of waiting for someone else to take the initiative, a lot more activity would be generated.

Further to my very terse reference last month to the death of HZ1AB I understand that it was the result of a helicopter crash in Saudi Arabia. When I used to be flying around from ST2 land he could often be heard on the aeronautical frequencies with his Convair aircraft that he flew around for the Aramco oil company.

Log Extracts (All SSB)

S. Budd: — 80m A9XBD IT9PUG LX1JAN WA6EGL/VQ9 (Chagos) VS6DO 6W8DY 9L1NP 40m IT9FTT VK3HW ZB2CF 20m HM9A WA6EGL/VQ9 15m AP2AL EA9FN KZ5RL VP2KAA VP2KF VP8HA WA6EGL/VQ9 (again!) VU2BX YN1RWG 9J2WR 10m EL2T TU2FW ZE1BL 6W8FP 9G1LZ

P. Barker:—20m SSTV EA2JO 17LKF K4ZRD OH5RM VO1BL W1BGW W1VRK WA2DWE W2HKW W4LZZ YU1NWJ YU2CB 9G1JX 20m EL2EK HZ1TA OE5GML/YK UF6FCO

S. Cottis:—80m EA6DA FP8DX EP2NC DU9FB SV0WZ (Rhodes) WB4ZKG/KC6 VS5MC 15m AP2SA VQ9HCS VU2LQA 9J2WR ZS1HS 10m 9J2WR

S. Larkins:—20m DU9FB OY8KH JW7FDI (Svalbard) OA2DX VK1AOP ZL3GG.

D.S. would also like to know how to enter the world of the licensed amateur and to this end I would suggest that the best thing to do would be to write to the Radio Society of Great Britain, 35 Doughty St., London W1 and get the Guide to Amateur Radio for £1.17 which explains all.

While still in the mysterious East let us turn to Robert Leo of Malacca, West Malaysia. It seems that even in this part of the world there are problems caused by competing stations. Robert reports that Radio Veritas on 11725 is hampered by the Madagascar relay of the Radio Nederland broadcasts on 11740. If anyone pulls in the Radio Veritas overseas service, and I must admit it is not often reported, the address is Radio Veritas Overseas Service, PO Box 939, Manila, Philippines.

This station is an evangelical service and I can find out nothing of the power of its transmitters only that they are listed as using 15345. However, to return to Robert's letter, he uses an Aiwa 7PR930 set with internal aerial and logs the following:—

- Radio Nederland (Madagascar Relay) on 11740 at 1400
- Radio Australia on 9670 at 1200
- FEBA Seychelles on 15190 at 0700
- Radio Japan on 11875 at 1115
- Radio Kuwait on 15345 at 0530
- Radio Veritas on 11725 at 1400

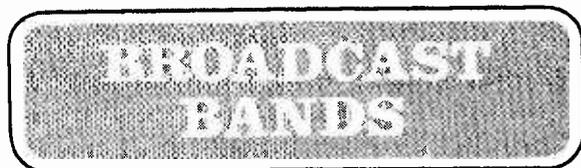
Bear in mind that Malaysia is Greenwich time plus seven hours and that for anyone here in the UK these are the times that apply since Robert has quoted in GMT. In fact Radio Australia would not be heard at 1200 here while for Robert it would be 1900 Malaysian time.

Station news this month is provided by Robin Bayley of Albrighton which brings us back to these wintery shores. Robin has recently constructed a short wave set from the pages of PW and it seems that hooked on to the end of the ever-popular long wire aerial it pulls some very interesting signals. Robin confirms our Malaysian friend's logging of Radio Veritas on 11725 and adds the following frequencies. 0100 to 0200 on 15280, 1400 to 1500 on 9610 and 11725. Signals sucked in by the PW set include

- 9570 Radio Australia at 0645
- 9710 Radio Nederland, Bonaire at 0800
- 9860 Radio Pekin at 1600
- 9910 AIR Delhi at 2100

It seems, according to Robin, that the Danish Short Wave Club PO Box 50 DK 2560 Alburstoland, Denmark has published its Tropical Bands Survey, for five IRCs.

Ken Smith from Ross-on-Wye has been keeping a keen eye on the Voice of America Broadcasts and can give the available channels for any hour of the day and night. His picture postcards are a delight on these gloomy days! However, what has puzzled



SHORT WAVE BROADCASTS

by Derek Bell

THIS month's column has more of an overseas look than has been evident for some time. The first letter comes from a DXer who is in the happy position of not only listening to the DX but in going to the stations rather than having them come to him! He is D. Simpson who is chief cook on the tanker "British Pioneer" one of the BP fleet. D.S. has written while on a trip in the Malacca Straits, Sumatra area and posted the letter in Kure, Japan. Dare I say it, a veritable Cook's tour! (sorry).

The set that our friend runs is a Vega Selena hung on the end of a long wire and he comments that the Philippines and Indonesia offer many stations that we in the UK can never hope to hear, and that it is nice to be able to hear Radio Australia



DRILL CONTROLLER
Electronically changes speed from approximately 10 revs to maximum. Control at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions £3-45 including post & VAT. Made up model £1.00 extra.

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: PPI, PP3, PP4, PP6, PP7, PP9 and others. Kit comprises: main transformer rectifier, smoothing and load resistor condensers and instructions. Real snip at only £1.50 VAT & Postage 50p.

RADIO STETHOSCOPE



Easiest way to fault find, traces signal from aerial to speaker, when signal stops you've found the fault. Use on Radio, TV, amplifier, anything. Complete kit comprises two special transistors and all parts including probe tube and crystal ear-piece, £2-95, twin stetho-set instead of £4-00 VAT and postage incl.

MICRO SWITCH BARGAINS

Rated at 5 amps 250 volts. Ideal to make a switch panel for a calculator and for dozens of other applications. Parcel of 10 for £1.00, VAT and post paid.

MOTORISED DISCO SWITCHES
With six 10 amp changeover switches. Multi adjustable switches are rated at 10 amp each so a total of 2000w's can be controlled and this would provide a magnificent display. For mains operating £4-25 post & VAT Paid. Ditto 9 switch £4-95 Post & VAT Paid. **DITTO BUT 12 SWITCH £5-75 POST & VAT PAID.**



AMMETERS
Ideal for chargers etc. 2" sq. full vision 0-8 amp 95p, 1 1/2" round 0-2 amp 55p, 0-3 amp 65p, 0-4 amp 75p. Post & VAT 25p each.

MAINS OPERATED SOLENOIDS

Model 772—small but powerful (lin. pull—approx. size 1 1/2 x 1 1/2 in., £1.00)
Model 4001—lin. pull. Size 1 1/2 x 2 x 1 1/2 in. £1.50
Model T71—lin. pull. Size 3 x 2 1/2 x 2 in. £2.50
Prices include VAT & postage.

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 90p VAT & Postage

RELAY BARGAIN

Type 600 relay with twin 500 ohm coils which may be joined in series or parallel thus relay will operate off voltages between 5 and 30 volts DC. Price 44p each, 10 for £4 post and VAT paid.

BATTERY CONDITION TESTER

Made by Mallory but suitable for all batteries made by Ever Ready and others, most of which are zinc carbon types but also mercury manganese—nickel—silver oxide and alkaline batteries may be tested. The tester puts a dummy load on the battery and the meter scale indicates the condition depending upon which section the pointer rests. The section reads "replace", "weak" or "good". The tester is complete in its case, size 8 1/2" x 6 1/2" x 3" with leads and prod. £4.50 post & VAT incl.

BATTERY CHARGER

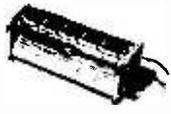
Famous Atlas in metal case with meter, output lead terminated by crocodile clips. For 6 or 12V charging simply by changing plug on front panel. Ready built and still £2-95 plus 1p Post & VAT

HONEYWELL PUSH BUTTON PANEL MOUNTING MICRO SWITCH

1-2-3 Bank, each Bank consisting of the changeover micro switch rated at 10 amps 250 volts. Through panel fixing by 2 lock nuts complete with black 1" diameter knob. Prices—1 bank 40p—2 bank 65p—3 bank 70p.

MULLARD UNILEX

A mains operated 4 x 4 stereo system. Rated one of the finest performers in the stereo field this would make a wonderful gift for almost any one in easy-to-assemble modular form and complete with a pair of Celestion speakers normally £20. 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 £16.50 including VAT and postage.



TANGENTIAL HEATER UNIT

This heater unit is most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. Comprises motor, impeller, 2kW element and 1kW element allowing switching on 1, 2 and 3kW and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only needs control switch. £5-83 plus VAT & post £1. 2kW Model as above except 2kW £4-25 plus VAT & post 75p. Don't miss this. Control Switch 44p. P. & P. 40p.

ISA ELECTRICAL PROGRAMMER



Learn in your sleep! Have radio playing and kettle boiling as you wake—switch on lights to ward off intruders—have a train house to come home to. All these and many other things you can do if you invest in an electrical programmer. Clock by famous maker with 15 amp. on/off switch. Switch-on time can be set anywhere to stay on up to 6 hours. Independent 60 minute memory jogger. A beautiful unit. Price £2-95. VAT & Postage 60p, or with glass front, chrome bezel. £1.50 extra.

ROOM THERMOSTAT

Famous Satchwell, elegant design, intended for wall mounting. Will switch up to 20 amps at mains voltage, covers the range 0-30°F. Special snip this month £2.50, post and VAT paid.

SMITHS CENTRAL HEATING CONTROLLER

Price £7.50 including VAT and postage.

RANDALL CENTRAL HEATING CONTROLLER

Price £6.50 including VAT and postage.

8 POWERFUL BATTERY MOTORS

For models, Meccano's, drills, remote control models, plane boats, etc., etc. £2.00.



ROTARY PUMP

Self priming, portable fits drill or electric motor, pumps up to 200 gallons per hour depending upon revs. Virtually uncorrodable, use to suck water, oil, petrol, fertilizer, chemicals, anything liquid. Hose connectors each end. £2.00 Post Paid.

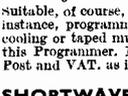


MAINS RELAYS

With triple 10 amp changeover contacts—operating coil wound for 230 volts AC, chassis mounting, one screw fixing, ex unused equipment 80p each, 10 for £5 post and VAT paid.

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 Programme. Mains operated. Size 3in x 3in x 2in deep. Price £5.50. 80p Post and VAT, as illustrated but less case.



SHORTWAVE CRYSTAL SET

Although this uses no battery it gives really amazing results. You will receive an amazing assortment of stations over the 19, 25, 31, 29 metre bands. Kit contains chassis front panel and all the parts £1-80—crystal ear-phone 55p including VAT and postage.



PAPST MOTOR

West German make, these fine motors are noted for their performance and reliability. Special features are the rotating heavy outer which acts as a flywheel to eliminate wow and flutter and switchable reversing. We have four types in stock, all 1360 revs., including starting capacitor.
(1) Reference No. KLZ 20.50-4, 230 volts 50HZ, price £5.50
(2) Reference No. KLZ 32.50-4, 230 volts 50HZ, price £5.50
(3) Reference same as above, 115 volts 50HZ, price £2.50
(4) Reference same as above, 110 volts 60HZ, price £2.50
Post and VAT 80p each extra.

PANEL METER SNIP

Japan made 2" x 1 1/2" full vision flush mounting, 100µA I.s.d.—scale engraved DB easily changeable as perspex cover simply clips on. A real snip £1.75 post and VAT paid, or 10 for £15 post and VAT paid.

TERMS: Where order is under £5 please add 40p surcharge to offset packing expenses

J. BULL (ELECTRICAL) LTD.
(Dept. P.W.), 103 TAMWORTH ROAD,
CROYDON CR9 1SG.

SWITCH TRIGGER MATS

So thin is undetectable under carpet but will switch on with slightest pressure. For burglar alarms, shop doors, etc. 24in x 18in £2-33. Post & VAT 60p.
18in x 10in £1-85. Post & VAT 50p.



MAINS TRANSFORMERS

All standard 230-250 volt primaries	2 1/2 amp	1.05
2-4v	5 amp	1.37
6-8v	2 amp	1.47
6-8v	3 amp	2.19
9v	1 amp	1.19
9v	3-5 amp	3.13
12v	13 amp	1.85
12v	1 amp	1.25
15v-0-6-3v	1 amp	1.85
15v	1 amp	1.95
24v	2 amp	3.88
24v	3 amp	4.75
12-0-12v	50mA	1.56
6-0-6v	50mA	1.56
8-0-8v	1 amp	1.96
25v	13 amp	2.44
25v	2 amp & 4-3v	5.63
60v	5 amp & 5v	9.35
27v	8 amp	5.68
30v	37 amp	27.50
80v tapped 75v & 70v	4 amp	6.87
250v-60mA & 6-3v	1-5 amps	2.19
275-0-275v at 90mA & 6-4v	3 amps	2.82
EHT Transformer 5000v	23mA	(Intermittent) 6.87
Charger Transformers		
6v and 12v	2 amps	1.87
6v and 12v	3 amps	2.82
6v and 12v	5 amps	4.25

Add 30p per £1 to cover postage and VAT

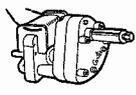
MULTI SPEED MOTORS

Six speeds are available from 850 and 1,100 r.p.m. and 7,000, 9,000 and 11,000 r.p.m. Shaft is 1/2 in. diameter and approximately 1 in. long. 230/240v. Its speed may be further controlled with the use of our Thyristor controller. Very powerful and useful motor, size approx. 2 in. dia x 5 in. long. Price £2.00 including Post & VAT.



SPIT MOTOR WITH CARTER GEAR BOX

Probably one of the best spit motors made. Originally intended to be used in very high priced cookers however this can be put to plenty of other uses, for instance your garden barbeque or to drive a tumbler for stone polishing; in fact, there are no ends to its uses. Normal mains operation. £3-25 including POST & VAT.



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: PPI, PP3, PP4, PP6, PP7, PP9 and others. Kit comprises: main transformer rectifier, smoothing and load resistor condensers and instructions. Real snip at only £1-80 including post and VAT.

MULLARD AUDIO AMPLIFIERS

All in module form, each ready built complete with heat sink and connection tags, data supplied
Model 1153 500mW power output £1.50 including Post & VAT.
Model 1172 1W, power output £1-85 including Post & VAT.
Model EP9000 4 watt power output £2.00 including Post & VAT.
EP 9001 twin channel or stereo pre-amp. £2-90 including Post & VAT.

28 RPM GEARED MAINS MOTOR

This is a substantial motor (1 1/2" stack induction type) quite powerful definitely large enough to drive a rotating display or a tumbler for polishing stone etc. Approximate overall size 4" x 3 1/2" x 2 1/2" these are ex-unused equipment, carrying our normal ex-equipment guarantees. PRICE £2-95 POST and VAT PAID.

TELESCOPIC AERIALS

for portable car radio or transmitter. Chrome plated—six sections, extending from 7 1/2 to 47in. 50p + 15p. Post & VAT.
KNUCKLED MODEL FOR FM. 80p + 17p. Post and VAT.

CENTRIFUGAL BLOWER

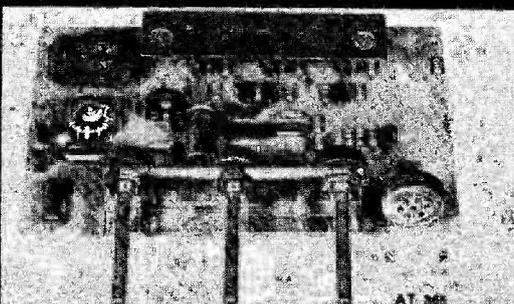
Miniature mains driven blower centrifugal type blower unit by Woods. Powerful but specially built for quick running—driven by cushioned induction motor with specially built low noise bearings. Overall size 4 1/2" x 4 1/2" x 4". When mounted by flange, it is blown into the equipment but to stick it out, mount from centre using clamp. Ideal for cooling electrical equipment or fitting into a cooker hood, film drying cabinet or for removing flux smoke when soldering, etc. A real bargain at £2-80, 60p post & VAT.





Announcement

Electronic Construction Kits for 1976/77



AF 25	Mixer	2.50
AF 30	Pre-amplifier	2.30
AF 300	3 Watt audio amplifier	6.10
AF 310-3	Power amplifier	5.90
AF 340	40 watt AF power amplifier	8.95
AF 380	2 Watt IC universal amplifier	3.25
AT 5	Automatic light control	3.10
AT 30	Photo-call amplifier	5.25
AT 50	Triac AC regulator up to 440W	3.70
AT 56	Triac AC regulator up to 2200W	5.55
AT 320	All-round AC/DC regulator	10.75
AT 325	Interval and flasher unit	7.20
AT 347	Electronic Roulette	8.75
AT 365	Light show	17.00
AT 405	Low-cost light/heat control	2.75
AT 460	Monolite	10.80
AT 465	Superlite	17.10
AT 466	Strobolite	20.45
AT 488	Quadrolite	19.45
GP 304	Main circuit unit	4.55
GP 310	Hi-Fi pre-amplifier	24.60
GP 340	Hi-Fi pre-amplifier	29.10
GU 330	Guitar tremolo	5.65
HF 61	Diode medium wave receiver	4.30
HF 65	FM transmitter/Signal Test Generator	2.50
HF 305	Amateur band 2 metre VHF 144 MHz converter	6.70
HF 310	FM tuner	11.50
HF 325-2	FM tuner module	19.85
HF 330	Stereo decoder	6.70
HF 375	Mini FM receiver	2.95
HF 385	VHF/UHF aerial amplifier	5.80
HF 395	Aerial amplifier AM-FM	1.50
LF 380	4d-stereo	8.45
MI 310	Stereo VU module	4.30
MI 350	S-meter module/amplifier	2.95
MI 360	Multivibrator/signal generator	1.40
MI 380	Dial module (meter not included)	2.55
MI 381	VU module (meter not included)	1.50
MI 392	Balance module (meter not included)	2.10
MI 393	Tuning module (meter not included)	2.60
MI 402	Semi-conductor tester for diodes/transistors	4.50
NT 300	Power pack (transformer not included)	10.15
NT 305	Voltage converter	4.40
NT 311	Voltage converter	2.80
NT 315	Power pack	6.75
NT 330	Power pack	4.70
NT 400	Power Supply (transformer not included)	17.15
NT 410	Power supply	4.50
NT 415	Power supply (transformer not included)	8.45

Please enclose 25p for p & p with order.

Send for free Catalogue to:
JOSTYKIT (UK) LTD., Mail Order Division
 P.O. Box 68, Middlesborough,
 Cleveland, TS1 5DG

NAME

ADDRESS

.....

.....

AMBIT international (dept 85)

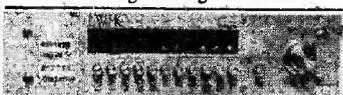
The Dynamic Twosome: Signalmaster/Audiomaster

After long and thorough deliberation, we are proud to announce a new unit from Larsholt - the Audiomaster. As ever, the instructions are designed to lead the unwary and the inexperienced through point-to-point steps that culminate in a professionally styled and finished amplifier to complement the Signalmaster FM tuner. Price £79.00



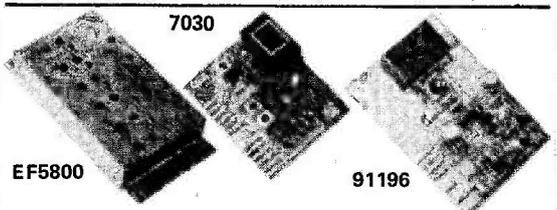
Power: 25+25W RMS
 THD: Less than 0.3%
 Dynamic range: an exceptional 80dB
 (Signalmaster shown on top of the Audiomaster)

The Signalmaster Mk.8 is equally simple to assemble, and results reflect the superb Scandinavian styling and careful electronic engineering. £85.00.



International Mk.2:
 A choice of tuners for the more experienced constructors.

A chassis, cabinet and front panel designed to be used with a variety of electronics inside. The standard set, with the Larsholt 7253 varicap FM tuner set, plus all necessary parts to complete costs £65.00. Alternative modules for the signal processing stages are available for the more advanced F.M. radio enthusiast/constructor. (EF5800/7030/91196)



From left to right, the EF5800 6 circuit varicap FM tuner head. Two MOS RF stages, both with AGC control, and an ultra stable oscillator. Next the 7030 Linear Phase 10.7MHz IF. Distortion 0.08%, muting, AGC, meter, auto stereo switch outputs. Finally the new 91196 mpX decoder and combined birdy filter. Mono THD 0.05%, stereo sep. 55dB at 1kHz, 42dB at 10kHz - the best decoder module yet. EF5800.....£14.50 7030.....£10.95 91196.....£12.99 (Built).

Overall performance of the three modules when correctly assembled:- 30dB S/N at 0.85uV input. 60dB at 5uV. THD 0.09%. AFC holds THD below 0.2% over 400kHz if required. AGC effective over a 90dB range. Image rejection -90dB. Noise floor -73dB.

Components: Coils, ICs, Filters, etc.

Radio ICs: (and modules)	Coils and filters:-
CA3089E/HA1137W FM 1.94	AM IFTs TOKO
CA3090AQ mpX 3.75	YRCS/YHCS types(10mm) 0.30
MC1310/KB4400 mpX 2.20	7MC5 types (7mm) 0.30
HA1196 mpX 4.20	FM IFTs:-
HA1197 AM radio 1.40	KAC5/KALS types(10mm) 0.33
TBA120AS FM IF 1.00	9A types (10mm) 0.30
TBA651 AM radio 1.81	AM filters:-
uA720/CA3123E AM rad 1.40	CFT types ceramic (455) 0.55
LM380N 2W Audio 1.00	CFU type ceramic (470) 0.60
TBA810AS 7W Audio 1.09	SFD470 types (470) 0.75
TCA940 10W Audio 1.80	FM filters:-
TDA2020 20W Audio 2.99	CFS/SFE ceramic (10.7) 0.50
LM381N stereo preamp 1.81	SFE6MA (TV sound) 0.80
LM3900 Quad amp 0.68	3132 linear phase 2.25
78M12-20-24 volt reg ea:1.20*	MPX 19&38kHz notch
NE550A variable reg 0.80	BLR3107 (4k7 imp) 1.75
TAA550B varicap reg 32v0.50*	BLR2007 (3k3 imp) 1.75
NE560/2B PLL IC ea:2.50	23 or 36mH chokes 0.33
NE561B PLL IC 3.50	Tunerheads: (& tunersets)
NE565A/567V PLL ea:2.50	EF5600 5 gang varicap 12.80
810k kit for TBA810 amp2.75	EC3302 3 gang varicap 5.50
2020k kit for 2020 amp 9.35	8319 (Larsholt) 12.00
92310 kit for mpX decoder 5.35	7252 tuner set complete 26.00
7020 kit for 3089 FM IF 6.65	7253 stereo tuner set 26.00
971197 kit for varicap AM radio tuner 9.65	Standard transistors also kept in stock - see lists for further detail and price information.
7700 built TV sound tuner 27.00	

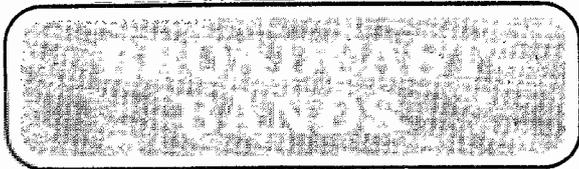
Terms: Vat extra, 12.5% unless marked *, which is 8%, all complete tuners require £3.00 for packing and carriage. The standard P&P rate remains at 22p per order. Catalogue 40p. Phone (0277) 216029 (After 3pm please). SAE for free price lists.

Write to: **37a High Street Brentwood, Essex: CM14 4RH**



Ken is the fact that a new service has popped up on the VOA scene. This is not in the printed schedule and is on 18MHz and available occasionally as late as 2100. As I said before, gloomy days are with us and to this end Ken notes that the best frequency reception of the VOA breakfast show is 6MHz while the National Public Radio is best on 11MHz around 2130.

It's an ill wind—etc" they say, and for **John Mcleod** the strike by the school cleaners has meant that the hours wasted in school have been put to better use DXing, with the result that he can report the signals from the Kalamabad transmitters of Radio Teheran with 100 and 350kW on 15315 and 9022 respectively. It might be a good thing however to use some of the time to listen to foreign language broadcasts in order to keep up with one's French or German! The last item this month is my very best wishes for Christmas and the New Year and may Santa bring that expensive piece of equipment that you have long been hinting at. So I will wish 73s to you and yours.



MEDIUM WAVE DX

by *Charles Molloy*

A NEW transmitter of Radio Gambia, located at Bouto, is now on 648kHz with a power of 20kW and is on the air during the evening until midnight. This is the unidentified station reported by **F. A. Ainslie** of Hartlepool who used a homebrew receiver and medium wave loop to pull in a programme in English and an African dialect with either Western or African style music. Local time was announced in GMT. Some difficulty with reception was experienced owing to QRM from BBC Radio 3 on 647kHz. According to the World Radio and TV Handbook 1976 Radio Gambia planned for a new medium wave station at Bouto to come into service during 1976 as a replacement for the short wave outlet on 4820kHz.

When FM broadcasting was first introduced it was thought that broadcasting on the medium waves would decline. This has not happened. New stations are continually appearing, both in the third world where transistor portables find a ready market and in the Western world where the medium waves are more readily received on car radios than FM broadcasts.

One recent addition to the band for the DXer to look for is Gafsa in Tunisia which is on 584kHz

with a power of 350kW and could easily be mistaken for the 1200kW Riyadh in Saudi Arabia which is on 587kHz. Another newcomer is Bukavu in Zaire which is reported to be on 800kHz with high power with sign-off at 2100.

Several readers have asked about the mechanics of MWDX. Propagation of radio waves in the medium and long wavebands during the hours of daylight is by means of the ground wave. Rays travelling upwards from the transmitter are absorbed by the D layer which is the lowest part of the ionosphere, located some 80km above the earth's surface. The range of the ground wave is rather limited since the signal is attenuated by the earth's surface. At sunset the D layer disappears and rays travelling upwards can now reach higher into the ionosphere where they are refracted and returned to the earth, with little attenuation, at considerable distance from the transmitter. This is the mechanism that permits continental signals to appear on domestic radios after dark and long distance DX to be heard in the UK from North and South America, Africa and a large part of Asia.

The medium wave DXer in the UK who wants to hear Canada or the United States will have to wait for some five to six hours after sunset until the path across the Atlantic is in darkness and sky-wave propagation becomes possible. In summer this will occur an hour before sunrise and in winter Canada will appear at 2200 and USA an hour later, when conditions are favourable. Newcomers to the band should be careful if they hear North American style programming earlier in the evening as it unlikely to be direct trans-Atlantic reception and may well come from one of the AFN outlets in West Germany.

Robin Beyeley reports again from Kingswood School near Wolverhampton. Using his Regentone DM2 he pulled-in Trans World Radio Bonaire on 800kHz, CJON on 930, WINS 1010 and WBZ in Boston on 1030. Robin reports that the Voice of Cyprus is on 755kHz in English from 0330 to 0600. The Voice of Cyprus, according to Sweden Calling DXers, is located at Anamur in Turkey and broadcasts multilingual programmes to Cyprus. It is also on the air between 1400 and 1600 and part of this transmission might be audible in the UK in mid-winter.

A good log of Latin American DX comes from Preston in Lancashire where **Derek Taylor** uses a Realistic DX160 receiver and a medium wave loop. Stations heard include Radio Aeropuerto in Maquetia, Venezuela, on 910kHz; Radio Eco in Cali, Colombia, on 940; Radio Jornal do Brasil in Rio de Janeiro also on 940; Radio Margarita in Las Asuncion on 1020, Radio Litoral on 1150 and Radio Puerto Cabello on 1290. The last three are in Venezuela and all were heard between midnight and 0400 GMT. The long sea path between the UK and the Atlantic coast of South America favours propagation on the medium waves and Latin Americans are often prominent on nights when North American DX is poor. Channels normally occupied by high power stations in Canada and the USA can yield some surprising DX on these occasions. Portuguese is the language of Brazil and Spanish the language of Colombia, Venezuela, Uruguay and Argentina.

Derek mentions the night programme from Athens on 1385kHz which identifies with "Radiophonikos Stathmos Athenon." It is audible after midnight when Radio Centro Madrid and Bernburg, East



Germany have cleared the frequency. Athens does verify. Derek has logged the YENED (Greek Armed Forces) outlet in Athens on 593kHz and he asks if the 4kW YENED station at Pyrgos in the Western Peloponese is still on 1349kHz? Pyrgos is listed as having a night programme from 2300 to 0300 with announcements in English. Has anyone heard it recently?

The mystery surrounding the Libyan broadcasts on 1570kHz now appears to be solved. The programme comes from the Deutsche Welle relay in Malta which is used by the Maltese Government after the DW transmissions finish at 2130. From 2130 until 2245 there is the Voice of Malta in Arabic and from 2245 to 0030 the Arabic Service from Radio Tripoli. Sharjah is on 1575 with 5kW from 0230 until 2000 and it can be heard in the UK.

BROADCAST BANDS

Short Wave Reports by the 15th of the month to Derek Bell, c/o Practical Wireless, Fleetway House, Farringham 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 end of the month to Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashted, Surrey, KT21 2TW.

Mail Order Protection Scheme

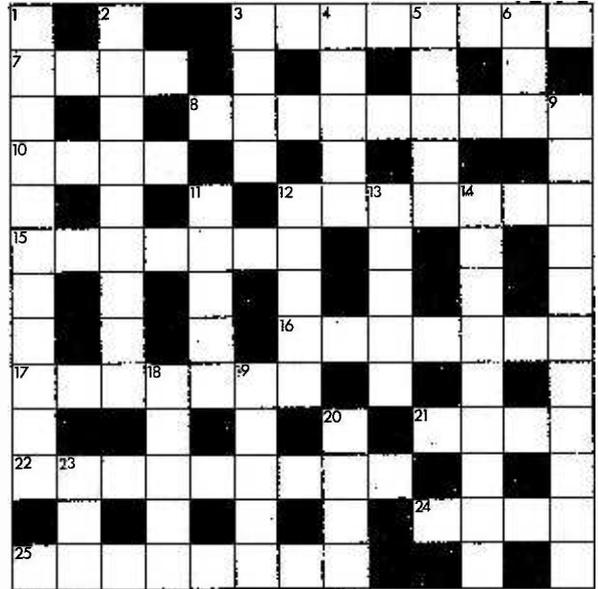
The Publishers of Practical Wireless are members of the Periodical Publishers Association which has given an undertaking to the Director General of Fair Trading to refund moneys sent by readers in response to mail order advertisements placed by mail order traders, who fail to supply goods or refund moneys owing to liquidation or bankruptcy. This arrangement does not apply to any failure to supply goods advertised in a catalogue or in a direct mail solicitation.

In the unhappy event of the failure of a mail order trader readers are advised to lodge a claim with Practical Wireless within three months of the date of the appearance of the advertisement, providing proof of payment. Claims lodged after this period will be considered at the Publisher's discretion. Since all refunds are made by the magazine voluntarily and at its own expense, this undertaking enables you to respond to our mail order advertisers with the fullest confidence.

For the purpose of this scheme, mail order advertising is defined as—

Direct response advertisements, display or postal bargains where cash had to be sent in advance of goods being delivered. Classified and catalogue mail order advertising are excluded.

PW TECHNICAL CROSS PUZZLE No.17



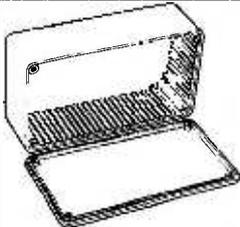
ACROSS

- 3 What you hold against the bridge tester? (8)
- 7 Essential part in retro leads? (4)
- 8 Non-conductors on the defensive? (9)
- 10 About a hooter with a hood? (4)
- 12 Banish radio leaving the motorway? (4, 3)
- 15 Chemical drier that's broadcast on a city? (3-4)
- 16 Ring five relay changes and sleep on! (7)
- 17 Implement for cutting our a wavelength? (7)
- 21 Ham said to get him on a hook-up? (4)
- 22 Revolver that holds the record? (4-5)
- 24 Arc he volted round a shorted motor? (4)
- 25 Interrupter of your old car radio? (8)

DOWN

- 1 Wire to get your teeth into—and part with this tool! (5, 3, 3)
- 2 Many stations to pick up on it? (4, 5)
- 3 Five-line system for music? (4)
- 4 L.P. I.O.U. from a broken French soldier (5)
- 5 Take someone else's partner for a dance! (3, 2)
- 6 The right pitch from the start (3)
- 9 No-risk radio component with release mechanism (6, 5)
- 11 Knaves who support damaged motors? (5)
- 12 Chuck to operate the switch? (5)
- 13 Dog with extremes of radio and receiver terminals! (5)
- 14 Halt Gus on distortion attack? (9)
- 18 He eats to the sound of jazz, girl! (5)
- 19 Divided one component? (5)
- 20 Correct arc for smooth music? (4)
- 23 Smith's short way in the studio? (3)

FOR AMUSEMENT ONLY ANSWERS NEXT MONTH



PLASTIC BOXES IN 5 SIZES

Easily drilled or punched, grey ABS boxes incorporate slots for 1.5mm pcb's with lid fixing screws running into integral brass bushes

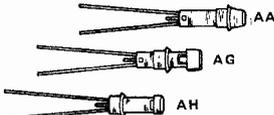
- 100x50x25mm 51p (1-9) 49p (10+)
- 112x62x31mm 59p (1-9) 52p (10+)
- 120x65x40mm 68p (1-9) 62p (10+)
- 150x80x50mm 77p (1-9) 74p (10+)
- 190x110x60mm £1.33 (1-9) £1.30 (10+)

Polystyrene version

Plain inside, no integral bushes
112x61x31mm 35p (1-9) 32p (10+)
Add 25p per £1 order value for Post & Packing

TYPE A NEON INDICATORS

Held in 8mm hole by plastic bezel
150mm wire leads



Red, Amber, Clear, Opal 19p each
Green 28p each

TYPE MP NEON INDICATOR

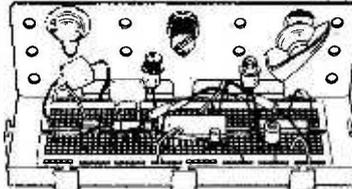
150mm leads, held in 6.4mm hole by nut



Red, Amber, Clear, Opal 20p each

On all orders quote reference PW/1/76

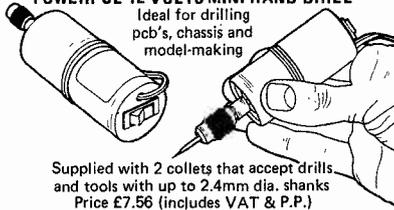
Stop wasting time soldering
The NEW MW BREADBOARD accepts
Transistors, LED's, Diodes, Resistors, Capacitors
and all DIL packages with 6 to 40 pins



Includes slot-in Component Support Bracket and has over
400 individual sockets, plus Vcc & Ground Bus Strips
Price £9.72 (includes VAT & P.P.)

POWERFUL 12 VOLTS MINI HAND DRILL

Ideal for drilling
pcb's, chassis and
model-making



Supplied with 2 collets that accept drills
and tools with up to 2.4mm dia. shanks
Price £7.56 (includes VAT & P.P.)

SEVEN SEGMENT DISPLAYS

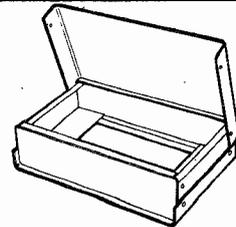
Economy Quality - Only 66p
0.3" - Red
Common Anode - Left Decimal



Full specification displays also available
Red, Green and Yellow
£1.35 each inc. data

P.P. Note. Unless included in price add 25p post & packing
for orders totalling under £10 Prices include VAT and are
valid in UK only for 2 months from journal issue date.

Michael Williams Electronics
47 Vicarage Av., Cheadle Hulme, Cheshire SK8 6JP



EYE CATCHING INSTRUMENT CASE

Removable Red, Orange or Grey covers
Black chassis with support brackets
Overall size 250x167x68mm
Price £11.86 (includes VAT & P.P.)

ECONOMY QUALITY LED's

50 for only £5
100 for only £9

Mixed bags, all sizes, various colours



FULL SPEC. INDIVIDUAL LED's

Red (any size) £0.75/pack
Green, Yellow, Orange (any size) £1.20/pack
Packs contain 5 LED's, clips and data



DH LAMP HOLDER

For LES or Midget flange lamps
13mm hole fixing, lamp not included
Red, Blue, Green, Amber, Clear, Opal, Orange
Price 25p each (See P.P. Note below)

Quantity quotations on request.



The Pictorial Method

BASIC ELECTRICITY (5vols) ELECTRONICS (6vols) TELEVISION (3vols)

You'll find it easy to learn with this outstandingly successful PICTORIAL METHOD. The essential facts are explained in the simplest language, one at a time, and each is illustrated by an accurate cartoon-type drawing. These clear and concise illustrations make study a real pleasure. The books are based on the latest research into simplified learning techniques. This easy-approach-to-learning method has proved beyond doubt that acquiring knowledge can be an enjoyable experience.

The series will be of exceptional value in training mechanics and technicians in Electricity, Radio and Electronics.

WHAT READERS SAY

- I didn't know this subject could be so easily presented. *J. K., Earlsfield*
- Pleased to say how understandable your books are—I now have a sound knowledge of the subject. *A. K., Hull*
- Invaluable for my training as a Technician. *W. J., Stockport*
- They have an easy approach to learning that a mathematical idiot like myself can easily understand. *K.L.Y., Ashton-u-Lyme*
- Thank you for the excellent publication: the best in form and type I have ever come across. *T.L.O., Shanklin*
- I find the Basic Manuals the best in their class and a real help in my work in phototype electronics. *C.L.P., Cardiff*

YOUR 100% GUARANTEE

Should you be, in any way dissatisfied with the MANUALS your money will be refunded by return of post.

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

Please find enclosed P.O./Cheque value £.....

BASIC ELECTRICITY 5 parts £8.00

BASIC ELECTRONICS 6 parts £9.50

BASIC TELEVISION 3 parts £5.00

Tick Set(s) required. Prices include Postage

YOUR 100% GUARANTEE. If after 10 days examination you decide to return the Manuals your money will be refunded in full.

NAME
BLOCK LETTERS

FULL POSTAL.....

ADDRESS

POST NOW FOR THIS OFFER!

RETURN OF POST MAIL-ORDER SERVICE

**R.C.S. 100 watt MIXER/AMPLIFIER
ALL VALVE CHASSIS**



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. 6 speaker outputs, A/C mains operated. Slave output. Produced by demand for a quality valve amplifier. Send for details. Suitable carrying cabinet £14. Price **£85** carr. £2-50

ANOTHER R.C.S. BARGAIN!

ELAC 9 + 5in. HI-FI SPEAKER TYPE 59RM
This famous unit now available, 10 watts, 8 ohm.
Price **£3-25** Post 40p



**8" ELAC
HI-FI SPEAKER**

Dual cone plasticised roll surround. Large ceramic magnet. 50-18,000 cps. Bass resonance 65 cps. 8 ohm impedance. 10 watts. Post 40p **£3-95**

10in round £4-95.

TEAK VENEER HI-FI SPEAKER CABINETS

MODEL "A". 20 x 13 x 12in.
For 12 in. dia. or **£13-50** Post 80p
10in. speaker. Illustrated

MODEL "B".
For 18 x 8in. or **£7-50** Post 75p
8 in. speaker

**R.C.S. ROSEWOOD
SPEAKERS**

Size 12in. x 9in. x 5in.
Response 50 to 14,000 cps
8 watts rms 3 or 8 or 16 ohms.
Post **£12** pair 75p

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

GOODMANS CONE TWEETER

3in. diam. 18,000 C.P.S. 25 WATTS 8Ω **£3-25**
8 inch woofer 15 watts £6-75.

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER.

Add musical highlights and sound effects to recordings. With mic. Microphone, records, tape and tuner with separate controls into single output. 9 volt **£5-20** battery operated.

STEREO VERSION OF ABOVE £6-85.

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built with volume, treble and bass controls. 18 volt battery operated. Mains Supply **£2-95**.

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. **£4.25** Post 40p

WAFER HEATING ELEMENTS

THIN OFFERING 1001 USES for every type of heating and drying applications in the home, garage, greenhouse, factory (available in manufacturing quantities). Approx. size 101 x 81 x 1/4in. Operating voltage 200/250V. a.c. 250 watts approx. Printed circuit element enclosed in asbestos fitted with connecting wires. Completely flexible providing safe Block 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 greenhouses 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" £10-35



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. **£13**

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 65 cps.

GROUP "25"
12in 30 watt **£8-95**
3, 8 or 15 ohms. Post 50p

GROUP "35"
12in 40 watt **£10-50**
3, 8 or 15 ohms. Post 50p

GROUP "50/12"
12in 60 watt professional model. 8 ohms or 15 ohms. With aluminium presence dome. Post 80p **£14-50**

GROUP "50/15"
15in 75 watt **£19-50**
8 or 15 ohms. post 90p

BAKER 150 WATT QUALITY TRANSISTOR MIXER/AMPLIFIER

Professional amplifier using advanced circuit design. Ideal for disco, groups, P.A. or musical instruments. 4 inputs 4 way mixing. Master treble, bass and volume controls. 3 speaker output sockets to suit various combinations of speakers. 4 to 18 ohm. Slave output. A/C mains. Guaranteed. Details S.A.E. Latest 50 watt Model **£49** **£68** Carr. £1-00

100 WATT DISCO AMPLIFIER CHASSIS
MADE BY JENNINGS MUSICAL INSTRUMENTS **£52**
4 speaker outputs, vol., treble, bass controls
CAN BE USED AS 100WATT SLAVE Carr. £1

B.S.R. SINGLE PLAYER DECK
3 speed. Plays all size records. Stereo Cartridge. Cueing. Ideal Disco Deck **£15-50** Post 75p

QUALITY LOUDSPEAKER ENCLOSURE

Teak veneered 1/2in thick wood cabinet. Size 18in x 18in x 8in. Weight 23lb. This cabinet features a wide mesh Silver Grill covering a separate compartment for mounting Tweeters or Mid-Range Horns. The fully sealed bass compartment is cut out for 6in. Woofer £5-95. Rosewood Version £6-95. Carr. £1-60. 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. 600 to 1,000 watts each. As featured in Practical Wireless. Price **£12-50** Cabinet extra £3.

8 inch PHILIPS LOUDSPEAKER
4 ohm. 4 watt. ceramic magnet **£1-95**
General purpose replacement unit.

MAINS TRANSFORMERS Post 50p

8 VOLT 1 AMP. £1-00 3 AMP. £1-40
15 VOLT 300 MA. £1-00 750 MA. £1-30
30 VOLT 5AMP. AND 34 VOLT 2AMP G.T. £3-45
20 VOLT 1 AMP. £1-75 1 AMP. £2-00 3 AMP. £2-20
20-0-20 VOLT TAMP. £2 30 VOLT 1 AMP. £1-75
40 VOLT 2 AMP. £2-95. 0-20-40-60 VOLT 1 AMP. £3-50

E.M.I. TAPE MOTOR **£1-85**
4 pole, 240 v. Size 3 1/2 x 2 1/2in.
1200 rpm. Spindle 1/4in. diameter. 75v version £1. Post 45p

E.M.I. GRAM MOTOR **£1-25**
240V a.c. 2,400 rpm
2-pole. Size 2 1/2 x 2 1/2in.
Collar gram motor 120v. 75v. Post 35p

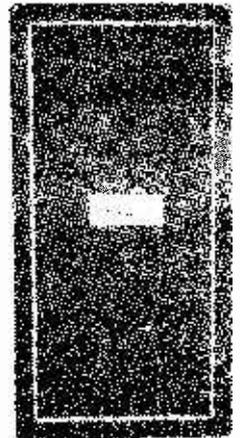
**BAKER DISCO SPEAKERS
HIGH QUALITY—BRITISH MADE
2 x 12" CABINETS**

For Disco or PA all fitted with carrying handles and corners Black finish. Other cabinets in stock. SAE For leaflet

**50
WATT
R.M.S.
£43
Carr. £3**

**70
WATT
R.M.S.
£46
Carr. £3**

**100
WATT
R.M.S.
£59
Carr. £4**



1 x 15" + 1 x 12" 100 WATT CABINET
Size 36" x 24" x 15" **£65-00.** Carr. **£5**
Ideal for Disco, Ogran or PA work.
High quality. Full range.

"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.

£16-30 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 Discotheques. 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 35cps Flux Density 15,000 gauss Useful response 20-14,000cps 8 or 15 ohms models.

£19-50 Post 90p

Loudspeaker Cabinet Wadding 18in wide. 20p per ft.
Hi-Fi Enclosure Manual containing plans, drawings, crossover data and cubic tables, 68p

RADIO COMPONENT SPECIALISTS 337 WHITEHORN ROAD, CROYDON

Minimum post 30p. Components Lists 10p. Cash price includes VAT Access & Barclay cards welcome. Rail Selhurst. Tel. 01-484 1665

Practical Wireless, January 1977

Sonic

HI-FI DISCOUNT CENTRES

DISCOUNT



SPEAKERS

Imp 8 or 15Ω as app.

ALL NEW UNITS

Guarantees:
TITAN 3 years
FANE 2 yrs
OTHERS 1 year
ALL PRICES INC. VAT

	List	Sonic Price
5" FANE 501 Mid or Full range	Sp. Price	£4-95
8" x 5" 10w Various makes	Sp. Price	£3-95
8" A.F. Model 80	Sp. Price	£5-95
8" A.F. Model 83	Sp. Price	£6-95
FANE 8" 808T	Sp. Price	£3-95
FANE 8" 807TP	Sp. Price	£4-75
8" WHARFEDALE LINTON KIT	Sp. Price Pair	£23-95
8" FANE MODE ONE KIT	Sp. Price Pair	£19-75
10" WHARFEDALE GLENDALE XP KIT	Sp. Price Pair	£31-95
10" ELAC Model 10RM	Sp. Price	£3-85
12" FANE 121/10 20w	Sp. Price	£7-95
12" FANE 122/10 25w	Sp. Price	£7-95
12" POP 25T	Sp. Price	£9-95
12" TITAN 12/35 35w	£15-80	£10-50
12" TITAN T12/60A 60w	£22-50	£12-50
12" TITAN T12/100A 100w	£36-00	£22-95
CELESTION G12M	Sp. Price	£12-95
12" CELESTION G12H 30w	Sp. Price	£13-95
12" CELESTION G12/50 50w	Sp. Price	£16-50
G12/50TC	Sp. Price	£17-95
12" GOODMANS 12 PD	Sp. Price	£17-95
12" GOODMANS 12 PG	Sp. Price	£17-95
12" FANE 'SPECIALIST' DISCO 80	£25-95	£17-50
12" FANE 'SPECIALIST' GUITAR 801	£24-75	£16-50
12" FANE 'SPECIALIST' GUITAR 80B	£24-95	£16-50
12" FANE 'SPECIALIST' P.A. 80	£24-75	£16-50
12" FANE CRESCENDO 12A	£57-35	£37-95
12" FANE CRESCENDO 12L	£59-95	£39-95
12" FANE CRESCENDO 12 BASS	£56-70	£39-95
15" TITAN T15/60 60w	£28-00	£18-95
15" TITAN T15/70 70w	£28-00	£19-95
15" TITAN T15/100 100w	£41-00	£27-95
15" FANE 'SPECIALIST' BASS 85	£37-75	£28-95
15" GOODMANS 15P	Sp. Price	£22-50
15" CELESTION G15C	Sp. Price	£26-95
15" FANE CRESCENDO 15/100A	£72-95	£49-95
15" FANE BASS CRESCENDO 15/100L	£76-00	£49-95
FANE CRESCENDO 15/100LT	£74-69	£49-95
18" TITAN T18/100 100w	£47-00	£29-95
18" GOODMANS 18P	Sp. Price	£38-95
18" CELESTION G18C	Sp. Price	£34-50
18" FANE CRESCENDO 18A	£101-95	£66-95
18" FANE CRESCENDO BASS	£89-95	£59-95
18" FANE CRESCENDO 'COLOSSUS' 18" 200 watt	£115-00	£69-95

HORN UNITS

CELESTION MH1000	Sp. Price	£13-75
FANE 910 MK II	£17-75	£12-99
FANE 920	£19-50	£14-99
FANE 944	£59-95	£39-95
FANE 104	£7-95	£5-95
FANE 1104	£16-95	£12-95

HIGH POWER 'CROSS OVER'S'

FANE HPX1	£1-75
FANE HPX2	£1-5

MANY OTHER DISCOUNT LINES
(for personal callers only)
inc. CABINETS, AMPS, T'ABLES, DISCO CONSOLES, etc. Add 75p each for carriage
CREDIT TERMS AVAILABLE orders £20 over
Please enclose stamp for leaflets or with enquiries. Prices correct at 29.9.76.
Branches at:
403 SAUCHIEHALL STREET, GLASGOW
Tel: 141 332 0700
24 Newgate Shopping Centre, NEWCASTLE
Tel: 0632 21469
106 NEWPORT ROAD, MIDDLESBROUGH
Tel: 0642 217402
Mail Orders & Export to Middlesbro Branch

Camera Kits and Ready Built Modules

Whether professional student, teacher or amateur a CROFTON module is the answer

Please send 10 x 12 15p stamp addressed envelope

CROFTON don't just sell kits, we offer you a technical back up service to ensure your success.

Apart from our popular C.C.T.V. Camera Kits we are launching a range of ready built, tested, and guaranteed electronic modules both for trade and end user. The ultimate range will be extensive. Some of the existing modules available are:-

- E.T.I. Master Mixer
- E.T.I. Electronic Ignition
- Wide range R.F. Wobulator
- E.T.I. Digital Voltmeter
- E.T.I. Frequency Meter
- Video Amplifier
- Video Mixer
- Sound/Video Modulator
- Guitar Amplifier

As well as all E.T.I. P.C.B.'s.
V.L.F. Transmitters & Receivers
Send S.A.E. for information.

Secondhand cameras and monitors always available.

NOTE PCBs for most published projects available to order

CROFTON ELECTRONICS LTD
Dept. B, 35 Grosvenor Road, Twickenham, Middx. Tele. 01-831 1923

NEW FROM AMERICA

LIQUID CRYSTAL DISPLAY WATCHES FROM FAIRCHILD TIMEBAND

5 + 4 functions. Continuous readout of Hrs, Mins, and pulsating Secs. Single command button, push once for Month/Date-auto reset; twice for Secs-manual reset.

PLUS
Programmed 4 Yr calendar, Backlight for night viewing, Optional continuously alternating Time/Date display, AM/PM setting indicator.

High contrast L.C.D. display visible in bright sunlight. Supplied in Presentation Boxes, these are superb watches selling in jewellers' shops for up to £80.

TC 411 White	£29-50
TC 410 Gold	£32-50
On Leather Strap	£34-50
TC 413 White	£37-50
TC 412 Gold	£37-50
Matching adjustable bracelet.	

OUR SPECIAL L.E.D. OFFER—
GALA 6 + 3 functions. At the touch of a button—Hrs, Mins, Secs, Alpha Day, Month & Date + PLUS + Programmed 4 Yr calendar, Auto Hold & Fadeout, AM/PM setting Indicator, Available in S/S or Gold plated with S/S back & matching adj. bracelet. Sold elsewhere at £22-90.
NEW LOW PRICE £17-50.

No moving parts to wear out, clean or oil. Accuracy to a few secs/month. We believe our prices are the lowest anywhere and include V.A.T. at 8% & P. & P. Free battery/s. No quibble 1 Year Guarantee.

Send Cheque/Money Order to:—
TEMPUS, Dept. PW, 5-7, Norfolk Street, CAMBRIDGE, CB1 2LW. Tel. 55094

A LOT OF TIME FOR THE MONEY

GIRO NO. 331 7056. Access and Barclaycard accepted.
C.W.O. only. Terms of business as in our Catalogue.
Export Order enquiries welcome (£5 min.)

Official Orders accepted from Educational and Government Departments.
ALL PRICES include VAT & P & P E. & O.E. SHOP HOURS 9-12.30, 1.30-5.00 5 days. CLOSED WEDNESDAY.

1977 ISSUE

66 PAGES—3 000 ITEMS FULLY ILLUSTRATED

20p CREDIT VOUCHERS

- *ALL NEW STOCK
- *SATISFACTION GUARANTEED
- *DISCOUNTS
- *NEW PRICE LIST For Cat. 4a—5.A.E.

Boxes - Cases
Kits
Materials - Tools
Resistors - Test Meters - Capacitors - Hardware - Semiconductors - Books - Pots - Collis - Audio Accessories - Screws - Connectors - Audio Modules - Veroboard - Transformers - Knobs - Calculators - Audio Leads - Batteries - S dec Storage Units - Heatsinks, etc., etc.

25p plus 5p postage

TRONIC COMPONENTS
Catalogue
ORS LTD.

SPECIAL CAPACITOR KITS

C250 Kit—PC Mounting polyester 250V 5 of each value: 0-01, 0-022, 0-047, 0-1, 0-22uF, 2 of 0-47, 1uF. £1-98 net

C296 Kit—Tubular polyester, 400V, 5 of each value 0-01, 0-022, 0-047, 0-1, 0-22uF, 2 of 0-47uF, £2-67 net.

"DIGITAL MULTIMETER KIT" AS IN E.T.I. SAE FOR LIST

SPECIAL RESISTOR KITS (CARBON FILM 5%)

(Prices include post & packing) 10E12 -W or 1W KIT: 10 of each E12 value, 22 ohms—1M, a total of 570 E12 29 net. 25E12 1W or 1W KIT: 25 of each E12 value, 22ohms—1M, a total of 1425 E12 64 net.

B. H. COMPONENT FACTORS LTD.

MULTIMETER U4323

22 Ranges plus AF/IF Oscillator 20,000Ω/Volt.
Vdc—0-5—1000V in 7 ranges
Vac—2-5—1000V in 6 ranges
Idc—0-05—500mA in 5 ranges
Resistance—5Ω—1MΩ in 4 ranges.
Accuracy—5% of F.S.D.
OSCILLATOR—1KHz and 465KHz (A.M.) at approx. 1 Volt.
Size—160 x 97 x 40mm.
Supplied complete with carrying case, test leads and battery.
PRICE £13-95 net P. & P. 75p

U4323

MULTIMETER U4324

34 Ranges. High sensitivity. 20,000Ω/Volt.
Vdc—0-6—1200V in 9 ranges.
Vac—3-900V in 8 ranges.
Idc—0-06—3A in 6 ranges.
Iac—0-3—3A in 5 ranges.
Resistance—5Ω—5MΩ in 5 ranges.
Accuracy—dc and R—2½% of F.S.D.
ac and db—4% of F.S.D.
Size—187 x 98 x 65mm.
Supplied complete with storage case, test leads, spare diode and battery.
PRICE £16-66 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.
Idc—0-06—600mA in 5 ranges.
Iac—0-3—300mA in 4 ranges.
Resistance—2KΩ—2MΩ in 4 ranges. Accuracy—dc—2½% ac—4% of F.S.D.
jfe—10—350 in 2 ranges.
Size—115 x 215 x 90mm.
Complete with carrying case, test leads, and battery.
PRICE £16-66 net P. & P. 75p

U4341

MULTIMETER U4313

33 ranges. Knife edge with mirror scale. 20,000Ω/Volt, High accuracy, mVdc—75mV.
Vdc—1-5—900V in 8 ranges.
Vac—1-5—900V in 8 ranges.
Idc—40—120 microamps in 2.
Idc—0-6—1500mA in 5 ranges.
Iac—0-6—1500mA in 6 ranges.
Resistance—1KΩ—1MΩ in 4 ranges.
db scale—10 to -12db.
Accuracy—dc—1½%, ac—2½%.
Size—115 x 215 x 90mm.
Complete with carrying case, test leads and battery.
PRICE £19-90 net P. & P. 75p.

U4313

(P.W.), LEIGHTON ELECTRONICS CENTRE
59 North Street, Leighton Buzzard, LU7 7EG.
Tel.: Leighton Buzzard 2316 (Std. Code 02523)

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

A Happy New Year to all our Customers

VARIABLE STABILISED POWER SUPPLY. mains input, 0-24V output, stabilised and current limiting at 500mA + 32V at 50mA. Brand new by British manufacturer. Size approx. 7 1/2 x 2 1/2 x 4 in. complete with external 5kΩ 3-turn pot for voltage control. Connection data supplied. £7.

50uA (25-0-25uA) EDGEWISE METERS. modern type by Sangamo Western. display area 2 x 1 1/2 in with 2 mounting lugs. (Can be zeroed left or right hand.) £1-50 each, while stocks last.

MAINS ISOLATION TRANSFORMERS. Tapped mains input, 240V at 3A + 12V at 500mA output. New. boxed, made by Gardner, £12.

SOLDER SUCKERS. (Plunger type). Standard Model, £4-50. Skinned Model, £4-95. Spare Nozzles, 60p each.

Good Quality Pressure Gauges. 2 1/2 in dia. flange mounting: 2 models at 50p, 100p, 150p, 100 lb/sq. in. 0-100 lb/sq. in. state which. £1-25 each.

2N3055 type Transistors. O.K., not unmarked, 5 for £1.

110V NEONS, SCREW-IN-TYPE. 4 for 50p.

SLOW MOTION MOTORS (suitable for programmers, displays, etc.) 230-240V a.c. input, rotation, 1 rev. every two to three minutes £1-25 each.

MINIATURE PLIERS High quality "Crescent" made in USA. £4-35 + VAT (35p).

SIDE CUTTERS. high quality. £3-70 + VAT 30p.

MIXED COMPONENT PACKS. containing resistors, capacitors, diodes, pots, etc. All new (random sample bag revealed approx. 700 items). £2 per pack, while stocks last.

4 MHz CRISTAL PACKS (10 assorted crystals between 4 MHz and 5 MHz). Our selection only £1 per pack.

PROGRAMMERS (magnetic devices). Contain 9 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.

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.

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. (Sorry, no single digit available.) Data Supplied.

BSX20 (VHF Osc/Mult). 3 for 50p.
BC 108 (metal can). 4 for 50p.
PBC 108 (plastic BC108). 5 for 50p.
BFY51 Transistors. 4 for 60p.
BC172 Transistors. 4 for 50p.
PNP audio type T05 Transistors. 12 for 25p.
BF152 (UHF amp/mixer). 3 for 50p.
2N3819 Fet. 3 for 60p.
BC148 NPN silicon. 4 for 50p.
BC158 PNP silicon. 4 for 50p.
BAV31 Signal Diodes. 10 for 35p.
BA121 Varicap Diodes. 4 for 50p.
1N814 diodes. 10 for 25p.

SMALL MAINS SUPPRESSORS (small chokes, ideal for radio. Hi-Fi inputs, etc.) approx. 1/2 in x 1/2 in. 3 for 50p.

PERSEX TUNER PANELS (for FM Band 2 tuners) marked 68-108 MHz and Channels 0-70, clear numbers, reel backed out, smart modern appearance, size approx. 8 1/2 in x 1 1/2 in. 2 for 35p. Lead suppressors (10k ohm) for mobile plug leads, 4 for 50p.

HEAVY DUTY RELAYS. 24V d.c. operated (will work on 18V) 3 heavy duty make contacts (around 10A rating) + 4 change over contacts + 1 break contact. New, complete with mounting bracket (ideal for switching HT on Liners.) Many uses for this high quality unit. £1-50 each.

TO3 transistor insulator sets. 10 for 50p.

ALU-SOL ALUMINIUM SOLDER (made by Multicore). Solders aluminium to itself or copper, brass, steel, nickel or tinplate. 16 s.w.g. with multicore flux, with instructions. Approx. 1 metre coil 50p pack. Large reel £2-75.

VARICAP TUNERS. Mallard type ELC 1043/45, brand new £4-40.

I.C.'s, some coded. 14 DIL type, untested, mixed. 20 for 25p.

Mobile Converters. 24V DC input 13-18V at approx 3-4A DC output, fully stabilised. £3-50 each (ideal for running 12V car radio from 24V tory battery).

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

Miniature earphones with min. jack plug, 2 for 50p + 12% VAT.

I.F. Cans. 1/2 in square, suitable for rewinding, 6 for 50p + 12% VAT.

TWIN I.F. CANS. approx. 1 1/2 in x 1 1/2 in high, around 3-5-MHz, 2 separate transformers, 1 can, internally screened, 5 for 50p + 12% VAT.

Duobler Electrolytics. 50uF, 450V, 2 for 50p.
Duobler Electrolytics. 100uF, 275V, 2 for 50p.
Plessey Electrolytics. 470uF, 63V, 3 for 50p.
TCC Electrolytics. 1000uF, 30V, 3 for 60p.
Plessey Electrolytics. 1000uF, 180V, 40p each (3 for £1).

Duobler Electrolytics. 5000uF, 35V, 50p each.
Duobler Electrolytics. 5000uF, 50V, 60p each.
ITT Electrolytics. 8800uF, 25V, high grade, screw terminals, with mounting clips, 50p each.
Plessey Electrolytics. 10,000uF at 63V, 75p each.
Plessey Cathodry Capacitors. 0-04uF at 12-5kV DC. Screw terminals. £1-50 each.
PLEASE ADD 12% VAT TO ALL CAPACITORS

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

TV PLUGS AND SOCKETS
TV Plugs (metal type), 5 for 50p.
TV Sockets (metal type), 4 for 50p.
TV Line Connectors (back-to-back sockets), 4 for 50p. Please add 12% VAT.

PLUGS AND SOCKETS
N-Type Plugs 50 ohm, 60p each, 3 for £1-50.
N-Type Sockets (4-hole chassis mounting), 50 ohms (a small coax lead type), 50p each.
PL259 Plugs (PTEE), brand new, packed with reducers, 65p or 5 for £3.
SO238 Sockets (PTEE), brand new (4-hole fixing type), 50p each or 5 for £2-25.
25-way ISEP Plugs and Sockets. 40p set (1 plug + 1skt).

Plugs and sockets sold separately at 25p each. **Bulgin Round Free Skis.** 3 pin, for mains input on test equipment, etc., 25p each.

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.). £8-80 + VAT (74p)

SPARE BITS, PAIR. 30p + VAT (2p)
MARKSMAN SOLDERING IRONS
SP15D 15W £3 + VAT (24p)
SP25D 25W £3 + VAT (24p)
SP25DK 25W + bits, etc. kit £3-85 + VAT (31p)
SP40D 40W £3-44 + VAT (28p)
BENCH STAND with spring for Marksman Irons, £2-22 + VAT (18p)

SPARE BITS
M78 for 15W, 45p + VAT (4p).
M74 for 25W, 36p + VAT (3p).
M70 for 40W, 42p + VAT (3p)
TC1 TEMPERATURE CONTROLLED IRON. Temperature controlled iron + PSU, £20 + VAT (£1-80)

SPARE TIPS
Type CC single flat. Type K double flat fine tip. Type P very fine tip. £1 each + VAT (6p).
MOST SPARES AVAILABLE

MULTICORE SOLDER
Size 5 Savbit 18 s.w.g. in alloy dispenser, 32p + VAT (3p).
Size CTSAV18 Savbit 18s.w.g., 56p + VAT (4p).
Size 12 SAVBIT 18s.w.g. on plastic reel £1-80 + VAT (19p)

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. CALLERS SATURDAYS ONLY 9.30-12.00, 1.30-5.00.

Wentworth Radio

1a Wentworth Court, Alston Road, Barnet
Telephone No. 01-440-0409

NEW AND GUARANTEED CROSSHATCH & DOT GENERATORS

Mains operated in metal cabinet with signal injection at T.V. aerial socket. Variable tuning over BAND 4 & 5. ABSOLUTE BARGAIN AT £16-00 plus £2-00 post and packing plus 8% V.A.T. Total £19-44

All devices top quality. By return service. Trade enquiries welcomed. C.W.O. Minimum order 75p. S.A.E. for complete lists. VAT to be added; 12% Semi-conductors; 8% Integrated Circuits. Postage and packing: add 25p for all orders under £1-50; add extra for airmail.

AC127	0-18	BC119	0-24
AC128	0-15	BC121	0-38
AC141K	0-38	BC125	0-16
AC175	0-16	BC138	0-19
AC179	0-30	BC139	0-26
AC187	0-17	BC142	0-25
AC198K	0-25	BC143	0-22
AD140	0-48	BC147	0-09
AD142	0-45	BC148	0-09
AD149	0-50	BC149	0-09
AD161	0-35	BC158	0-11
AD182	0-35	BC159	0-12
AF126	0-29	BC171	0-10
AF139	0-32	BC182	0-13
AF180	0-68	BC208	0-10
AF239	0-38	BDX32	1-80
ALU13	0-80	BF167	0-19
BA100	0-18	BF179	0-32
BA145	0-16	BF180	0-31
BA148	0-14	BF182	0-33
BA155	0-18	BF184	0-30
BAX16	0-20	BF185	0-29
BC107	0-09	BF186	0-25
BC108	0-09	BF194	0-10
BC108C	0-11	BF195	0-10
BC109	0-09	BF196	0-13
BC113	0-14	BF199	0-18
BC116A	0-17	BF241	0-19
BC117	0-18	BF336	0-33

SPECIAL OFFERS
Mullard BC157 £1 for 12
Mullard BY127M £1 for 8

BF337	0-25	IN4005	0-09
BF450	0-17	IN4006	0-05
BFY51	0-17	IN4143	0-05
BR100	0-20	2N5298	0-32
BR101	0-30	TAA550	0-22
BT106	0-85	TAA700	3-25
BY126	0-10	TBA120	0-90
BY127	0-10	TBA480Q	20
BYX10	0-15	TBA520Q	2-50
BYX36-600	0-15	TBA530Q	1-50
		TBA540Q	2-50
		TBA550Q	2-50
BZX61c160-19		TBA573	2-85
BZX61c30-19		TBA750Q	2-25
BZX61c51-19		TBA800	0-95
E1222 =		TBA810	0-95
BFT42	0-27	TBA820	0-95
OA90	0-05	TBA920	2-80
OC191	0-05	TBA940	2-10
OC70	0-12	TBA990	2-00
R2008B	1-80	TCA270Q2	2-00
R2010B	1-80	TCA270Q2	2-00
TIP29C	0-38	TC270SQ	2-15
TIP30B	0-48	TCA640	2-10
TIP30C	0-48	TCA650	2-10
TIP31B	0-42	TCA940	2-00
TIP32B	0-62	MC1349P	1-50
TIS90	0-17	SN76530P	2-00

SPECIAL OFFER
NEW MULLARD ELC1043/05 U.H.F. TUNERS
£3-50

SOLENT MARK II STEREO AUDIO SYSTEM

£5 down



Separate Bass 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 £69-95. Credit Sale £5-00 deposit 9 monthly payments of £8-70 (Total Credit price £83-30). P. & P. £4-00. Send £9-00 today.

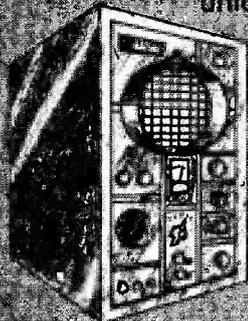
Chassis only available for cash at £49-00 + p. & p. £3-00
Full 12 months Guarantee.

Access and Barclaycard Orders Accepted by Telephone
CALLERS WELCOME

LEWIS radio PW/176, 100 CHASE SIDE SOUTHGATE LONDON N14 5PL Telephone: 01-882-1644

1. Understand electronics.

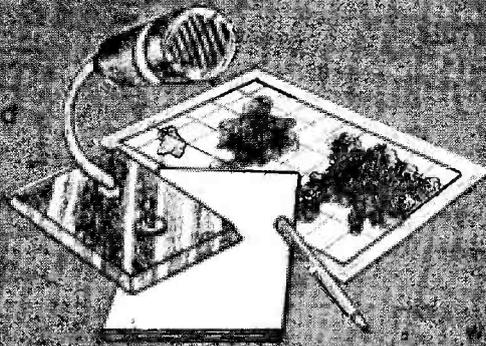
Step by step, we take you through all the fundamentals of electronics and show you how easily the subject can be mastered using our unique Learn Kit course.



- (1) Build an oscilloscope
- (2) Read, draw and understand circuit diagrams.
- (3) Carry out over 40 experiments on basic electronic circuits and see how they work.

2. 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:
BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL,
 P.O. Box 156, Jersey, Channel Islands.

W.C.17

NAME _____

ADDRESS _____

Block caps please

4-STATION INTERCOM



£17.95

+ V.A.T. £1.44

Solve your communication problems with this 4-Station Transistor Intercom system (1 master and 3 Subs), in robust plastic cabinets for desk or wall mounting. Call/talk/listen from Master to Subs and Subs to Master. Ideally suitable for Business, Surgery, Schools, Hospitals and Office. Operates on one 9V battery. On/off switch. Volume control. Complete with 3 connecting wires each 86ft. and other accessories. P. & P. 85p.

MAINS INTERCOM NEW MODEL
 No batteries—no wires. Just plug in the mains for instant two-way, loud and clear communication. On off switch and volume control. Price £31.49 per pair P. & P. 90p.

NEW! AMERICAN TYPE CRADLE TELEPHONE AMPLIFIER



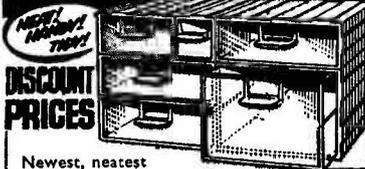
£12.95

VAT £1.04

Latest transistorised Telephone Amplifier with detached plug-in speaker. Placing the receiver on to the cradle activates a switch for immediate two-way conversation without holding the handset. Many people can listen at a time. Increase efficiency in office, shop, workshop. Perfect for "conference" calls: leaves the user's hands free to make notes, consult files. No long waiting, saves time with long-distance calls. On/Off switch, volume. Direct tape recording model at £14.95 + VAT £1.20 P. & P. 75p, 10-day price refund guarantee.

WEST LONDON DIRECT SUPPLIES (P.W.1)
 169 KENNINGTON HIGH STREET, LONDON, W8

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 and 2D have space dividers. Build up any size cabinet for wall, bench or table top.

AS SUPPLIED TO POST OFFICE, INDUSTRY & GOVERNMENT DEPTS.

SINGLE UNITS (1D) (5ins x 2½ins x 2½ins) £2.50 DOZEN,
DOUBLE UNITS (2D) (5ins x 4½ins x 2½ins) £4.40 DOZEN,
TREBLE (3D) £4.20 for 8.
DOUBLE TREBLE 2 drawers, in one outer case (6D2), £6.50 for 8.
EXTRA LARGE SIZE (6D1) £5.50 for 8.

PLUS QUANTITY DISCOUNTS!
 Orders over £20, less 5%.
 Orders over £60, less 7%.

PACKING/POSTAGE/CARRIAGE: Add 75p to all orders under £10. Orders £10 and over, please add 10% carriage.

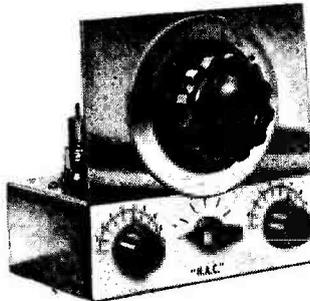
QUOTATIONS FOR LARGER QUANTITIES
 Please add 8% V.A.T. to total remittance

All prices correct at time of going to press

FLAIRLINE SUPPLIES
 (Dept. PW1)
 124 Cricklewood Broadway, London NW2
 Tel. 01-450 4844

H.A.C. SHORT-WAVE KITS

WORLD-WIDE RECEPTION



Famous for over 35 years for Short-Wave Equipment of quality. "H.A.C." were the Original suppliers of Short-Wave Receiver Kits for the amateur constructor. Special offer A48 valves—70p each.

1976 "DX" RECEIVER

Complete kit—Price £8.60 (incl. p. & p. & V.A.T.). Customer writes: "I think the performance is astonishing for such an inexpensive and foolproof kit. I would wholeheartedly recommend this kit to anyone, however inexperienced, as an antidote to TV-titis, and as an entry into a fascinating hobby".

This kit is ready to assemble and contains all genuine short-wave components, drilled chassis, valve, accessories and full instructions. Full range of other S.W. kits, including the famous model "K plus" (illustrated above). All orders despatched within 7 days. Send now for free descriptive catalogue of kits and components. Send stamped envelope for details.

"H.A.C." SHORT-WAVE PRODUCTS
 P.O. BOX No. 16, EAST GRINSTEAD,
 SUSSEX RH19 3SN

RADIO EXCHANGE LTD.

**ALL PRICES
INCLUDE VAT**

NEW EDU-KIT MAJOR



Total Building Costs **£9.00**

P & P + Ins. 85p.

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 Loud-speaker 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 in 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.

VHF AIR CONVERTER 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. **£3.95**

P & P and Ins. 45p.



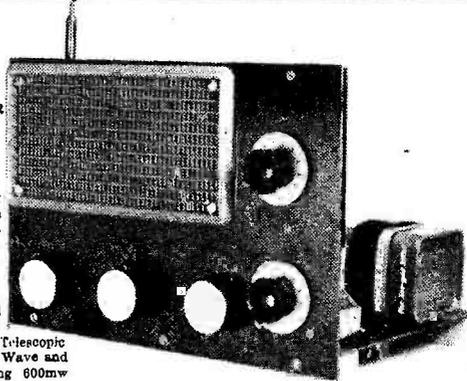
NEW ROAMER TEN MODEL R.K.3.

MULTIBAND V.H.F. AND A.M. RECEIVER
 13 TRANSISTORS AND FIVE DIODES
 QUALITY 5" x 3" LOUDSPEAKER

WITH Multiband V.H.F. section covering Mobiles, Aircraft, T.V. Sound, Public Service Band, Local V.H.F. Stations, etc. and Multiband A.M. section with Airspaced Slow Motion Drive Tuning Capacitor for easier and accurate tuning, covering M.W.1, M.W.2, L.W. Three Short Wave Bands, S.W.1, S.W.2, S.W.3, and Trawler Band. Built in Ferrite Rod Aerial for Medium Waves, Long Wave and Trawler Band, etc., Chrome Plated 7 section Telescopic Aerial, angled and rotatable for peak Short Wave and V.H.F. reception. Push Pull output using 800mw Transistors. Gain, Wave-Change and Tone Controls. Plus two Slider Switches, Negative Feedback circuit and SPECIAL POWER BOOSTER SOCKET AND RESISTOR, to virtually double gain if required. Powered by P.P.9 9 volt battery. Complete kit of parts including carrying strap, Building Instructions and Operating Manuals.

£13.99 Including Post and Packing

Case Enclosure Kit (if required) £1.80 inc. P & P.



POCKET FIVE

NOW WITH 3" LOUDSPEAKER

3 Tuneable wavebands. M.W., L.W. and Trawler Band, 7 stages, 5 transistors and 2 diodes, supersensitive ferrite rod aerial, attractive black and gold case. Size 5 1/2" x 1 1/2" x 3 1/4" approx.

All Parts including Case and Plans. P&P+Ins. 60p.



Total Building Costs

£3.60

NEW Everyday Series

Build this exciting new series of designs.



ELECTRONIC CONSTRUCTION KITS

ECK 2

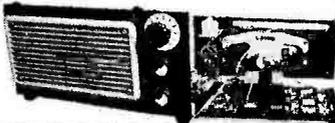
Self Contained Multi-Band V.H.F. Receiver Kit. 8 Transistors and 3 Diodes. Push/Pull output. 8" Loudspeaker, Gain Control. Superb 9 section swivel ratchet and retractable chrome plated telescopic aerial, V.H.F. Tuning Capacitor, Resistors, Capacitors, Transistors, etc. Will receive T.V. Sound, Public Service Band, Aircraft, V.H.F. Local Stations, etc. Operates from a 9 Volt PP7 Battery (not supplied with kit). Complete kit of parts including construction plans

£7.95 P & P and Ins. 70p



ECK 4

7 Transistors, 6 tuneable wavebands, M.W. 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 PP7 Battery (not supplied with kit). Complete kit of parts including construction plans. **£7.25** P & P and Ins. 70p.



E.V. 5. 5 Transistors and 2 diodes. MW/LW. Powered by 44 volt Battery. Ferrite rod aerial, tuning condens, volume control, and now with 3" loudspeaker. Attractive case with red speaker grille. Size 9" x 6 1/2" x 2 1/4" approx. All parts including Case and Plans.

Total Building costs **£4.30** P & P + Ins. 60p.

E.V. 6. Case and looks as above. 6 Transistors and 3 diodes. Powered by 9 volt battery. Ferrite rod aerial, 3" loudspeaker, etc., MW/LW coverage. Push Pull output.

All parts including case and plans. Total Building costs **£4.95** P & P + Ins. 65p.

E.V. 7. Case and looks as above. 7 Transistors and 3 diodes. SW wavebands, MW/LW, Trawler Band SW1, SW2, SW3, powered by 9 volt battery. Push Pull output. Telescopic aerial for short waves. 8" Loudspeaker.

All parts including Case and Plans. Total Building costs **£6.95** P & P + Ins. 70p.

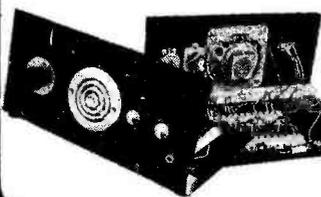
EDU-KIT JUNIOR

Completely Solderless Electronic Construction Kit. Build these projects without Soldering Iron or Solder.

- ★ Crystal Radio Medium Wave Coverage -- No Battery necessary.
- ★ One Transistor Radio.
- ★ 2 Transistor Regenerative Radio.
- ★ 3 Transistor Earpiece Radio Medium Wave Coverage.
- ★ 4 Transistor Medium Wave Loudspeaker Radio.
- ★ Electronic Noise Generator
- ★ Electronic Metronome.
- ★ 4 Transistor Push/Pull Amplifier.

All parts including Loudspeaker, Earpiece, MW Ferrite Rod Aerial, Capacitors, Resistors, Transistors, etc. Complete kit of parts including construction plans.

£6.55 P & P + Ins. 60p



TO RADIO EXCHANGE LTD.,
 61A HIGH STREET, BEDFORD MK40 1SA
 Tel: 0234 52367.

ALL PRICES INCLUDE VAT Reg. No. 788872

- ★ Callers side entrance "Lavelle's" Shop.
- ★ Open 10-1, 2.30-4.30. Mon-Fri. 9-12 Sat.

I enclose £.....
 for
 Name
 Address

PW1/77

VAT INCLUSIVE PRICES

Fully branded devices from
RCA, TEXAS, MOTOROLA,
MULLARD, etc.

Add 20p P & P—No other extras

TTLs by TEXAS

7400	16p	7492	55p
7400	30p	7493	43p
7401	18p	7494	90p
7402	18p	7495	70p
7403	18p	7496	84p
7404	24p	7497	340p
74H04	30p	74100	118p
7405	25p	74101	32p
7407	39p	74105	60p
7408	22p	74107	36p
7409	22p	74109	30p
7410	18p	74111	55p
74H10	22p	74118	90p
7411	26p	74121	32p
7412	27p	74122	52p
7413	40p	74123	73p
7414	85p	74125	70p
7416	40p	74126	65p
7417	40p	74132	75p
7420	18p	74136	81p
7421	43p	74142	85p
7422	28p	74142	300p
7423	36p	74145	95p
7425	33p	74148	173p
7427	40p	74151	120p
7428	39p	74150	77p
7430	19p	74153	82p
7432	32p	74154	164p
7437	32p	74155	97p
7438	32p	74156	97p
7440	18p	74157	96p
7441	85p	74159	220p
7442	75p	74160	107p
7443	116p	74161	107p
7444	116p	74162	107p
7445	120p	74163	107p
7446	95p	74164	130p
7447	81p	74165	150p
7448	80p	74168	140p
7450	18p	74167	107p
7451	18p	74173	160p
7453	18p	74174	120p
7454	18p	74175	92p
7450	18p	74176	131p
7470	36p	74177	100p
7472	32p	74180	108p
7473	36p	74181	322p
7474	37p	74182	88p
7475	45p	74185	146p
7476	37p	74190	155p
7480	54p	74191	130p
7481	103p	74192	130p
7482	85p	74193	102p
7483	99p	74194	76p
7484	103p	74195	102p
7485	120p	74198	108p
7486	38p	74197	108p
7489	340p	74198	214p
7490	43p	74199	197p
7491	60p	74199	197p

C-MOS ICs

4000	21p	4029	120p
4001	21p	4030	89p
4002	21p	4042	96p
4006	104p	4043	100p
4007	21p	4046	150p
4009	67p	4047	110p
4011	21p	4048	88p
4012	22p	4050	90p
4013	55p	4044	120p
4015	90p	4055	120p
4016	54p	4056	145p
4017	100p	4060	120p
4018	120p	4069	40p
4019	50p	4071	29p
4020	120p	4072	29p
4022	180p	4081	19p
4023	21p	4082	29p
4024	75p	4510	142p
4025	21p	4511	160p
4026	200p	4516	140p
4027	81p	4521	140p
4028	152p	4528	130p

LOW PROFILE DIL SOCKETS BY TEXAS

1	16 pin	13p
1	18 pin	14p
1	24 pin	40p

VOL. REGS.

FIXED—Plastic 3 Terminals		
1 Amp	7805	130p
5V	7812	130p
15V	7815	130p
18V	7818	150p
24V	7824	150p
1 Amp	Negative	
1V	7905	215p
12V	7912	215p
15V	7915	215p
18V	7918	215p
24V	7924	215p

LM309K (TO3) 5V 1 Amp	150p
LM323K (TO3) 5V 3 Amp	150p
TB 4855BCT (TO9) 12V 0.5A	90p
7805 (TO3) 5V 1 Amp	150p

VARIABLE VOL. REG.		
723	14 Pin DIL	45p

TRANSISTORS

BC184	14p	BF258	39p
BC187	14p	BF339	34p
BC122	12p	BF440	34p
BC126	18p	BF79	34p
BC127	18p	BF80	34p
BC137	16p	BF88	37p
BC176	18p	BFX30	32p
BC177	18p	BFX4	20p
BC188	15p	BFX5	30p
AD149	46p	BFX8	30p
AD161	39p	BFX7	30p
AD162	39p	BFX8	30p
AF114	22p	BFY50	17p
AF115	22p	BFY31	16p
AF117	22p	BD140	60p
AF139	40p	BD181	97p
AF239	48p	BD182	97p
BC107/B	10p	BD156	175p
BC108/B	10p	BF115	24p
BC109/C	11p	BF167	25p
BC147	9p	BF170	25p
BC148	8p	BF177	28p
BC149	10p	BF178	30p
BC157	11p	BF179	35p
BC158	13p	BF180	35p
BC159	13p	BF181	35p
BC169/C	15p	BF182	35p
BC172	12p	BF184	24p
BC173	13p	BF185	24p
BC177	13p	BF194	13p
BC178	17p	BF195	11p
BC179	20p	BF196	17p
BC182	20p	BF197	17p
BC183	12p	BF257	34p

OP. AMPS

301A	Ext. Comp. 8 pin DIL	40p
538T	FE Op. Amp. T O 99	30p
710	Ext. Comp. 8/14 pin DIL	30p
710	DIR. Comp. 14 pin DIL	45p
741	Int. Comp. 8/14 pin DIL	25p
747	Dual 741 14 pin DIL	76p
748	Ext. Comp. 8 pin DIL	40p
778	Prog. Op. Amp. T O 99	15p
3130	Dual Op. Amp. 8 pin DIL	108p
3140	CMOS/Bipolar Mosfet	108p
3900	BIOS/FET Input 8 pin DIL	108p
	Quad. Op. Amp. 14 pin DIL	60p

LINEAR I.Cs

AY-1-0212	Tone Gen. 18pin DIL	850p
CA 3028A	Dir. Cascade Amp. To 99	112p
CA 3048	5 Transistor Array 14 pin DIL	70p
CA 3048	Quad. Low Noise Amp.	250p
CA 3053	Dir. Cascade Amp. TO9/DIL	60p
CA 3053	Op Transconduct. Amp 8 DIL	90p
CA 3058E	FM IF System 18 pin DIL	150p
CA 3090AQ	FM Stereo Decoder QIL	500p
ICL8038BC	VCO Fun.ken 14 pin DIL	600p
ICL8038CC	VCO Fun.ken 14 pin DIL	370p
LM3800	2W Audio Amp 14 pin DIL	112p
LM381N	Stereo Pre Amp 14 pin DIL	180p
LM389N	Aud Amp. 4 Trs. Arr. 18 DIL	140p
M21	Rhythm Ken 18 pin DIL	850p
MC1310	FM Stereo Decoder 14 pin DIL	200p
MC1381P	Lim/Det. Audio Preamp	104p
MC1498	Multiplexer 14 pin DIL	370p
MC1498	Bal. Mod/Demod 14 DIL	115p
MC3340P	FM IF System 18 pin DIL	150p
MFC400B	1W Audio Amplifier PCB	75p
NE540L	Audio Pwr. Driver TO99	140p
NE555V	Timer 8 pin DIL	40p
NE558	Dual 555 14 pin DIL	76p
NE581B	PLL with AM Demod	425p
NE582B	PLL with VCO 18 pin DIL	425p
NE585	PLL 14 pin DIL	200p
NE586V	PLL Function Gen 8 pin DIL	165p
NE587V	PLL Tone Decoder 8 pin DIL	200p
2567	Video 567 18 pin DIL	150p
SN7273S	Video Amplifier 14 pin DIL	150p
SN76033N	Audio Pwr. Amp with Int. HS	275p
SN76033N	10W in 4 ohms Spin Plas.	280p
SN76033N	Audio Pwr Amp with Int HS	175p
SN76033N	Audio Pwr. Amp with Int. HS	275p
TAA821A	Aud. Amp. for TV QIL	310p
TAA861B	FM IF Amp Lim/Detector QIL	150p
TBA641B	Audio Amp QIL	100p
TBA800	5W Audio Amp QIL	125p
TBA810	7W Audio Amp QIL	150p
TBA820	2W Audio Amp QIL	100p
TD A2020	20W Audio Amp QIL	445p
XR244	Prog Timer/Counter 16 pin DIL	400p
ZN414	TRF Radio Receiver TO18	140p

OPTO-ELECTRONICS

PHOTO-TRANSISTORS	LEDs	
OC770	TIL209 Red	15p
OC771	TIL211 Green	32p
OC772	TIL32 Infrared	81p
OC773	MV505	27p
ORP10	60p Red	18p
ORP60	75p Green	29p
ORP61	75p Yellow	32p

SEVEN SEGMENT DISPLAYS

3015F	Minitron 0-3"	175p
DL704	Com. Cathode 0-3"	160p
DL707	Com. Anode 0-3"	160p
DL747	Com. Anode 0-6"	250p

DRIVERS: 75491 84p, 75492 98p

TIP30A	60p	40361	43p
TIP30C	45p	40362	45p
TIP31A	58p	40400	75p
TIP31C	66p	40409	75p
TIP32A	63p	40411	300p
TIP32C	85p	40594	90p
TIP33A	97p	40595	97p
TIP34A	124p		
TIP34C	160p	BF244	45p
TIP35A	243p	MPF102	40p
TIP35C	290p	MPF103	40p
TIP36A	297p	MPF105	40p
TIP37A	360p	2N3819	27p
TIP41A	70p	2N3820	50p
TIP41C	84p	2N3823	54p
TIP42A	96p	2N5457	40p
TIP42C	96p	2N5458	40p
TIP2955	76p	2N5459	40p
TIP3055	60p	3N128	81p
2N583	28p	3N140	92p
2T1008	11p	3N141	81p
ZTX30	130p	40803	63p
ZTX500	19p	40873	58p
ZTX504	60p		
2N697	25p		
2N698	32p		
2N700	28p		
2N708	22p		
2N918	45p		
2N930	19p		
2N1131	25p		
2N1132	25p		
2N1134	25p		
2N1305	40p		
2N1306	40p		
2N1307	40p		
2N1613	22p		
2N1711	22p		
2N1833	32p		
2N2219	30p		
2N2222	22p		
2N2389	15p		
2N2484	32p		
2N2904/A	22p		
2N2905/A	22p		
2N2905/B	22p		
2N2926RB	9p		
2N2928OG	11p		
2N3053	19p		
2N3054	43p		
2N3055	54p		
2N3056	15p		
2N3442	14p		
2N3702	14p		
2N3703	14p		
2N3704	14p		
2N3705	14p		
2N3706	12p		
2N3707	12p		
2N3708	11p		
2N3709	14p		
2N3710	14p		
2N3773	30p		
2N3886	90p		
2N3904	22p		
2N3905	22p		
2N3906	22p		
2N4088	19p		
2N4089	19p		
2N4123	22p		
2N4124	22p		
2N4125	22p		
2N4126	22p		
2N4289	24p		
2N4371	142p		
2N4348	173p		
2N4401	34p		
2N4403	34p		
2N4427	97p		
2N5089	34p		
2N5298	82p		
2N5401	52p		
2N5407	70p		
2N6247	200p		
2N6254	140p		
2N6292	70p		
40380	43p		

DIODES

SIEMAL	
OAA7	9p
OAA1	10p
OAA5	11p
OAA9	7p
OAA1	9p
OAA5	9p
OAA200	22p
OA202	10p
1N814	11p
1N916	11p
1N4148	4p

RECTIFIER

BY100	31p
BY128	15p
BY127	12p
1N4001	8p
1N4002	6p
1N4004	7p
1N4005	7p
1N4007	8p

J. BIRKETT

Radio Component Suppliers

25 The Strait, Lincoln, LN2 1JF

Telephone: 20767

10 ASSORTED 20 TURN TRIMPOTS For 60p.
 5 MHz 10X CRYSTALS at 50p each.
 20 ASSORTED PHOTO and PHOTO DARLINGTON TRANSISTORS Untested for £1.
 SILICON BRIDGES 200 PIV 2 Amp @ 30p, 40 PIV 3·2 Amp, 400 PIV 1 Amp @ 30p, 100 PIV 10 Amp @ 83p.
 50 ASSORTED TRANSISTOR ELECTROLYTIC CAPACITORS @ 57p.
 100 MULLARD C280 ASSORTED POLYESTER CAPACITORS @ 57p.
 TAG ENDED ELECTROLYTICS size 2½ x 1½ 3300uf 64 v.w. @ 50p, 4700uf 40 v.w. @ 45p.
 PLASTIC TRIACS 50 PIV 6 Amp @ 15p, 400 PIV 6 Amp @ 60p.
 PLASTIC S.C.R.'s. 50 PIV 6 Amp @ 15p, 400 PIV 6 Amp @ 40p.
 TUNING CAPACITORS 500-P500-17-17p with S.M. Drive @ 38p.
 STC 12 VOLT DOUBLE POLE CHANGE-OVER RELAYS @ 50p.
 P CHANNEL MOS FET's with circuits at 20 For £1.
 TEXAS PNP POWER DARLINGTON TRANSISTORS @ 35p each.
 TEXAS 800 Volt 2 Amp NPN TRANSISTOR PLASTIC TO3 @ 3 For £1.
 200 ASSORTED CARBON FILM ½, ¼ Watt RESISTORS Odd Values @ 75p.
 10 AMP S.C.R.'s. 100 PIV @ 25p, 400 PIV @ 50p, 800 PIV @ 60p.
 600 KHZ CRYSTALS 10XAJ TYPE @ 50p each.
 POWER TRANSISTORS MP 8512 PNP @ 20p, MP 8112 NPN @ 20p, R2008 @ 50p, R2010 @ 75p, BD 112 @ 25p.
 10GHz STRIPLINE NPN TRANSISTOR SIMILAR TO BFR90/91 @ £3 each.
 VHF POWER TRANSISTORS UNMARKED GOOD 2N 3375 @ £1 each.
 WIRE ENDED CRYSTALS 28 KHz at 50p each.
 LOUSPEAKERS 2½" 8 ohm, 40 ohm, 75 ohm. All at 75p each.
 BOOKS "Building Simple Short Wave Transistor Receivers" at 60p and "Simple Transistor Test Gear" @ 75p or £1 Pair.
 TIL 209 REPLED's at 5 For 57p.
 30 ASSORTED CRYSTALS 10XAJ Type Between 5100 To 7900 KHz @ £1·20.
 AUDIO AMPLIFIER I.C.'s. SN 76001 @ 55p, TBA 611B @ 65p, TBA 641 @ 80p, TBA 800 @ 85p, LM 380 @ 80p, SN 76013ND @ £1.
 1 Pole 21 Way ROTARY SWITCHES @ 65p each.
 TEXAS 600 MHz NPN TRANSISTORS TYPE BF 224. 10 For 57p.
 25 BC 107-8-9 TRANSISTORS Untested for 57p.
 GERMANIUM TRANSISTORS AC 141K, AC142K, AC153K, AC176K, AC187K, AC188K All at 20p each.
 QUAD OP-AMPS 14 PIN DIL LM 3900 at 60p.
 20 VHF TUNING VARIATOR DIODES Untested for 45p.
 1000uf 40 v.w. ELECTROLYTIC CAPACITORS size 1½ x ½ at 3 for 35p.
 SILICON SOLAR CELLS 5 Volt 5mA @ 35p each.
 FM I.C.'s. like TAA 570 Untested with data at 5 for 57p.
 WAYRAD 10·7 MHz DOUBLE TUNED I.F. TRANSFORMERS @ 11p each.

NICKEL CADMIUM RECHARGEABLE CELLS 1·25V per cell. 1·2 AmpH, 1·8 AmpH, 3·5 AmpH, 4·00 AmpH, 7·00 AmpH, 10·00 AmpH. The above cells can be supplied in sealed packs with or without built in mains charger unit at various voltages and current. S.A.E. for prices giving D.C. voltage and current required.
 TRANSFORMERS 240V A.C. primaries. SEC 0·6V 1 amp. Sec 0·12-15-20-24-30V 1 amp. Various others with low voltage high current secondaries.
 INVERTOR TRANSFORMERS 6V-8watt. 12V-8 watt.
 RELAYS 6V D.C. coil 2 pole c/o. 12v D.C. coil 2 pole c/o. 230V A.C. coil 3 pole c/o suitable for aerial c/o. Various Bridges, Diodes, Transistors. ½ watt carbon resistors. Condensers in stock.
 CAD PLATED B.A. nuts and bolts. 6BA, 4BA, 2BA. Bolts various lengths. 6BA, 4BA, 2BA. Brass studing in 12inch lengths. Single sided P.C. board industrial grade.
 ALUMINIUM or TIN PLATED CHASSIS Price on application, made to your size, S.A.E. with measurements required.
 STEEL CASES. For your home brew equipment, made to your size. With steel or alloy front panel, mesh back panel, fixed or loose mesh lid. Finished in White or Metallic Blue, S.A.E. for price giving details of size required. S.A.E. for lists to:-

NIXON'S ELECTRONICS G3CLP. H.F.P.
 (CHESTERFIELD) LTD.

497 Sheffield Road, Whittington Moor, Chesterfield, Derbys.
 Phone 0244-459650 Chesterfield

MAGENTA

electronics ltd.

PW12, 61 Newton Leys,
 Burton on Trent, Staffs.
 DE15 0DW

COMPONENTS & HARDWARE

LATEST CATALOGUE contains NEW PRODUCTS sheet 11.
 (sae for sheet 11 only).

25p VOUCHER INCLUDED:

Send for your copy now—25p.

BUILD THESE PROJECTS!

EXPERIMENTERS' POWER SUPPLY.

TRANSISTOR TESTER.

TEST METER RANGE EXTENDER.

Circuits & details—send 20p per item—refunded when all parts are ordered.

Or send sae for further information.

SCOPES general purpose 3" for use on 240v tested with circ see Nov P.W. or write for details £25. V.H.F. Rx A.M. type R1392 crystal controlled for use on 100 to 150Mc/s band normally used as ground station Rx, uses 13 valves as two RF stages, B.F.O. Tuning meter etc with O/P for phones. Contained in 19" case reqs ext supplies of 250v HT & 6·3v. Supplied with manual & mods to make Rx tunable over band in very good cond having recently been reconditioned by A.M. £18·50.

AIRCRAFT H.F. Rx type R4187 & Control box these are a crystal controlled Rx covering 2·8 to 18M/cs in 24 channels normally remotely controlled, the Rx is a dual conversion type using 16 min valves, also as BFO, CW & RT I.F. filters etc. normally O/P for phones. The req ext supplies of 24 & 19v DC or 200v HT & 19v, uses Hc6/u crystals not supplied, we can now furnish modification details to enable these Rx to tune 80, 40 & 20 meters also details of power supplies, copy of manual & control box are also supplied. £18·30.

AIRPORT TAPE RECORDERS 10 channel units in 19" racks complete with amplifiers, bias osc, monitor & power unit panels, uses ½" tape on 14" spools as two 5 track Rec & two 5 track replay heads. For use on 230v 50c/s supplied with handbook and data (note no provision for erase) £86·40. We have a few tape decks only at £35.

SIG GENS Marconi type TF144G 85Kc to 25Mc/s in 8 bands O/P var luv to 1 volt with O/P meter etc for use on 240v with circ & leads tested £26.

SLOW MOTION DIALS type A. 3" dia ratio 40:1 scale 0 to 180 with cursor for ¼" shaft. Type B. 4" dia ratio 200:1 scale 0 to 100 for ⅜" dia shaft (note type B new but soiled) £1·65 each.

CRYSTAL FILTERS 10·7 Mc/s size 28 x 16 x 18mm 12 Kc b.w. £2·20 30Kc b.w. £1·50 both new.

TUNING CONDS 3 gang 78pf per section ¼" shaft £1·30. **CRYSTALS** types 10X & 10XJ 2 pin in freq range 2 to 15Mc/s 20 for £2. **ROTARY SWTS** larger type Inst swts all new. 8p 12w 8b & 2p 23w 2b both £1·6- 6p 12w 6b £1·40. 7p 23w 7b £2. **HEADPHONE LEAD** 5ft lead complete with 4000 to 250 ohm trans fitted-standard jack plug new £1·40. **HEADPHONES** with rubber ear muffs low res nom 100 ohm & complete with throat mikes £2. **METER UNIT** dual unit as 270 deg 1 Ma scale 0 to 20 & small centre reading 100-0-100 Ua in case size 3½" sq front glass 2½" tested £4·50. **HELIPOTS** two types both small, new with ¼" shafts 5K or 10K £1·65 eac. **FERRITE AE** etc as follows all new, ferrite rod with long & med wave coils 7" 60p, ferrite rod only 8" x ⅝" 65p. Ae telescopic 8 section chrome 36" open ⅝" at base 85p. **CABLE** 24 core colour coded ea core screened approx ⅝" O.D. new 5mt for £1·70. **RADAR TX/RX ASS** 3cm contains, 2J42 Mag, K308 Klystron, mixer & AFC crystals, I.F. strip, 715C valve, TR cell, etc modern unit £18. **POWER TRANSIS** Lucas type DT6106 Sil npn Vc 500v 1c 10 maps, Ft 5 Mc/s new £3·50 ea. **MURPHY R.T.** Units H.B. dash mt. with handset & circ rew only £22, also one H.B. 50w AM 25Kc base station & 4 mobiles as described £165.

Above prices include carr/postage & V.A.T. Goods ex equipment unless stated otherwise, S.A.E. for list 16 or enquiry. Shop open Tues to Sat.

A. H. SUPPLIES

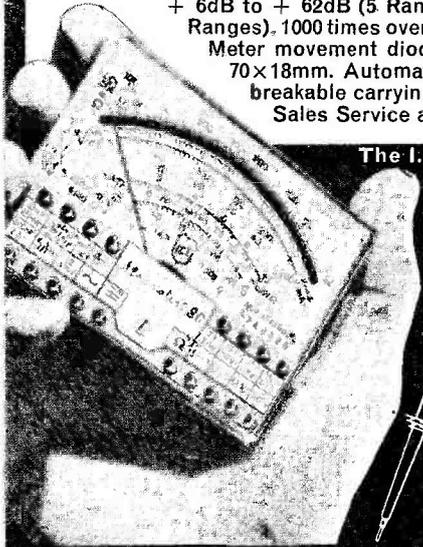
122 HANDSWORTH ROAD
 SHEFFIELD. S9 4AE. Phone 442278 (0742).

Incredible Value in Precision Test Meters

AVAILABLE FROM SELECTED STOCKISTS. WRITE OR PHONE FOR LIST

MICROTEST 80—I.C.E. 20,000 Ohms/Volt 40 RANGES

20,000 Ohms/Volt, (d.c.) 4,000 Ohms/Volt (a.c.) 2% accuracy. V d.c. 100mV to 1kV (6 Ranges). I d.c. 50 μ A to 5A (6 Ranges). V a.c. 1.5V to 1kV (5 Ranges) I a.c. 250 μ A to 2.5A (5 Ranges). Resistance, Low Ohms, Ohms \times 1, Ohms \times 10, Ohms \times 100. Output Level Measurements 1.5V to 1000V (5 Ranges) + 6dB to + 62dB (5 Ranges). Capacitance 25 μ F to 25,000 μ F (4 Ranges). 1000 times overload protection (on Resistance ranges). Meter movement diode protection. Size (without case) 90 \times 70 \times 18mm. Automatic zero, non-parallax mirror scale. Unbreakable carrying case and probes supplied. Full After Sales Service available. **Price £15.66 inc. VAT**



The I.C.E. Measurement System includes a comprehensive range of accessories: shunts, transformers, specialised probes, transistor-tester etc. I.C.E. High-Voltage d.c. Probe, Model 18. Input Impedance: 500M Ohm, nominal (Other values available to order). The Model 18 d.c. Probe consists of a highly insulated moulded plastic body, fitted with a hand guard-ring, containing a stable, precision 500M Ohm resistor, which may be used to extend the d.c. voltage measuring capability of analogue multi-meters or electronic voltmeters, to a maximum value of 25kV. The probe is fitted with a prod-tip for connection to the voltage source to be measured and a connecting lead terminating in a 2mm plug for insertion into the measuring instrument's d.c. voltage input socket. (4mm plug available to order). **£6.42 inc. VAT**

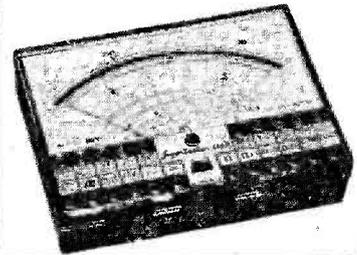


SUPER TESTER 680R—I.C.E.

20,000 Ohms/Volt 80 RANGES

20,000 Ohms/Volt 1% d.c. 4,000 Ohms/Volt a.c. 2% V d.c. 100mV to 2kV (13 ranges). V a.c. 2V to 2kV (11 Ranges). I d.c. 50 μ A to 10A (12 Ranges). I a.c. 250 μ A to 5A (10 Ranges). Resistance Ohms \times 1, \times 100, \times 1000, \times 10,000 and Low Ohms. Reactance Detector 0-10M Ohms. Freq. Measurement 0-5000 Hz (2 Ranges). Output Level 10-2000V (9 Ranges). Decibels -24 to +70dB (10 Ranges). Capacitance 0-500,000 pF (2 Ranges using mains supply) 0-20,000 μ F (4 Ranges using internal 3 Volt battery). 1000 times overload protection on Resistance ranges and meter movement diode protection. 10 Measurement Functions and 80 Ranges. Size 128 \times 95 \times 32mm. Non-parallax mirror scale. Unbreakable carrying case supplied which contains probes, mains lead, crocodile clips and shorting link.

Price £24.30 inc. VAT



Sole Importers and Distributors

Electronic Brokers Ltd

49-53 Pancras Rd., London NW1 2QB. Tel: 01-837 7781

ESSENTIAL BOOKS FOR RADIO AMATEURS

RSGB AMATEUR RADIO CALL BOOK

New (1977) Edition

Incorporates all new call signs and amendments notified between August 1975 and August 1976.

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. **176 pages Price £2.10 post paid**

VHF-UHF MANUAL

by D. S. Evans, PhD, AIM, G3RPE, and G. R. Jessop, CEng, MIERE, G6JP

The most comprehensive and up-to-date review of vhf and uht techniques available today.

Chapters on receivers, transmitters, space communications, filters, aerials, microwaves and much more. Simple amateur television is covered and a data section provides valuable facts and figures to help the constructor. Many of the designs make use of integrated circuits, and the microwaves chapter gives details of equipment for use up to 24GHz. **Over 400 pages Price £5.70 post paid**

AMATEUR RADIO TECHNIQUES

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 5th edition some 50 pages of new material have been included and other sections have been revised and expanded.

304 pages. Over 700 diagrams Price £2.57 post paid

A GUIDE TO AMATEUR RADIO

by Pat Hawker, G3VA

Extensively revised and enlarged, this 16th edition reflects current interest in ssb, vhf, transistor and valve equipment, and Class A and Class B licences.

It describes how licences are obtained and provides guidance on home-built and factory-made equipment.

112 pages, fully illustrated Price £1.17 post paid

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



SOUTHERN VALVE COMPANY
P.O. Box 144, Barnet, Herts. Tel: 01-440 8841

"QUALITY" Valves—90 day guarantee. ALL NEW & BOXED VALVES (incl. tax)—many makes. Radio Societies, trade etc. welcome.

AZ261 85p	PC386 44p	PY801 41p
EY367 36p	PC388 65p	UBF59 47p
DY802 42p	PC389 50p	UC385 46p
EB91 18p	PC391 58p	UCH42 72p
EC081 35p	PCF80 40p	UCH81 42p
EC082 35p	PCF82 50p	UCL82 42p
EC083 34p	PCF86 58p	UCL83 58p
EC085 48p	PCF90 50p	UF41 65p
EC088 45p	PCF801 50p	UF58 45p
EC442 72p	PCF802 55p	UL41 72p
EC881 36p	PCF805 41.40p	UL84 44p
EC882 52p	PCF906 50p	UY85 35p
EC884 52p	PCF808 41.35p	U26 72p
ECL80 52p	PCJ200 77p	V26 65p
ECL82 47p	PCL83 37p	U191 70p
ECL85 65p	PCL83 50p	6/80L2 70p
ECL86 50p	PCL84 47p	6B7 68p
EF80 30p	PCL85 62p	6F22 70p
EF85 37p	PCJ806 50p	6F28 75p
EF86 52p	PCL88 50p	6V9 47p
EF89 32p	PCL290 41.30p	6LA (near 90p)
EF188 37p	PD500 22.25p	equiv KT66)
EF184 37p	PFL200 73p	20L1 80p
EH90 56p	PL36 70p	20P4 85p
EL34 98p	PL81 50p	30C1 40p
EL41 55p	PL81A 54p	30C15 75p
EL54 35p	PL82 38p	30C17 80p
EL509 22.25p	PL83 46p	30C18 41.40p
EM84 47p	PL84 46p	30P5 75p
EY31 47p	PL800 75p	30P11 80p
EY367 36p	PL804 75p	30P12 75p
EZ40/1 55p	PL508 41.10p	30L1 40p
EZ80 35p	PL509 22.00p	30L15 78p
EZ81 30p	PL519 22.80p	30L17 72p
GY301 41.00p	PL802 22.00p	30P12 75p
GZ20 45p	PY38 52p	30P19 70p
PC88 63p	PY81/3 41p	30PL1 41.30p
PC88 63p	PY88 41p	30PL13 75p
PC97 40p	PY500 } 41	30PL14 85p
PC900 49p	PY500A } 41	30PL15 85p
PCC84 40p	PY800 41p	30P4MR 80p

We offer return of post service. Post free over £10.00. Postage: 1st valve 9p, extra valves 6p. Max. 55p. Most types available, send *see for lists*. Discount Prices. All prices subject to alteration without notice due to market fluctuations etc. Trade: Representative calls certain areas. Telephone enquiries welcomed, *see with enquiries* PLEASE! C.W.O. ONLY. No C.O.D. Export enquiries welcomed. VAT invoices on request. Mail order only. (LARGE valves 2p extra).

Please mention
Practical Wireless
when replying
to

Advertisements

SEMICONDUCTORS

from
LYNX ELECTRONICS (LONDON) LTD.

THYRISTORS

PIV	.8A	1A	3A	4A	6A	8A	10A	15A
(TO92)	(TO5)	(C108)	(TO220)	(TO220)	(TO220)	(TO220)	(TO220)	(TO64)
50	0-20*	0-25	0-35	0-32	0-41	0-42	0-47	0-98
100	0-25*	0-25	0-40	0-37	0-47	0-48	0-54	1-02
200	0-27*	0-35	0-45	0-40	0-58	0-60	0-68	1-14
400	0-30*	0-40	0-50	0-45	0-87	0-88	0-98	1-40
800	—	0-65	0-70	—	1-09	1-19	1-26	1-80

TRIACS (PLASTIC TO-220 PKGE ISOLATED TAB)

	4A	6-5A	8-5A	10A	15A
(a)	(b)	(a)	(b)	(a)	(b)
100V 0-60	0-60	0-70	0-70	0-78	0-83
200V 0-64	0-64	0-75	0-75	0-87	0-87
400V 0-77	0-78	0-80	0-83	0-97	1-01
600V 0-96	0-99	0-87	1-01	1-21	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.

OPTOELECTRONICS

Displays	Discretes	Special Offer
704 0-95	0-125 Red (TIL209)	0-12
707 0-95	0-2 Red	0-13
727 1-95	0-2 Green	0-20
728 1-95	0-2 Clear	0-14
747 1-85		
750 1-85		

Special Offer
Red Led
RL209
10p

ITT BRANDED TRANSISTORS

Type BSY85. Med Voltage High gain NPN. To-18. Similar to BC107/8/9.
5 pcs for 0-35.
25 pcs for 1-20.
100 pcs 3-50.

LINEAR ICs

7410	0-16		
7401	0-16		
7402	0-16		
7403	0-16		
7404	0-18		
7405	0-18		
7406	0-51		
7407	0-18		
7408	0-18		
7409	0-18		
7410	0-18		
7412	0-25		
7413	0-25		
7414	0-72		
7416	0-43	307	0-55*
7417	0-43	380	14 Pin DII 0-90*
7422	0-38	585	8 Pin DII 0-45
7423	0-40	585	14 Pin DII 2-00*
7425	0-30	586	8 Pin DII 1-50*
7427	0-48	567	8 Pin DII 2-00*
7428	0-59	709	8/14 Pin DII 0-35
7430	0-16	741	8/14 Pin DII 0-28
7432	0-37	748	8 Pin DII 0-35
7433	0-49	748	14 Pin DII 0-70*
7437	0-35	3900	
7438	0-35	CA3045	0-85*
7440	0-16	CA3046	0-50*
7441	0-76	MC1304	1-55
7442	0-65	MC1307P	1-17*
7445	1-50	MC1458P	0-77
7446	2-50	MC1456L	1-10*
7447	0-91	TAA550	0-45*
7448	0-81	SN75324	2-55
7450	0-85	SN75451	0-80*
7451	0-16	SN75452	0-85*
7453	0-18	TAA300	1-61
7454	0-38	TAA310A	1-38
7460	0-18	TAA550	0-45*
7470	0-26	TAA611B12	1-25*
7472	0-26	TAA530	1-85*
7473	0-30		
7474	0-32		
7475	0-47		
7478	0-36		
7480	0-55		
7481	1-26		
7482	0-75		
7483	1-12		
7484	0-85		
7485	1-25		
7486	0-36		
7489	2-92		
7490	0-45		
7491	0-68		
7492	0-57		
7493	0-45		
7494	0-85		
7495	0-67		

TO-3 NPN POWER TRANSISTORS

FULLY TESTED BUT UNMARKED. SIMILAR TO 2N3055 EXCEPT V_{CEO} > 50V HFE > 20 @ 3 Amps.
5 pcs for £1-00
10 pcs for £1-80
20 pcs for £2-40
50 pcs for £7-50
100 pcs for £13-00



REGULATORS

723	0-45
1 amp Plastic	
7805	1-50
7812	1-50
7815	1-50
7818	1-50
LM340-5	1-35
LM340-12	1-35
LM340-15	1-35
LM340-18	1-35

SPECIAL OFFER

LM309K
1A TO3 5V
£1.25

IC SOCKETS

8 Pin	0-16
14 Pin	0-16
16 Pin	0-18
24 Pin	0-45
40 Pin	0-80

TO3 HARDWARE INCLUDING

1 Mica - 2 washers
Solder Tag
2 Nuts/Bolts
Washers
50 sets for 65p

TRANSISTORS, DIODES, RECTIFIERS

AC126	0-15	BD181	0-86	OA90	0-08
AC127	0-16	BD182	0-92	OA91	0-08
AC128	0-13	BD183	0-97	OC41	0-15
AC128K	0-25	BD232	0-60*	OC42	0-15
AC141	0-18	BD233	0-48*	OC44	0-13
AC141K	0-28	BD237	0-55*	OC45	0-10
AC142	0-18	BD238	0-60*	OC70	0-10
AC142K	0-28	BD184	1-20	OC71	0-10
AC176	0-16	BDY20	0-80	OC72	0-22
AC176K	0-25	BDY38	0-60	OC84	0-14
AC187	0-18	BDY80	0-60	SC40A	0-73
AC187K	0-25	BDY91	0-65	SC40B	0-81
AC188	0-18	BDY82	0-55	SC40D	0-88
AC188K	0-25	BF178	0-28	SC40F	0-65
AD140	0-50	BF179	0-30	SC41A	0-85
AD142	0-50	BF184	0-10*	SC41B	0-70
AD143	0-46	BF185	0-10*	SC41D	0-85
AD149	0-46	BF196	0-12*	SC41F	0-60
AD161	0-35	BF197	0-12*	ST2	0-20
AD182	0-35	BF24J	0-18*	TIP29A	0-54
AL102	0-95	BF244	0-17*	TIP30A	0-42
AL103	0-93	BF257	0-30*	TIP31A	0-54
AF114	0-20	BF258	0-35	TIP32A	0-84
AF115	0-20	BF337	0-20	TIP34	1-05
AF116	0-20	BFW60	0-17*	TIP41A	0-68
AF117	0-20	BFX29	0-26	TIP42A	0-72
AF118	0-50	BFX30	0-30	IN2069	0-14
AF139	0-33	BFX34	0-23	IN2070	0-16
AF238	0-37	BFY35	0-35	IN4001	0-84
BC107	0-69	BFX88	0-50	IN4002	0-05*
BC107B	0-09	BSY50	0-20	IN4003	0-06*
BC108	0-09	BFY51	0-18	IN4004	0-07*
BC109	0-09	BFY52	0-19	IN4005	0-08*
BC109C	0-12	BFY54	0-35	IN4006	0-08*
BC111	0-19*	BFY90	0-85	IN4007	0-10*
BC125	0-13*	BR100	0-20	2N698	0-14
BC126	0-20*	BFY39	0-40	2N697	0-12
BC141	0-28*	BSX19	0-16	2N706	0-10
BC142	0-23	BSX20	0-18	2N629	0-14
BC143	0-23	BSX21	0-20	2N930	0-14
BC144	0-30	BSY95A	0-12	2N1131	0-15
BC147	0-09*	BT106	1-00	2N1132	0-18
BC148	0-09*	BT107	1-80	2N1304	0-45
BC149	0-09*	BT108	1-80	2N1305	0-45
BC152	0-25*	BT109	1-00	2N1171	0-18
BC153	0-18*	BT116	1-00	2N1202	0-44
BC157	0-09*	BU105	1-80*	2N3689	0-14
BC158	0-09*	BU105/021-90*	2N2369A	0-14	
BC159	0-09*	BU126	1-60*	2N2484	0-16
BC160	0-32	BU204	1-60*	2N2646	0-30
BC161	0-38	BU208	2-60*	2N2905	0-18
BC168B	0-09*	BY206	0-15	2N2905A	0-22
BC182	0-11*	BY207	0-20*	2N2926R	0-10*
BC182L	0-11*	BYX36-		2N2926Q	0-09*
BC183	0-10*			2N2926Y	0-09*
BC183L	0-10*			2N2926G	0-10*
BC184	0-11*			2N3053	0-15
BC184L	0-11*			2N3054	0-40
BC207B	0-12*	BYX38-		2N3055	0-50
BC212	0-11*			2N3440	0-58
BC212L	0-11*			2N3442	1-20
BC213	0-12*			2N3825	0-50
BC213L	0-12*			2N3870	0-80
BC214	0-14*	BZX61 Series		2N3702	0-10*



NOTICE TO READERS

Whilst prices of goods shown in classified advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

Receivers and Components

ZN1040E 4 Digit Count/Display IC £7.00
 1040E(R) Unmarked Reject of above
 Counts/Displays/Resets OK £3.00
 DL707 Litronix CA 7 Seg. Display £1.35
 7447 BCD-7 Seg. Decoder Driver 0.95
 7489 84 BIT Read/Write Memory Fully
 Functional-Speed Failures 0.65
 ZN425E 8 BIT D-A/A-D Converter £3.75
 P & P 20p. Free on orders over £5.00.
 Data Sheets 10p each (Mail Order Only).
**GJD Electronics, 105 Harper Fold Road,
 Radcliffe, Manchester, M25 0RQ.**

BRAND NEW COMPONENTS BY RETURN. Electrolytics 16V, 25V, 50V, 0.47-1.0, 2.2, 4.7, 10mfd.-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, 4.7/25V-11p, 10/25V, 22/16V, 47/6V, 100/3V-12p. Mylar Film 100V, 0.001, 0.002, 0.005-3p, 0.01, 0.02-3 1/2 p, 0.04, 0.05-4p. Mullard C280 series miniature polyester vertical mounting E6 series 0.01-0.1-4p, 0.15, 0.22-5p, 0.33, 0.47-8p, 1.0-15p, 1.5-20p, 2.2-24p. Mullard miniature ceramics 63V, 2p, E12 series 1.8 pf.-47 pf.-3p, 56 pf.-330 pf.-3 1/2 p. Plate ceramics 50V E12 series 22 pf.-1000 pf., E6 series 1500 pf.-47000 pf.-2p. Polystyrene 63V E12 series 10 pf.-1000 pf.-3p, 1200 pf.-10000 pf.-4p. Miniature Highstab carbon film resistors 1/3W E12 series 5% (10% over 1MΩ) 1Ω-10MΩ-1p, 1N4143-3p, 1N4002-5p, 1N4006-7p, 1N4007-8p. Postage 10p. Prices VAT inclusive. The C. R. Supply Co., 127, Chesterfield Rd., Sheffield S8.

SOWTER TYPE 3678

MULTITAP MICROPHONE TRANSFORMER
 Primary windings for 600 ohm, 200 ohm and 80 ohm with Secondary loadings from 2K ohm to 10K ohm. Frequency response plus/minus 4dB 20 Hz to 25 KHz. Contained in well finished Metal box, 33mm diameter by 22mm high, with colour coded end leads, low distortion. Delivery (small quantities) EX STOCK, HIGHLY COMPETITIVE PRICE. FULL DETAILS ON REQUEST.
E. A. SOWTER LTD., Dedham Place, Ipswich, IP4 1JP. Telephone 0473 52794

DIODES IN914E 2p ea. £1.30/100, £10/1,000 5% Zeners 2.7-36V 5p ea. £4/100, 800V 1 amp Low VF 5p ea. £4/100 20p p & p. Bale Electronics, 'Nanock' Dalton, Dumfriesshire.

SMALL ADS

The prepaid rate for classified advertisements is 17 pence per word (minimum 12 words), box number 40p extra. Semi-display setting £14.00 per single column inch (2.5cm). All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance, should be sent to the Classified Advertisement Manager, Practical Wireless, Room 2337, IPC Magazines Limited, King's Reach Tower, Stamford St., London, SE1 9LS. (Telephone 01-261 5846).

RESISTORS: Type AEL II Carbon Film 5% E24 range. Sold in units of 10 1/4w 7p per 10, 1/2w 8p per 10. Min. order of £2 P&P 15p + 12% VAT. C. W. Electronics, 10 Kingsley Path, Britwell, Slough, Berkshire. We can also supply to the Trade.

300W TOUCH SWITCH KITS

TS300K Contains Triac, IC, Diodes, Resistors, P.C.B. Frontplate, etc. Replaces conventional light switch with NO REWIRING. TOUCH one insulated plate for ON, another for OFF. Complete with instructions-ONLY £3.67.
 ALSO TSA300K AUTOMATIC as above but with only ONE TOUCHPLATE. TOUCH for ON and light stays on for a preset time. Ideal for stairs and hall. Complete with instructions-ONLY £3.67.
 300W LIGHT DIMMER KIT replaces conventional Light Switch-£2.45.

CMOS Motorola	TRIACS 400V T0220 CASE ISOLATED	BC148 9p*
4000 20p	6-5A 80p	BC158 11p*
4001 20p	*8-5A 80p	2N3055 36p
4007 20p	Diac 20p (put) 30p	2N6027
4011 20p	NE555 8 pin DIL 44p	1N4004 6p
4013 57p	741 8 pin DIL 24p	1N4148 4p*
4015 105p		
4016 57p	RESISTORS 1/3W 5% E12 22Ω* -10M Mullard 2p*	
4017 105p	LDR 1/2" Dia. 400Ω to 1MΩ light to dark 45p	
4040 105p	NEON wire-ended 7p	
4049 57p	Choke 1/2 Amp 20p	
4501 20p	Ferrite rod 1 1/2" x 3/4" diameter 12p	
4510 135p	MINI MAINS TRANSFORMERS 100mA 6.0-6V 35p	
4516 135p	12-0-12V 85p	
4566 155p		

Add 8% VAT (*12%) PLUS 25p P&P. Mail Order Only to:-
T.K. ELECTRONICS
 106 Studley Grange Road, London, W7 2LX

COMMUNICATIONS RECEIVER modules. Small superhet circuit boards requiring only controls and tuned circuits. 9 volt. Mosfet mixer, IC IF, BFO, PROD. Det. Excellent AM/CW/SSB results reported by delighted users. SAE details. PR College Electronics, Millend, Stonehouse, Glos.

VINTAGE RADIO

1920 to 1950

Receivers, valves, components, service data, historical research, books, magazines, repairs and restorations. A complete service for the collector and enthusiast of vintage radio.

S.a.e. with enquiries and for monthly newsletter. Full 1976 catalogue, 50p post paid.

TUDOR REES (Vintage Services), 64, Broad Street, Staple Hill, Bristol, BS16 5NL. Tel. Bristol 565472.

MULLARD COMPONENTS. Send s.a.e. for free list to P.M.S., Dept., PW3, P.O. Box 6, Crawley, Sussex RH10 6LH.

CONDITIONS OF ACCEPTANCE OF CLASSIFIED ADVERTISEMENTS

1. Advertisements are accepted subject to the conditions appearing on our current advertisement rate card and on the express understanding that the Advertiser warrants that the advertisement does not contravene any Act of Parliament nor is it an infringement of the British Code of Advertising Practice.
2. The publishers reserve the right to refuse or withdraw any advertisement.
3. Although every care is taken, the Publishers shall not be liable for clerical or printers' errors or their consequences.

3W INTEGRATED AMPLIFIER

*Po=3W rms *THD=0.2% @ 2.5W
 *Freq. response 10Hz-100KHz @ 2.5W *O/P into 4, 8 or 16 ohms
 *80mm x 80mm *Supply s/cot and thermal protection *With data sheet and cct. diagram.

ONLY £1.95

Holme Electronics,
 36A Front St.,
 Arnold, Notts.

(P & P 19p)

Precision Polycarbonate Capacitors

All High Stability-extremely Low Leakage

440V AC RANGE	Value (µF)	Dimen- sions (mm) each	Price	63V DC RANGE	Value (µF) ±1% ±2% ±5%
		L D			0.01-0.2
0.1µF	27	12-7	68p	0.68µF	£1.44
0.15µF	27	12-7	80p	1.0µF	£1.66
0.22µF	33	16	86p	1.5µF	£1.74
0.25µF	33	16	92p	2.2µF	£1.98
0.33µF	33	16	99p	3.3µF	£2.40
0.47µF	33	19	£1.10	4.7µF	£2.82
0.6µF	33	19	£1.16	6.8µF	£3.48
0.82µF	50-8	19	£1.25	10µF	£4.98
1.0µF	50-8	19	£1.37	15µF	£7.14
1.5µF	50-8	25-4	£1.84	22µF	£9.66
2.2µF	50-8	25-4	£1.95		

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 8V/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*, 100 for £9*.

TRANSISTORS & I.C.s
 BC107/8/9 12p *BC121/212L 12p 2N3055 50p
 *BC114 12p *BC121/213L 11p OC44/45 20p
 *BC147/8/9 10p *BC124/214L 11p OC71/2 20p
 *BC153 15p *BF194/5 12p NE555 Timer 81p
 *BC184/7/8/9 12p BFY60/1/2 20p 741C 8 pin DIL 82p
 *BC182/182L 11p AF78 45p ZN414 21.15
 *BC185/183L 11p AF239 38p SN76013ND
 *BC184/184L 12p 2N3702/4 11p £1.50

POPULAR DIODES-IN914 6p, 8 for 45p, 18 for 90p
 IN918 8p, 6 for 45p, 14 for 90p, 1844 6p, 11 for 50p;
 26 for £1.00, 1N4148 5p, 6 for 27p, 12 for 45p; 1N4001 5p; 002 8p; 003 6p; 004 7p; 005 7p; 006 8p; 007 8p
LOW PRICE ZENER DIODES-400mW, Tol. ±5% at 5mA: 3V; 3V3; 3V6; 4V7; 5V1; 5V6; 6V2; 6V8; 7V3; 8V2; 9V1; 10V; 11V; 12V; 13V; 13.6V; 15V; 16V; 18V; 20V; 22V; 24V; 27V; 30V; 33V. All at 7p each, 5 for 35p, 10 for 65p, 50 for £3.12. SPECIAL OFFER: 100 Zeners (may be mixed) for £6.00.

RESISTORS-High stability, low noise carbon film 5% 1/4W at 40°C, 1/3W at 70°C. E12 series only-From 2.2Ω to 2.2MΩ. 41L at 1p* each, 8p* for 10 of any one value, 70p* for 100 of any one value. SPECIAL PACK; 10 of each value 2.2Ω to 2.2MΩ (730 resistors) 85p.

SILICON PLASTIC RECTIFIERS-1.5 amp, wire-ended D027: 100 P.I.V. 7p (4 for 28p); 400 P.I.V. 8p (4 for 30p).
BRIDGE RECTIFIERS-2 1/2 amp: 200V 40p; 350V 45p; 800V 55p.

SUBMINIATURE VERTICAL PRESSETS-0.1W only: All at 5p* each; 50; 100; 250; 470; 680 ohm; 1k; 2k; 4k7; 6k8; 10k; 15k; 22k; 47k; 100k; 320k; 680k; 1M; 2M; 5M.

PLEASE ADD 20p POST AND PACKING ON ALL ORDERS. EXPORT-ADD COST OF SEA/AIRMAIL. Add 8% VAT to all items except those marked with * which are 12%.

Send S.A.E. for additional stock lists. Wholesale price lists available to bona fide companies.

MARCO TRADING (Dept. P4),
 The Old School, Edgaston, Wem, Shropshire.
 Tel: Whixall 464/465 (STD 064 872)
 (Proprs. Minicost Trading Ltd.)

ELECTRONIC COMPONENTS. Standard Jack Plugs 15p, 2 Pin Din plugs 10p, 5 Pin Din Plugs 16p, 5 Pin-5Pin Din Leads 90p, Stereo Headphones £2.75 1A3 3 Pin plugs 20p. VAT included. S.A.E. Lists: Callers welcome. Torbay Electronics Components, 185 Higher Union Street, Torquay, Devon.

VALVES

Radio-TV Industrial Transmitting
2200 Types, 1930 to 1975, many obsolete. List
20p. S.A.E. for quotation. Postal export service.
We wish to purchase all types of new and boxed
valves. Wholesaler's, Dealer's, etc., stocks
purchased.

**COX RADIO (SUSSEX) LTD., The Parade,
East Wittering, Sussex. West Wittering 2923**

Books and Publications

FREE T.V. CIRCUIT DIAGRAMS

All main British T.V. sets (plus many foreign)
comprehensively covered in our easy-to-follow
T.V. Repair Manuals—4 mono and 3 colour.
Just send model no., if colour (mfrs. chassis
type helps) with £4.50 and receive the manual
covering your set—plus your set's circuit diagram
on request free. Set of 7 only £27 post free.
British T.V. Circuit Diagram Manuals—the main
mono (over 37 series) for £9.90 and virtually
every colour for £17.50.

Full details of these and other publications from:

T.V. TECHNIC

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

DX-TV

The new booklet "LONG-DISTANCE
TELEVISION" by Roger W. Bunney
is now published, detailing the
practical and theoretical aspects of
weak signal reception and the DX-
TV hobby. The 3rd edition is a
completely revised and enlarged
version of earlier editions, now
running to some 60 pages and pro-
fusely illustrated. It is available
at £1.11 (inclusive of surface
postage world wide) only from:
WESTON PUBLISHING, 33 Cher-
ville Street, Romsey, Hants, SO5
8FB.

START YOUR OWN BUSINESS REWINDING ELECTRIC MOTORS

This unique instruction manual shows step by
step how to rewind motors, working part or full
time, without previous experience. Everything
you need to know easily explained, including
where to obtain materials, how to get all the work
you need, etc. A goldmine of information and
knowledge.

Only £3.90 plus 26p P&P.

Magnum Publications Dept PW5

Brinkaway Trading Estate, Brinkaway,
Stockport SK3 9BZ.

Overseas Distributors wanted.

Aerials

G2DYM AERIALS & PROJECTS

G5RV & G2DYM AERIALS FOR TX or SWL,
see last months Advertisement. G5RV designed
aerials under Licence of LOUIS VARNEY.
C.Eng. M.I.E.E. ANY AERIAL, A.T.U. or
Product CUSTOM BUILT by G2DYM (Ex B.B.C.
ENGINEER). WE make NO wild claims, we state
facts:— THE AERIAL is the MOST important part
of YOUR STATION. GOOD STATIONS, TX or
SWL's, Commercial or Amateur, START with a
GOOD AERIAL, made & properly designed to
work on SOUND THEORY, they must be efficient,
but need not cost a fortune. Any man who tells
you in "Gobbledegook" he can sell you a quart
in a pint bottle is a fool, and what's more takes
you to be a fool too! For a Q5 R9+ signal use a
GOOD AERIAL designed for the frequencies you
use and where applicable on A.T.U.; for that
exotic DX, add skill and good propagation
conditions.

DO NOT BUY A ROLLS ROYCE AND TRY TO RUN IT ON PARAFFIN.

CONSULT US for DESIGN & ADVISORY
SERVICE, send large S.A.E., 3 6½ stamps, a list
of the Bands in order of interest to you, a good
legible diagram of your layout of Garden, show
the positions of House, usable Trees, Poles,
Chimneys, Shack etc., give all measurements
inc. heights & relevant details. TX & RX. mention
any special problems, T.V.I. etc. We will quote
you for (1) Designing, (2) Custom building, one
or more systems tailored to your individual
requirements, equipment and space available
to you.

**LAMBDA ANTENNA STUD FARM,
WHITEBALL, WELLINGTON, SOMERSET.**

Electrical

STYLI, CARTRIDGES & AUDIO LEADS
etc. For the best at keenest prices send
S.A.E. for free illustrated list to:
Felstead Electronics (PW), Longley
Lane, Gatley, Cheadle, Cheshire. SK8
4EE.

Ladders

LADDERS. Varnished. 20ft 9in extd.
£23.03. Carr. £1.90. Leaflet. Also alloy
ext. up to 62½ft. The Ladder Centre
(WLS) Halesfield (1) Telford, Salop.
Tel: 586644. Callers welcome.

Educational

GO TO SEA as a Radio Officer. Write:
Principal, Nautical College, Broadwater,
Fleetwood FY78JZ.

**COURSES - RADIO AMATEURS
EXAMINATION** City & Guilds. Pass
this important examination and obtain
your G8 licence, with an RRC Home
Study Course. For details of this, and
other courses (GCE, Professional
Examinations etc) write or phone—
THE RAPID RESULTS COLLEGE Dept
JK1 Tuition House, London SW19 4DS.
Tel. 01-947 7272 (Careers Advisory Ser-
vice) or for a prospectus only ring 01-
946 1102 (24hr recording service).

For Sale

DISCOLIGHTS. 3-channel soundlights
£17.50! Strobes £22! Full catalogue
from: Aarvak Electronics, 12a (P)
Bruce Grove, London N17 (01-808 8923).

RHYTHM GENERATOR profession-
ally built from kit supplied by
Watford Electronics. Perfect working
order. £30.00 inc. postage. D. M.
Nicholls, "Brooklyn" Shore Road,
Gronant, Prestatyn, Clwyd.

BACK COPIES of PW/PE, SAE for list.
15 Yealmpstone Drive, Plympton, Ply-
mouth, Devon.

SINCLAIR SCIENTIFIC £6, 3BP1 C.R.T.
New £6. Scope good working order,
Sens 10mV-100V per cm 3 in screen.
T.B. 10hz-5khz. Good value £33. Moore,
29 Longmynd Drive, Fareham, Hants.
PO14 1RW.

Wanted

**WANTED—NEW VALVES, TRAN-
SISTORS. TOP PRICES,** popular types.
Kensington Supplies (C), 367 Kensig-
ton Street, Bradford 8, Yorkshire.

WE PAY £2 EACH (plus postage) for
clean copies of "Radio & TV Servicing"
books from 1960-61 edition on-
wards. Bells Television Services, 190
Kings Road, Harrogate, N. Yorkshire.
Tel: 0423 55885.

EDDYSTONE EC10Mk11 Receiver good
condition wanted privately. Please
write; Sperring, Hartley Wintney,
Hants. RG27 8NA.

Service Sheets

SERVICE SHEETS—COLOUR TV SERVICE MANUALS

Service Sheets for Mono TV, Radios, Record Players and Tape Recorders 75p. Please send large
Stamped Addressed Envelope.

We can supply manuals for most makes of Colour Television Receivers by return of post.
B.R.C. PYE ECKO PHILIPS IIT/KB SONY G.E.C. HITACHI BAIRD ULTRA INVICTA
FERGUSON H.M.V. MARCONI AND MANY MORE.

Let us quote you. Please send a STAMPED ADDRESS ENVELOPE for a prompt reply. Also
comprehensive TV, repair manuals by J. M. Court, S.A.E. for details.

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

SERVICE SHEETS, Radio, TV, etc.,
50p and s.a.e. Catalogue 20p and s.a.e.
**HAMILTON RADIO, 47 Bohemia Road,
St. Leonards, Sussex.**

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

SERVICE SHEETS—COLOUR TV SERVICE MANUALS

LARGE SELECTION COVERING MOST MAKES—S.A.E. WITH ENQUIRIES PLEASE TO:

BELL'S TELEVISION SERVICES

190 KINGS ROAD, HARROGATE, N. YORKSHIRE TEL. (CODE 0423) 55885

We also have a large stock of Books & Magazines on Radio, TV, etc. Free lists on request

BUILD THE TREASURE TRACER MK III Metal Locator



- Variable tuning
- Britain's best selling metal locator kit: 4,000 sold
- Weighs 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 Post £1.00 + £1.10 VAT Built & tested Post £1.80 + £1.50 VAT

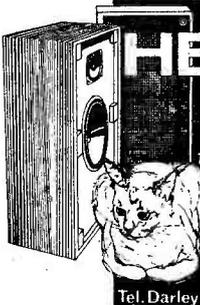
MINIKITS ELECTRONICS, 8a CLEVELAND ROAD, LONDON, E18 2AN (Mail order only)

Musical Miracles!

by Dewtron®

Build your own synthesiser or musical effects using some of the huge range of DEWTRON modules. Or, build fuzz or wau-wau at budget prices using special kits.

Send 20p for Catalogue from—
D.E.W. Ltd., 254 Ringwood Road, Ferndown, Dorset BH22 9AR.



HELME

DO-IT-YOURSELF HI-FI STEREO SPEAKER KITS

The best value around!
Send for details
HELME AUDIO PRODUCTS LTD.
Dept. P.W.
SUMMERBRIDGE
HARROGATE YORKS
Tel. Darley 279 (Std Code 0423-72)

SUPERB INSTRUMENTS 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 82p. Examples: width, depth, height, 8in x 5in x 3in, £1.70. 10in x 6in x 3in £2.42. 10in x 8in x 3in £3.02. 12in x 10in x 3in £3.96. 8in x 4in x 4in £1.98. 10in x 6in x 4in £2.97. 12in x 8in x 4in £3.96. 7in x 7in x 5in £2.91. 8in x 10in x 6in £3.96. 12in x 8in x 7in £4.40. 12in x 12in x 7in £4.84. Plus 85p carriage 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.

LOW-COST I.C. MOUNTING for any size DIL package. 100 Soldercon sockets 65p. 7 and 8 hole plastic supports 5p/pair. Quantity rates. SAE details and sample. Trial pack 65p. (P & P 10p/order). P.K.G. Electronics, Oak Lodge, Tansley, Derbyshire DE4 5FE.

ENAMELLED COPPER WIRE

S.W.G.	1 lb reel	1/2 lb reel
10 to 19	£2.95	£1.60
20 to 29	£3.15	£1.80
30 to 34	£3.45	£1.90
35 to 40	£3.65	£2.10

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

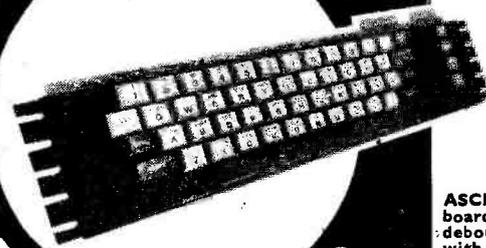
COPPER SUPPLIES
102 Parrswood Road, Withington, Manchester 20 Tel: 061-445 8753

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

RECHARGEABLE NICAD BATTERIES 'AA' (HP7), £1.05; 'Sub C', £1.29; 'C' (HP11), £2.02; 'D' (HP2), £2.92. PP3, £4.98. Matching chargers, respectively, £4.48, £4.48, £5.24, £5.24, £3.98. All prices include VAT. Add 10% post and package. SAE for full list, plus, if wanted, 35p for 'Nickel Cadmium Power' booklet. Sandwell Plant Ltd., 1 Denholm Road, Sutton Coldfield, West Midlands B73 6PP. Tel: 021-354 9764.

ELECTRONIC BROKERS LTD



ELECTRONIC BROKERS LTD
49/53 Pancras Road
London NW1 2QB
Tel: 01-837 7781

Computer parts for hobby, experimental, educational and professional use.

KB6: 56-station standard Teletype layout

AS RECOMMENDED FOR PRACTICAL WIRELESS VIDEO-WRITER PROJECT

ASCII-Coded TTL-compatible 4-bank alphanumeric reed-switch keyboard with ROM encoder chip, strobed output, two-key rollover and debounce. Standard 7-bit ASCII code (no parity). Supplied complete with circuit diagrams and code chart.

SPECIFICATIONS
Power Supply: +5VDC +/-5% 150mA; -12VDC +/-10% 10mA. Output Logic Levels: Data Bits 1 through 7: Ov "0" .45V; 2.6V "1" 5.25V. Fan Out: One standard TTL load. Strobe: 2.6V "1" 5.25V; Ov "0" .46V. Fan Out: 10 standard TTL loads. Strobe signal delay 10 milliseconds nominal to allow data to stabilise.

Price **£35.00** plus £1.00 P&P + 8% VAT (Send £38.88)

ALSO AVAILABLE—SPECIAL LOW-COST KEYBOARD:
KB5: 3-bank alphanumeric Baudot-coded 36-station keyboard. TTL-compatible strobed output.

Price **£20.00** plus £1.00 P&P + 8% VAT (Send £22.68)

BURROUGHS SELF-SCAN DISPLAYS
16 display positions instructed by a 6-bit coded signal to display one of 64 pre-programmed characters as a 5 x 7 dot matrix. Each character 0.4" high. Input signal 6-bit data, clock, reset, etc. Power supplies +5V, -12V and +250V. External repertoire A-Z, 0-9 + special symbols. Size 8 1/2 x 2 1/2 approx. Price: Ex-equipment £49.50, brand new £60.00 plus £2 P&P plus 8% VAT.

CHROMASONIC ELECTRONICS

From Denco Coils through TTL, C'Mos, Quartz Crystals, Vero, DVM Chips, Clock Chips, LED's; LCD's; Displays, Transformers, Boxes, Cases, Knobs and millions of R's and C's, Transistors and Diodes.
It's all in our BRAND NEW illustrated CATALOGUE. FREE with every copy are 36p worth of vouchers.

Send 35p, inc. Free p & p to:
Dept. 1 Chromasonic Electronics, 56, Fortis Green Road, London N10 3HN.

LOW COST — HIGH EFFICIENCY

AUDIO TEST OSCILLATOR £20



RANGE: 10Hz to 100kHz. OUTPUT: IV, sine/sq. DISTORTION: less than 0.02%. 9V battery. Also available in Kit form at £16. Add 8% VAT. P. & P. and ins. 75p. Leaflet available, also F.M. Signal Generator, Millivoltmeter, freq. meter, THD analyser, P.S. Units. S.A.E. please for literature.

TELERADIO ELECTRONICS
325 Fore Street, London, N9 0PE
Tel. 01-807 3719

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 PW-177 4 Princes Square, Harrogate, North Yorkshire.

GOING DOWN?

LISTEN to EXCITING 100-600 KHz band with an L.F. CONVERTER between your antenna and receiver (3-5.4 MHz). EASY to make, all parts, printed circuit, case etc, instructions, money back assurance, ONLY £8-99 inc. post.

CAMBRIDGE KITS
45(PN) Old School Lane, Milton, Cambridge.

RADIO, learn from the beginning. 16 Vintage Circuit Diagrams, Receivers and Transmitters with notes, £1.00. J. M. Allister, P.O. Box 78, Maidenhead, Berks SL6 5AY.

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

AERIAL WIRE. High quality p.v.c. covered multi-strand copper. 50ft, 85p (15p); 75ft, £1.28 (17p); 100ft, £1.67 (23p); 150ft, £2.51 (34p); 200ft, £3.36 (39p); 250ft, £4.19 (46p); 300ft, £4.97 (48p); P&P in brackets. A.I Radio Components, 19 The Borough, Canterbury, Kent CT1 2DR.

SURPLUS TO INDUSTRIAL REQUIREMENTS

25—assorted spindle potentiometers
25—assorted electrolytics axial wire ended

25—assorted 7R 10R 20R wire-wound presets

4—single pole 100VDC relays
20—neons (10 clear 10 amber)
5—misc. lever key switches
6—misc. dual potentiometers

£1.25 inc. VAT + 20p post & packing—any selected pack C.W.O. to—

BLORE-BARTON LTD. REEDHAM HOUSE BURNHAM BUCKS.

12 VOLT FLUORESCENTS

35% OFF
RRP

MADE BY THORN LIGHTING. Ideal for Caravan, Boat, Tent, Emergency Lighting etc. All lamps guaranteed for 12 months.

21 ins
13 watt
£4.90



12 ins
8 watt
£4.00

All lamps have On/Off Switch, Wrong Polarity Protection Device and Diffuser.

C60 CASSETTES 32p All Cassettes in Plastic Case with Index and Screwed Assembly.
C90 CASSETTES 45p

All prices include VAT. Add Postage 5p in £1.

Quantity Discounts. **SALOP ELECTRONICS**
10 Units 5%
50 Units 7%
100 Units 10%
23 WYLE COP
SHREWSBURY
Tel. 53206

BINOCULAR MAGNIFIER



FOR PRECISION CLOSE-UP WORK—LEAVES BOTH HANDS FREE
2.2x or 3x Model with Hinged Lens Mount

See close-up work with less eye strain. Lightweight adjustable head-band. Powerful optically ground lenses. Can be worn over normal glasses. Essential industry, Home workshop, Collecting, Modelling, Jewellery, Watchmakers. Any fine work. **DE LUXE** model with superior quality lens. **PLUS** hinged lens mount. 2x model £9.95 + 75p p. & p., 2½x model £10.50 + 75p p. & p., 3x model £10.95 + 75p p. & p. Access accepted—Send name, address and no. **JOHN DUDLEY & CO. LTD.**, Dept. WPS, 301 Cricklewood Lane, London, NW2. Tel. 01-458 5917. (Callers welcome).

FOR A PROFESSIONAL FINISH to your projects use our engraved front panel service. S.A.E. for price list. Write to Box No. 134.

PRINTED CIRCUITS and HARDWARE

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

Ramar Constructor Services,
Masons Road, Stratford on Avon,
Warwicks. Tel. 4870

GORSE'S MAIN STOCKISTS FOR GRUNDIG

Satellit 2000, 21 Wave Band Radio, TK545 and TK745 Stereo Tape Recorders, Radios, Radio/Cassette Recorders, Cassette Recorders, Microphones, etc., etc. Please write, phone or call for full details and prices. (please send S.A.E.)
42-44 CHURCH ST., BLACKBURN Tel: 51682
77 THE MALL BURNLEY Tel: 35229

MAIL ORDER PROTECTION SCHEME

The Publishers of *Practical Wireless* are members of the Periodical Publishers Association which has given an undertaking to the Director General of Fair Trading to refund monies sent by readers in response to mail order advertisements, placed by mail order traders, who fail to supply goods or refund monies owing to liquidation or bankruptcy. This arrangement does not apply to any failure to supply goods advertised in a catalogue or in a direct mail solicitation.

In the unhappy event of the failure of a mail order trader readers are advised to lodge a claim with *Practical Wireless* within three months of the date of the appearance of the advertisement, providing proof of payment. Claims lodged after this period will be considered at the Publisher's discretion. Since all refunds are made by the magazine voluntarily and at its own expense, this undertaking enables you to respond to our mail order advertisers with the fullest confidence.

For the purpose of this scheme, mail order advertising is defined as:—

'Direct response advertisements, displays or postal bargains where cash had to be sent in advance of goods being delivered'. Classified and catalogue mail order advertising are excluded.

WATFORD ELECTRONICS

33/35, CARDIFF ROAD, WATFORD HERTS, ENGLAND
MAIL ORDER, CALLERS WELCOME. Tel. Watford 3774

ALL DEVICES BRAND NEW, FULL SPEC. 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 Export orders no VAT. Applicable to U.K. Customers only. Unless stated otherwise, all prices are exclusive of VAT. Please add 8% to devices marked *. To the rest add 12½%.

We stock many more items. It pays to visit us. We are situated behind Watford Football Ground. Nearest Underground/Br. Rail Station: Watford High Street. Open Monday to Saturday, Ample Free Car Parking space available.

POLYESTER CAPACITORS: Axial lead type. (Values are in μ F).
400V: 0-001, 0-0015, 0-0022, 0-0033 5p; 0-0047, 0-0068, 0-01, 0-015, 0-018, 0-022 6p;
0-033, 0-047, 0-068 8p; 0-1, 0-15, 0-22, 10p; 0-33, 0-47, 18p; 0-68 24p;
160V: 0-039, 0-15, 0-22, 0-33 6p; 0-47 10p; 0-68 15p; 1-0 18p; 1-5 20p; 2-2 24p; 4-7 28p
DUBILIER: 1000V: 0-01, 0-02, 0-04 10p; 0-022, 15p; 0-047, 16p; 0-1, 19p; 0-47 43p.

POLYESTER RADIAL LEAD (Values in μ F). 250V: 0-01, 0-015, 0-022, 0-027 5p; 0-033, 0-047, 0-068, 0-1 6p; 0-15 7p; 0-22, 0-33 9p; 0-47 10p; 0-68 14p; 1-0 19p; 1-5 24p; 2-2 28p.

ELECTROLYTIC CAPACITORS: Axial lead type (Values are in μ F).
100V: 100 μ F 40p; 100 μ F 20, 5p; 50V: 47, 10, 1-5, 2-2, 2-5, 3-3, 4-7, 6-8, 8, 10, 15, 22, 47, 7p; 22, 50, 10p; 63, 100, 12p; 1000, 50V: 1-0, 6p; 50, 10p; 220, 10p; 470, 28p; 40V: 33, 3p; 35V: 1000, 33p; 25V: 10, 22, 6p; 80, 100, 16p; 220, 13p; 640, 21p; 1000, 27p; 2200, 34p; 3300, 39p; 4700, 47p; 16V: 10, 40, 47, 68, 100, 125, 220, 6p; 1000, 150p, 15p; 4700, 46p; 10V: 4, 100, 6p; 540, 10p; 1000, 14p; **TAG-END TYPE:** 70V: 2500, 98p; 4700, 111p; 64V: 3300, 94p; 50V: 2000, 72p; 40V: 10000 145p; 4000 70p; 2500, 65p; 25V: 4700, 48p; 16V: 38p

TANTALUM BEAD CAPACITORS
35V: 0-1 μ F, 0-22, 0-33, 0-47, 0-68, 1-0, 2-2 μ F, 3p; 4-7, 6-8, 25V: 1-5, 10, 20V: 1-5, 16V: 10 μ F, 22, 47, 10V: 4-7, 15, 25, 33, 6V: 47 μ F, 3p; 10 μ F, 11p each.

MYLAR FILM CAPACITORS
100V: 0-001, 0-002, 0-005, 0-01 μ F 5p
0-015, 0-02, 0-04, 0-05, 0-05 μ F 6p
0-1 μ F, 0-15, 0-2 50V: 0-47 μ F 7p

CERAMIC THERMISTOR CAPACITORS
Range: 0-5pF to 10,000pF 3p
0-015 μ F, 0-022 μ F, 0-033 μ F, 0-047 μ F 4p

TETFER Trimmer (Jackson) 10pF, 58p.

JACKSONS VARIABLE CAPS.
Dielectric Dial Drive 4103
100/300pF 95p
500pF 105p
DILEMIN 100 2 365pF 265p
300pF/500pF 165p
4832/2K 2 speed .. with slow
Drive Unit complete motion drive 290p
with knobs and C804-5pF; 10; 15; 20; coupling 32p 25; 50pF 135p
Drum 54mm 30p 100, 150pF 195p
E1 Ball Drive 'H' 3x310pF 345p
4511/DAF 107p 00-3x25pF 348p

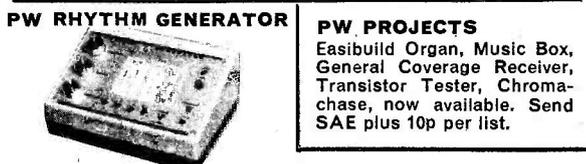
CERAMIC TRIMMER CAPACITORS
2-7pF; 4-15pF; 6-25pF; 8-30pF
R-30pF 20p

MINIATURE TYPE:
2-5-6pF; 3-10pF; 3-30pF; 10-40pF 22p
5-25pF; 60pF; 88pF 30p

COMPRESSION TYPE
3-40pF 8-80pF 22p
20-140pF; 50-200pF 31p
100-500pF 38p

SILVER MICA (Values in pF)
3-3, 4-7, 6-8, 10, 12, 18, 22, 33, 47, 50, 75, 82, 85, 100, 120, 150, 200, 250, 300, 330, 360
50 each.
1000, 2200pF 11p each.

RELAYS Miniature, enclosed, assorted 105p



PW RHYTHM GENERATOR
Build this PW Author approved, Easy build Low cost Rhythm Generator. We are the sole suppliers of the complete kit including the Case, predrilled printed front Panel and the three RE-DESIGNED Fibre-glass P.C. Boards. Prices including VAT: Complete Kit £39-95 (p. & p. and insur. £1-00). Ready Built £49-95 + £1-00. Semiconductor kit £12-75. Set of three boards £55-90. M252AA £7-50 (incl.VAT). Send SAE for complete list. (Demonstration on at our shop).

TRANSISTORS

AC107* 10	BC147 7	BF178* 33	MPSU56 74	TIS49 39	2N3054* 49
AC117 35	BC148 7	BF180* 33	MPU131* 38	ZT330* 38	2N3055* 49
AC125* 32	BC149 9	BF182* 33	OC25* 59	TIS74 47	2N3525* 76
AC126* 18	BC153 20	BF183* 33	OC28* 58	TIS91 24	2N3614* 169
AC127* 18	BC154 20	BF184* 33	OC29* 58	ZTX107 12	2N3651* 135
AC128* 15	BC157 19	BF185* 30	OC35* 54	ZTX108 12	2N3663 32
AC141* 22	BC158 12	BF186* 36	OC36* 58	ZTX109 15	2N3702 11
AC142* 29	BC159 13	BF187 16	OC37* 58	ZTX301 14	2N3703 12
AC142* 29	BC160* 32	BF195 16	OC42* 18	ZTX302 19	2N3705 12
AC142K* 38	BC167 12	BF197 15	OC44* 25	ZTX303 22	2N3706 10
AC176* 18	BC168 12	BF198 15	OC45* 18	ZTX304 24	2N3707 11
AC187* 18	BC169C 14	BF200 40p	OC46* 35	ZTX311 15	2N3708 9
AC188* 19	BC170 11	BF224A 11	OC70 35	ZTX314 24	2N3709 9
AC171 35	BC171 11	BF244 34	OC71* 23	ZTX321 18	2N3710 12
AC172 11	BC172 11	BF256* 14	OC71* 27	ZTX500 17	2N3711 12
AC178 16	BC177* 16	BF257* 34	OC77* 56	ZTX501 15	2N3711* 164
AC190 24	BC178* 16	BF258* 38	OC77* 58	ZTX502 19	2N3712* 175
AC191 29	BC179* 18	BF259* 40	OC81* 24	ZTX503 19	2N3713* 275
AC192 16	BC182 10	BF294 38	OC81D* 28	ZTX504 47	2N3819 22
AC198 21	BC182L 12	BF295 28	OC82* 25	ZTX501 28	2N3820 22
AC199 78	BC183 10	BF296 30	OC82D* 25	ZTX502 32	2N3821 47
AC199 78	BC183L 11	BF297 25	OC83* 28	2N526* 40	2N3824* 89
AC199 78	BC184 11	BF298 25	OC84* 28	2N696* 15	2N3866 90
AC199 78	BC184L 12	BF299 25	OC84N* 44	2N697* 15	2N3903 15
AD161* 36	BC186 22	BF318 54	OC123* 115	2N698* 30	2N3904 15
AD162* 36	BC187* 28	BF329 28	OC139* 140	2N699* 45	2N3905 17
AF114* 20	BC212 12	BF338 40	OC140* 125	2N706* 15	2N3906 17
AF115* 20	BC212L 11	BF342 40	OC141* 125	2N707* 50	2N3907 39
AF116* 20	BC213 13	BF355 40	OC170* 30	2N708* 15	2N4058 15
AF117* 25	BC214 13	BF364 38	OC171* 32	2N708* 15	2N4061 13
AF118* 25	BC214 13	BF364* 38	OC201* 125	2N914* 18	2N4062 14
AF121* 33	BC214L 16	BF384 24	OC202* 135	2N916* 27	2N4289 24
AF121* 33	BC307B 15	BF385 28	OC203 150	2N918* 34	2N4859 35
AF125* 30	BC328 18	BF393 28	OC204* 150	2N920* 32	2N4860 35
AF126* 30	BC341* 40	BF397 23	OC207* 50	2N930* 18	2N4922* 65
AF127* 30	BC342* 40	BF398* 26	TIP29 50	2N981* 61	2N5132 12
AF128* 33	BC346* 30	BF400 17	TIP29A 54	2N1131* 19	2N5136 12
AF128* 33	BC349C 15	BF451* 17	TIP29C 68	2N1132* 23	2N5138 12
AF170* 70	BC350* 55	BF452* 17	TIP30 52	2N1302* 25	2N5170 60
AF170* 70	BC352* 65	BF455* 25	TIP30A 56	2N1303* 27	2N5180 60
AF170* 70	BC354* 80	BF456* 25	TIP30B 59	2N1304* 32	2N5181 62
AF181* 48	BC354* 80	BSY29 85	TIP30C 74	2N1305* 32	2N5305 40
AF185* 60	BC355* 204	BSY78 25	TIP31* 52	2N1306* 37	2N5437 34
AF186* 48	BC359* 18	BSX20 20	TIP31A* 54	2N1307* 37	2N5454 34
AF187* 38	BC370* 15	BSY95A 18	TIP31B* 58	2N1308* 48	2N5459 40
AF211 138	BC371* 20	BU105* 195	TIP31C* 68	2N1671* 150	2N5485 42
AF212 136	BC372 15	BU105* 195	TIP32* 68	2N1672* 150	2N5486 42
AF213 136	BC373 15	MJ491 160	TIP32A* 63	2N1883* 27	4031* 38
AF214 136	BC374 15	MJ491 160	TIP32B* 63	2N1883* 27	4031* 38
AF215 136	BC375 15	MJ2955 425	TIP32C* 63	2N2160* 80	4031* 38
AF216 136	BC376 15	MJ2955 425	TIP32D* 63	2N2217* 40	4031* 38
AF217 136	BC377 15	MJ3070 68	TIP33* 95	2N2218A* 25	4031* 38
AF218 136	BC378 15	MJ3070 68	TIP33A* 95	2N2219A* 24	4032* 48
AF219 136	BC379 15	MJ3070 68	TIP33B* 112	2N2221A* 21	4034* 73
AF220 136	BC380 15	MJ3070 68	TIP33C* 112	2N2222* 21	4034* 73
AF221 136	BC381 15	MJ3070 68	TIP34* 115	2N2303* 250	4036* 43
AF222 136	BC382 15	MJ3070 68	TIP34A* 115	2N2305* 250	4036* 43
AF223 136	BC383 15	MJ3070 68	TIP34B* 115	2N2306* 250	4036* 43
AF224 136	BC384 15	MJ3070 68	TIP35* 225	2N2483* 30	4036* 43
AF225 136	BC385 15	MJ3070 68	TIP35A* 225	2N2484* 30	4036* 43
AF226 136	BC386 15	MJ3070 68	TIP35B* 225	2N2485* 30	4036* 43
AF227 136	BC387 15	MJ3070 68	TIP35C* 225	2N2486* 30	4036* 43
AF228 136	BC388 15	MJ3070 68	TIP36* 225	2N2487* 30	4036* 43
AF229 136	BC389 15	MJ3070 68	TIP36A* 225	2N2488* 30	4036* 43
AF230 136	BC390 15	MJ3070 68	TIP36B* 225	2N2489* 30	4036* 43
AF231 136	BC391 15	MJ3070 68	TIP36C* 225	2N2490* 30	4036* 43
AF232 136	BC392 15	MJ3070 68	TIP36D* 225	2N2491* 30	4036* 43
AF233 136	BC393 15	MJ3070 68	TIP36E* 225	2N2492* 30	4036* 43
AF234 136	BC394 15	MJ3070 68	TIP36F* 225	2N2493* 30	4036* 43
AF235 136	BC395 15	MJ3070 68	TIP36G* 225	2N2494* 30	4036* 43
AF236 136	BC396 15	MJ3070 68	TIP36H* 225	2N2495* 30	4036* 43
AF237 136	BC397 15	MJ3070 68	TIP36I* 225	2N2496* 30	4036* 43
AF238 136	BC398 15	MJ3070 68	TIP36J* 225	2N2497* 30	4036* 43
AF239 136	BC399 15	MJ3070 68	TIP36K* 225	2N2498* 30	4036* 43
AF240 136	BC400 15	MJ3070 68	TIP36L* 225	2N2499* 30	4036* 43
AF241 136	BC401 15	MJ3070 68	TIP36M* 225	2N2500* 30	4036* 43
AF242 136	BC402 15	MJ3070 68	TIP36N* 225	2N2501* 30	4036* 43
AF243 136	BC403 15	MJ3070 68	TIP36O* 225	2N2502* 30	4036* 43
AF244 136	BC404 15	MJ3070 68	TIP36P* 225	2N2503* 30	4036* 43
AF245 136	BC405 15	MJ3070 68	TIP36Q* 225	2N2504* 30	4036* 43
AF246 136	BC406 15	MJ3070 68	TIP36R* 225	2N2505* 30	4036* 43
AF247 136	BC407 15	MJ3070 68	TIP36S* 225	2N2506* 30	4036* 43
AF248 136	BC408 15	MJ3070 68	TIP36T* 225	2N2507* 30	4036* 43
AF249 136	BC409 15	MJ3070 68	TIP36U* 225	2N2508* 30	4036* 43
AF250 136	BC410 15	MJ3070 68	TIP36V* 225	2N2509* 30	4036* 43

TTL 74*

7400 14	7474 36	74153 82	4016AE 55	LINEARICS 75p	MC1304P 360p
7401 14	7475 36	74155 80	4017AE 95	702 75p	MC1310P 180p
7402 16	7476 36	74156 80	4018AE 95	709C 14 pin 27p	MC1312P 175p
7403 16	7477 36	74157 80	4019AE 48	710* 41p	MC1458P* 77p
7404 20	7478 41	74158 225	4020AE 105	714 14 pin 32p	MC1496 91p
7405 22	7482 82	74161 116	4021AE 105	741C 22p	MC1700G 79p
7406 24	7483 95	74162 116	4022AE 95	741C 72p	MC1700G 79p
7407 24	7484 95	74163 116	4023AE 116	745C 72p	MM5023* 550p
7408 26	7485 125	74164 116	4024AE 116	745C 72p	MM5112S 450p
7409 27	7486 36	74165 120	4025AE 116	745C 72p	NE550 160p
7410 25	7489 390	74166 161	4026AE 165	AY-1-0121 570p	NE581A 210p
7411 25	7490 43	74167 382	4027AE 69	AY-1-1224 34p	NE555B* 41p
7412 25	749				

WATFORD ELECTRONICS

(Continued from opposite side)

DIODES		*BRIDGE RECTIFIERS		SCR's* Thyristors	
AAZ15	15p	(plastic case)	1A50V	1A50V	38p
AEY11	60p	1A100V	2A100V	1A100V	42p
BA100	10p	1A200V	2A200V	1A200V	47p
BY128	12p	1A400V	2A400V	1A400V	52p
BY127	12p	1A600V	2A600V	1A600V	70p
OA9	40p	1A800V	2A800V	3A50V	34p
OA10	40p	2A50V	3A100V	4A50V	43p
OA47	8p	2A100V	4A200V	3A200V	50p
OA70	8p	2A200V	4A400V	3A400V	110p
OA79	12p	2A400V	5A600V	3A600V	99p
OA81	10p	2A600V	6A800V	5A400V	105p
OA85	12p	4A100V	7A400V	7A400V	125p
OA90	8p	4A400V	7A700V	C106D	55p
OA91	8p	4A800V	12A100V	TIC44	25p
OA95	8p	6A100V	7A30V	TIC45	45p
OA200	8p	6A400V	8A600V	2N4444	191p
QA202	8p	BY122	5A4p		
PL4004	8p	BY164	5A4p		
ZENERS		TRIACS*		DIAC*	
IN914	4p	3A400V	115p	3A400V	115p
IN916	5p	6A400V	140p	6A500V	140p
IN4001/2*	8p	Rnp:3-3V-33V	35p	8A500V	160p
IN4003*	8p	400mW	9p	10A500V	195p
IN4004/5*	8p	1-3W	17p	15A400V	280p
IN4006/7*	7p	VARICAPS		15A500V	285p
IN4142	7p	MVAM1	35p	40430	95p
3A/100V*	10p	MVAM2	135p	40689	95p
3A/400V*	20p	BB105B	30p		
3A/600V*	23p	Noise Diode			
3A/1000V*	27p	Z5J	105p		

OPTO ELECTRONICS*		VOLTAGE REGULATORS*	
LEDS + Clip	DL728	723 DIL 45p; 723 T05 53p;	MC7812 1A 12V
TIL209 Red/14p	DL747	TBA625B 95p	MC7815 1A 15V
0-2" Red 18p	XAN354-3*	T03 Metal Can Type	FT8N2A 1A 24V
Yellow, Green, Amber	Green 140p	1A 5V	TDA1412 1A 12V
OCF 70	8p	1A 12V	Variable Type
OCF 71	8p	1A 15V	LM325 ±15V
ORP 12	8p	1A 18V	LM326 ±12V
ORP 61	8p	301F	LM329K
RM5777	5p	TIL111	LM327N +5 -12
DL704	5p	TIL112	MVR5
DL707	75p	TIL114	MVR12
DL727	180p	TIL117	170p
		Plastic Case	LM317K 20W 1-5A
		MC7805 1A 5V	+1-2V to 37V
			LM317H 5W 1-5A
			+1-2V to 37V

ALUM. BOXES with lid*		SPEAKERS	
22x35x14	54p	8Ω 0-3W	
4x4x14	54p	2.5" 24"	50p
4x2x14	54p	2.5" 3"	55p
4x2x13	70p	8Ω 2-5"	65p
4x2x12	54p	4Ω 4"	125p
5x4x2	80p	4Ω 7x3"	125p
6x4x2	91p	8Ω 5W	
7x3x2	39p	7" x 4"	175p
8x3x2	13p	16Ω 5W	
10x3x2	14p	7 x 4"	185p
10x4x3	117p		
12x5x3	127p		
12x8x3	205p		

COPPER CLAD BOARDS	
Fibre single dble/	S.R.B.P.
glass sided	sided
6"x8"	64p
6"x12"	115p
7"x8 1/2"	40p

FERRIC CHLORIDE* 1lb bag Anhydrous 65p + 30p p. & p.

DALO ETCH RESIST PEN* + spare tip 75p

VEROBOARD* Pitch	
0-1	0-15
(copper clad)	(plain)
21 x 35"	36p
21 x 5"	43p
21 x 3"	49p
21 x 17"	134p
21 x 17"	173p
41 x 17"	222p
Pkt of 36 pins	28p
Spot face cutter	52p
Pin insertion tool	72p

KNOBS* fit 1" shaft with grub screws, except K2 (push fit) & K8 (for sliders).	
K1 Black or White pointer type	9p
K2 Slim silvered aluminium	10p
K4 Black serrated, Metal top with line indicator 33mm diam.	22p
K4A As above but 25mm diam.	20p
K5 Black fluted metal top and skirt calibrated 0-10, 37mm diam.	26p
K6 PK2 as K5, pointer on skirt.	26p
K7 Black, knurled, tapered. Metal top & skirt, Calif. 0-10, 30mm	25p
K8 Black or silvered for slider pot	10p
K9 Solid Aluminium, Amplifier Knob, Professional type, with etch line indicator 16.5 x 12mm diam.	26p
K10 As above but tapered 18.5 x 17mm diam.	26p
K11 Aluminium, (Top Hat) Knurled body with 18.5mm skirt. Knotted Attractive	30p

JACK PLUGS		SOCKETS	
Screened chrome	Plastic body	Open metal	Moulded with break contacts
2.5mm	10p	8p	8p
3.5mm	14p	10p	8p
MONO	19p	15p	13p
STEREO	28p	18p	15p

DIN		Plugs		Sockets	
2 pin Loudspeaker					
3, 4, 5 (180° & 240°)		12p		8p	

CO-AXIAL (TV)		Plugs		Sockets	
		14p		10p	

PHONO		Plugs		Sockets	
assorted colours		9p		5p (Single)	
Metal screened		17p		7p (Double)	
				10p (Triple)	

BANANA		Plugs		Sockets	
4mm		8p		10p	
2mm		15p		15p	

LAMP HOLDERS AND LAMPS*	
LES HOLDER Dome shaped, Red, Blue, Green, Yellow, White	14p
LES BULBS 6v and 12v	9p
MES HOLDERS Chrome cover, Red or Amber, Jewelled top	50p
MES BULBS 3.5V 6V 12V	9p
NEONS Mains, Sealed with Resistor, Sq. Top, Red or Grn, Round Top Red 24p Neon with leads, 85V AC (No resistor) 9p	

PANEL METERS* Full scale	
55x46 x 35mm req. 1 1/2" hole	
0-50μA 0-100mA	50μA-0-50μA
0-100μA 0-500mA	100μA-0-100μA
0-500μA 0-1 Amp	500μA-0-500μA
0-1mA 0-50V DC	£3-85 each
0-5mA 0-300V AC	EDGEWISE
0-10mA "S"	89 x 32 x 70mm
0-50mA "VU"	0-1mA, 0-500μA
Price £3-55 each.	Price £4-95
108 x 82.5 x 38mm req. 60mm panel hole	
0-50μA; 0-100μA; 0-500μA	£5-36

DUAL VU METERS (150μA approx) £5-25

TRANSFORMERS* (Mains Prim. 220-240V)	
6-0-6V 100mA	90p
9-0-9V 75mA	95p
12-0-12V 100mA	95p
15-0-15V 100mA	185p
0-12-0-12V 150mA	140p
0-6-0-6V 280mA	150p
0-12-0-12V 0-5A	240p+
15-0-15V 0.5A	220p+
24-0-24V 0.5A	260p+
9-0-9V 1A	245p+
0-12-0-12V 1A	245p+
15-0-15V 1A	245p+
30-24-20-15-12-0 1A	360p+
Multi tapplings	360p+
30-24-20-15-12-0 2A	445p+
2A multi tap	445p+
(Please add 48p p&p charge to all prices marked +, above our normal postal charge.)	

SWITCHES*		SLIDE 250V:	
TOGGLE: 2A, 250V	1A DP	1A DP	14p
SPST	2A DP C/O	1A DP C/O	13p
DPDT	32p	1A DP (mini)	13p
4 pole changeover	4 pole/2 way	PUSH BUTTON	24p
SP changeover	54p	Spring loaded	50p
SPST on/off	48p	SPST on/off	58p
DPDT 6 tag	78p	SPDT C/over	68p
DPDT Centre off	82p	DPDT 6 tag	82p

SWITCHES* PUSH BUTTON:	
Miniature Non Locking	15p
Push to Make	15p
Push to Break	25p
ROCKER (white): 10A 250V	
SP changeover centre off	28p
ROCKER: (black) on/off 10A 250V	23p
ROCKER: Illuminated (white) lights when on, 3A 240V	52p
ROTARY: (ADJUSTABLE STOP) 11p; 2-12 way, 2p/2-6V, 3p/2-4W, 4p/2-3W	
ROTARY: Mains 250V AC, 4 Amp	39p

INDEX TO ADVERTISERS

A. H. Supplies	799
Alben Engineering	736
Ambic International	788
Astro Electronics	728
Bamber B.	795
Barclay Electronics	727
Barrie Electronics	737
Bell's Television Services	803
Bentley Acoustic Corp.	724
B. H. Component Factors	794
Bi-Pak Ltd.	730-731
Bi-Pre-Pak Ltd.	735
Birkett, J.	799
Blore-Barton Ltd.	805
British National Radio & Electronics School	728, 756, 777, 796
J. Bull (Electrical) Ltd.	787
Cambridge Kits	805
Cambridge Learning Enterprises	740
Chromasronics	805
C.J.L. Ltd.	732
Copper Supplies	804
Cliffpalm	726
Cox Radio (Sussex) Ltd.	803
Crescent Radio Ltd.	729
Crofton Electronics	794
C.S.C. Ltd.	759
Decon Laboratories	729
Decca Radio Ltd.	785
D.E.W. Ltd.	804
Doram	722, 724, 726, 728
Dudley, John & Co. Ltd.	805
Electronics Brokers Ltd.	800, 804
Electronics Design Assoc.	722
Electronic Mail Order Ltd.	740
Electropares	785
Electrovalve Ltd.	734

Fairline	796
G2DYM Aerials & Projects	803
G. J. D. Electronics	802
Gorses	805
Greenbank Electronics	756
Greenway Electronics	742
Greenwell Electronics	756
G. T. Technical Information Service	803
H.A.C. Short-Wave Supplies	796
H.M. Electronics	805
Harvorsons Surplus	cover iii
Helme Audio	804
Holme Electronics	802
Home Radio	760
I.L.P. Electronics Ltd.	743
Intertext I. C. S.	732
Josty Kit	788
Kramer & Co.	808
Lewis Radio	795
Lynx Electronics	801
Manor Supplies	734
Magenta	799
Magnum Publications	803
Maplin Electronic Supplies	cover iv
Marco Trading	802
Marshall, A. & Sons	734
Minikits Electronics	804
Newmart Electronics	724
Nixon Electronics	799
Orchard Electronics	791
Partridge Electronics Ltd.	739
P. B. Electronics	755
P. C. Radio (Colomor)	760
Plastronics	785
Precision Petite	742
Pulse Electronics	732

Radio Components Specialists	793
Radio Exchange Ltd.	797
Ramstar Construction Services	805
Rownsgem Ltd.	726
R.S.C. (Hi-Fi)	723
R. S. G. B.	800
R.S.T. Valve Mail Order	733
Radio & T.V. Components Ltd.	725
Salop Electronics	805
Saxon Entertainments	738-739
Scientific Wire Co., The	804
Selray Book Co.	792
Sintel	742
Sonic Hi Fi	794
Southern Valve Co.	801
Southern Warehouses	791
Sower Ltd. E. A.	802
Surplustronics	808
Swanley Electronics	798
Tamba Electronics	740
Tandy Corp.	732
Technomatic Ltd.	798
Teleradio Electronics	805
Tempus	794
T.K. Electronics	802
Trampus Electronics	cover ii
Tudor Tees (Vintage Services)	802
T.V. Technical Publications	803
Vero Electronics	722
Watford Electronics	806-807
Web Europa	734
Welbrook	736
West London District Supplies	796
Weston Publishing	803
Williams, Michael	792
Wilmslow Audio	741
Xeroza Radio	737
Z. & i. Aero Services	808

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

Z & I AERO SERVICES LTD.

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

Please send all correspondence and Mail-Orders to Head Office

AC/DC TAUT SUSPENSION MULTIMETERS (Made in USSR)

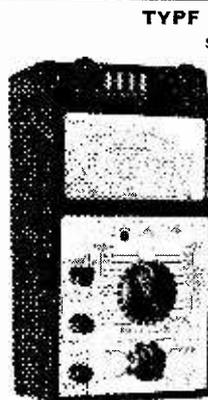


TYPE	U4312	U4313	U4315
Sensitivity D.C.	667 o.p.v.	20,000 o.p.v.	20,000 o.p.v.
Sensitivity A.C.	667 o.p.v.	2,000 o.p.v.	2,000 o.p.v.
D.C. Current	300 μ A-6A	60 μ A-1.5A	50 μ A-2.5A
A.C. Current	1.5mA-6A	0.6mA-1.5A	0.5mA-2.5A
D.C. Volts	75mV-900V	75mV-600V	75mV-1000V
A.C. Volts	300mV-900V	15V-600V	1V-1000V
Resistance	0.02-3k Ω	1K-1M	300 Ω -500k Ω
Capacity	—	0.5 μ F	0.5 μ F
Accuracy	1% D.C., 1.5% A.C.	1.5% D.C., 2.5% A.C.	2.5% D.C., 4% A.C.

Price complete with pressed steel carrying case and test leads.

TYPES U4313 AND U4315 ARE PROVIDED WITH ANTI-PARALLAX MIRROR SCALES

£14.50 £17.50 £14.95



TYPE U4341

Sensitivity:
1670 Ω /V D.C.,
330 Ω /V A.C.
Ranges:
D.C. current: 0.06-
0.6-6-60-600mA
A.C. current 0.3-3-30-
300mA
D.C. Voltage: 0.3-1.5-
6-30-60-150-300-
900V
A.C. Voltage: 1.5-7.5-
30-150-300-750V
Resistance: 2-20-
200k Ω -2M Ω
Transistor collector
cut-off current 60 μ A
Transistor D.C. cur-
rent gain in two
ranges 10-350
Accuracy: 2.5% D.C.,
4.0% A.C.,
5% D.C.
current gain
Power supplies: 4.5V
battery
(Eveready 1289)

Complete with steel carrying case, test lead, battery and instruction manual £14.50

NO OVERLOAD PROTECTION IS INCORPORATED IN THESE INSTRUMENTS



TYPE U4324

D.C. Current: 0.06-0.6-60-600mA-3A
A.C. Current: 0.3-3-30-300mA-3A
D.C. Voltage: 0.6-1.2-3-12-30-60-120-600-1200V
A.C. Voltage: 3-6-15-60-150-300-600-900V
Resistance: 500 Ω -5.50-500k Ω
Accuracy: D.C. 2.5%; A.C. 4% (of F.S.D.)

PRICE complete with test leads and fibreboard storage case £14.50

THE ABOVE PRICES ARE EXCLUSIVE OF VAT (at present 8%) HANDLING AND POSTAGE CHARGES £1.25 PER INSTRUMENT

OUR NEW 1976/1977 CATALOGUE IS NOW READY AND WILL BE SENT ON RECEIPT OF REMITTANCE FOR £0.30

Wire Wound Resistors. Our selection of mixed values. 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. 200 μ A. Size $\frac{3}{4}$ " 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 of each with spring clip. £1.25.

Copper Clad Laminate. 8" x 7" - 3 boards £1.00 + 8%.

Ferric Chloride. 1lb 65p + 8%.

Crystals HC6U. (MHz) 12700; 12891.6; 9455.55; 9530.55; 9087.5; 9456.25; 52.01667; 52.02500; 37.7625; 51.56667; 52.03333; 9090.02; 9531.94; 9533.33, 50p each.

Electrolytics. 32/32/32 μ F, 325v. 2" x 1 $\frac{1}{2}$ " 35p; 80 μ F 150v 1 $\frac{1}{2}$ " x 1" 20p; 2000 μ F 30v, 2 $\frac{1}{2}$ " x 1" 25p; 2000 μ F 35v 3" x 1" 30p; 470 μ F 100v 3" x 1 $\frac{1}{2}$ " 25p; 2000/2000 μ F 25v 2" x 1 $\frac{1}{2}$ " 35p; 700 μ F 200v 3" x 1 $\frac{1}{2}$ " 30p; 16/16 μ F 275v 1 $\frac{1}{2}$ " x 1" 20p; 4500/900/900 μ F 30v 2 $\frac{1}{2}$ " x 1 $\frac{1}{2}$ " 50p; 2500 μ F 40v 3" x 1 $\frac{1}{2}$ " 40p; 470 μ F 25v 1 $\frac{1}{2}$ " x 1" 15p; 4,000 μ F 25v 3" x 1 $\frac{1}{2}$ " 40p; 32 μ F 450v 1 $\frac{1}{2}$ " x 1" 30p; 8 μ F 16 μ F 450v 1 $\frac{1}{2}$ " x 1" 30p; 1000 μ F 12v 1 $\frac{1}{2}$ " x 1" 15p; 6000 μ F 50v 2" x 1 $\frac{1}{2}$ " 50p; 150/200/200 μ F 300v 3" x 1 $\frac{1}{2}$ " 50p; 16/16/16 μ F 350v 2" x 1" 30p; 50/50 μ F 500v 3 $\frac{1}{2}$ " x 2" 50p.

Low Voltage Transformer. - (17VT 17VT 34VT 2 amp £2.00)

Miniature Presets. - Selection of various 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.

Aluminium Chassis. $\frac{7}{8}$ " x $\frac{5}{8}$ " x 2 $\frac{1}{2}$ " 65p. 10" x $\frac{7}{8}$ " x 2 $\frac{1}{2}$ " 75p. 11" x $\frac{7}{8}$ " x 2 $\frac{1}{2}$ " 85p + 8%.

Thorn TA/28. Slide synchroniser for 4 track reel to reel recorders. 6 pin DIN socket models. £4.50.

BSR Single Play Decks with Cue. Fitted stereo cartridge. P146 £11.00. P153 £12.00.

Low Voltage Transformers. Prim. 200/240 VT. A.C. (28 VT, 750 MA) (10 VT-10 VT-20 VT 500 MA) (7 VT-12 VT-19 VT 750 MA) £1.50 each. 8% VAT.

4 Phono Sockets on Paxolin Panel. 5 for 75p.

E.H.T. Cable 13/0-2. 10 metres 75p, VAT 8%.

TUNING CAPACITORS. - (380 PF 11-5 PF; 320 PF 11-5 PF); (388 PF 10-5 PF; 324 PF 10-5 PF) 95p each.

Please add 30% P.P. Unless stated free P/P. VAT 12 $\frac{1}{2}$ % to be added to total order unless stated 8%. No goods despatched outside U.K.

SURPLECTRONICS

216 LEAGRAVE ROAD, LUTON LU3 1JD, BEDS.

SCIENTIFIC CALCULATOR SALE!

TEXAS SR52-Magnetic card programmable calculator 224 steps, 9 levels of brackets, 20 memories, subroutine capabilities; indirect addressing, branching, editing and "debugging", preprogrammed "IF" Statements, decrement and skip on zero, user defined flags, 72 labels, 10 digit mantissa, 2 digit exponent, supplied with adaptor/charger, carry case and instruction manuals plus 20 blank magnetic cards at £195 inc. VAT.

PC100 PRINTER FOR SR52 or SR56. Prints out entire program print calculate mode results, print instructions or results without halting program execution, trace program execution step for error detection at £175 inc. VAT. SR51-II @ £247.45. T130 at £215.95, recharger kit for T130 at £7.95 inc. VAT. **HEWLETT PACKARD**, 21 at £60.25 at £106.25C at £163.27 at £130.67 at £369.91 at £345.97 at £626 inc. VAT. **CBM 4190R** at £39.95 inc. VAT. **CASIO AL10** at £16.40, AL8 at £13.95, FX10 at £16.95 (6-2) FX102 at £18.40 (8-2) = 4 Fraction calcs. FX201P at £49.95 (8-2) Programmable, 127 steps, 11 memories with adaptor. Rockwell: 44RD at £18.60, 64RD at £23.90. **REALTONE: SC60** at £34.3 memories, Scientific/Statistical, SC6010 at £46 (13 memories, rechargeable, 2 levels of brackets, scientific/statistical, L.E.D. display. All prices include P+P & VAT at 8%. If increase please add new percentage to all prices.

SR56 10 digit mantissa, 2 digit exponent, 10 data memory register, 100 program steps, 9 levels of brackets, 7 branching instructions, 2 loop control instructions, 4 subroutine levels, 5 program levels, easy editing, 26 preprogrammed key functions at £57.56 inc. VAT. S.A.E. for full details and Quantity prices. C.W.O. to: **KRAMER & CO. Dept. PW3 9 October Place, Holders Hill Road, London NW4 1EJ** Tel: 01-203 2473. Telex: 888941ATTN Kramer

IT'S EASY WHEN YOU KNOW!

To avoid missing your copy of **PRACTICAL WIRELESS**—simply complete this order form and hand it to your newsagent.

ORDER FORM

To: (name of newsagent)

Address

Please reserve/deliver every month one copy of **PRACTICAL WIRELESS** until further notice.

My Name

Address

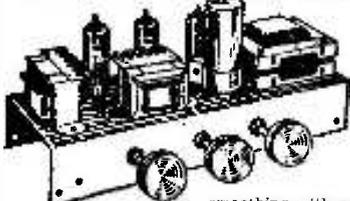
Published on approximately the 7th of each month by IPC Magazines Limited, Fleetway House, Farringdon Street, London EC4A 4AD. Printed in England by Index Printers, Dunstable, Beds. Sole Agents for Australia and New Zealand—Gordon and Gotch (Asia) Ltd.; South Africa—Central News Agency Ltd. **PRACTICAL 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 Eire 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.

SUPERSOUND 13 HI-FI MONO AMPLIFIER



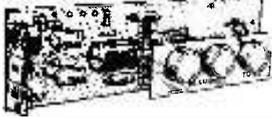
A superb solid state audio amplifier. Brand new components throughout. 5 silicon transistors plus 2 power output transistors in push-pull. Full wave rectification. Output approx. 13 watts r.m.s. into 8 ohms. Frequency response 12Hz 30KHz \pm 3db. Fully integrated pre-amplifier stage with separate Volume, Bass boost and Treble cut controls. Suitable for 8-15 ohm speakers. Input for ceramic or crystal cartridge. Sensitivity approx. 40mV for full output. Supplied ready built and tested, with knobs, escutcheon panel, input and output plugs. Overall size 3" high \times 6" wide \times 7 1/2" deep. A/C 200/240V. PRICE £13.75. P. & P. £1.00.

DE LUXE STEREO AMPLIFIER



A.C. mains 200-240 v. U.S. & Canada heavy duty fully isolated mains transformer with full wave rectification giving adequate smoothing with negligible hum. Valve line up: 2 \times ECL86 Triode Pentodes. 1 \times EZ80 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" w \times 4" d. Overall height including valves 5". Ready built & tested to a high standard. £12.40. P. & P. £1.30.

HARVERSONIC STEREO 44



A solid state stereo amplifier chassis, with an output of 3-4 watts per channel into 8 ohm speakers. Using the latest high technology integrated circuit amplifiers with built in short term thermal overload protection. All components including rectifier smoothing capacitor, fuse, tone control, volume controls, 2 pin din sockets & 5 pin din tape rec./play socket are mounted on the printed circuit panel size approx. 9 1/2" \times 2 3/4" \times 1" max. depth. Supplied brand new & tested, with knobs, brushed anodised aluminium 2 way escutcheon (to allow the amplifier to be mounted horizontally or vertically) at only £7.50 plus 50p P. & P. Mains transformer with an output of 17w a/c at 500mA can be supplied at £1.50 + 40p P. & P. if required. Full connection details supplied.

VYNAIR & REXINE SPEAKERS & CABINET FABRICS app. 64 in. wide. Our prices £1.50 yd. length. P. & P. 50p per yd. (min. 1 yd.). S.A.E. for samples.

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-210-240V. Secondary combinations 0-5-10-15-20-25-30-35-40-50v. half wave at 1 amp. or 10-0-10, 20-0-20, 30-0-30v. at 2 amps full wave. Size 3in. long \times 3 1/2in. wide \times 3in. deep. PRICE £2.90 P. & P. 90p.

MAINS TRANSFORMER. For power supplies. Pri. 200/240V. Sec. 9-0-9 at 500 mA. £1.50. P. & P. 60p. Pri. 200/240V. Sec. 12-0-12 at 1 amp. £1.65. P. & P. 60p. Pri. 200/240V. Sec. 10-0-10 at 2 amp. £2.35. P. & P. 90p. Pri. 200/240V. Sec. 23V at 1.5amp, 6V at .6 amp, 8V at 50mA. £2.00 + 65p P. & P.

ALL-PURPOSE POWER SUPPLY UNIT 200/240V. A.C. input. Four switched fully smoothed D.C. outputs giving 6v. and 7 1/2v. and 9v. and 12v. at 1 amp on load. Fitted insulated output terminals and pilot lamp indicator. Hammer finish metal case overall size 6" \times 3 1/2" \times 2 3/4". Ready built and tested Price £5.75 P. & P. 85p.

STEREO-DECODER

SIZE 2" \times 3" \times 1 1/2" ready built. Pre-aligned and tested. Sens. 20-560 mV for 9-16V neg. earth operation. Can be fitted to almost any FM VHF radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied. £5.62 plus 20p. P. & P. Stereo beacon light if required 40p extra.



QUALITY RECORD PLAYER AMPLIFIER MK. II A top quality record player amplifier employing heavy duty double wound mains transformer, ECC83, 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 6in. high. Ready built and tested. PRICE £6.20. P. & P. 90p. ALSO AVAILABLE mounted on board with output transformer and speaker. PRICE £7.30. P. & P. £1.

HARVERSONIC MAINS OPERATED SOLID STATE STEREO FM TUNER



Enjoy fabulous stereo radio at this low introductory price!

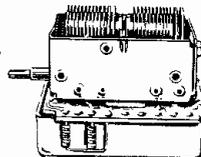
Designed and styled to match our 10 + 10 amplifier but will suit any other standard stereo amplifier. The design incorporates the very latest circuitry techniques with high-gain, low noise IF stages. Automatic frequency control to "lock-on" station and prevent drift. IC stereo decoder for maximum stereo separation. L.E.D. for stereo beacon indicator. Nominal output of 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 £22.50 + £1.40 p. & p.

SPECIAL OFFERS

Mullard LP1159 R.F.-I.F. Double Tuned Amplifier Module for nominal 470 KHz. Size approx. 2 1/2" \times 1 1/2" \times 7/8" 7.6 Volt \pm earth. Brand new pre-aligned. Full specification and connection details supplied. £2.25. P. & P. 12p

Pye VHF/FM Tuner Head covering 88-108 M/Hz. 10.7 M/Hz I.F. output. 7.8 Volt \pm earth. Supplied pre-aligned, with full circuit diagram. Connection details supplied. Beautifully made with precision-gear FM gang and 323PI + 323PI A.M. Tuning gang only £3.15 + 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. £ for £1.50 + 20p 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 £12.00 each Carr. £1.90.

Cabinet Available Separately £7.25. Carr. £1.40. Also available in 8 ohms with EMI 13" \times 8" bass speaker with parasitic tweeter £10.25. Carr. £1.90.

LOUDSPEAKER BARGAINS

5in. 3 ohm £1.45. P. & P. 35p. 7 \times 4in. 3 ohm £1.69. P. & P. 48p. 10 \times 6in. 3 or 15 ohm £2.50. P. & P. 75p. E.M.I. 8 \times 6in. 3 ohm with high flux magnet £2.06. P. & P. 50p. 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 19oz. 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 £8.40 each - p. & p. (one 75p, two 90p).

Now also available 8" - 8 ohm 10 watts, r.m.s. 20 watt peak 40 Hz-20,000 Hz. Overall depth 1". Ideal for Hi-Fi or for use in cars £5.10 - p. & p. (one 35p, two 65p).

SPECIAL LINES OFFERED SUBJECT TO STOCK AVAILABILITY

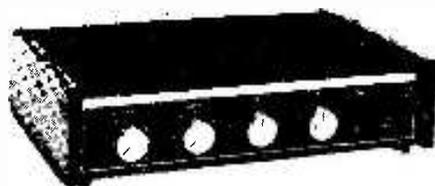
Hi-Fidelity stereo cassette tape deck transport mechanisms as used in Hi-Fi Music Centres. Electronically speed controlled motor, belt-driven flywheel capstan, three digit re-settable counter. Record/Play pre-amps. Bias oscillator. Record/Play and erase heads etc. Power supply required 12V D.C. Circuit diagram, etc. supplied. These units are brand new, but untested and are only offered to the more advanced constructor enthusiast. PRICE £16.87 + £1.25 P. & P. WE REGRET THAT WE ARE UNABLE TO ENTER INTO CORRESPONDENCE ON THESE UNITS.

New but very slightly marked 'GLENBURN' BSR automatic record changer decks fitted with cueing lever, lightweight arm and ceramic Hi-Fi stereo/compatible cartridge. Can be used for automatic or manual play. PRICE £9.58 + £1.26 P. & P.

Latest model GARRARD 6300 auto/manual changer de-luxe with cueing lever, bias compensator, counter-balanced low resonance arm and fitted with ACOS 104 diamond ceramic stereo cartridge. PRICE ONLY £14.50 + £1.50 P. & P.

Limited number of the latest BSR C141R1 auto/manual changer de-luxe. Lightweight tubular arm cueing lever, bias compensator. PRICE £12.60 + £1.40 P. & P. Also similar but without cueing lever or bias compensator. ONLY £11.00 + £1.40 P. & P.

HARVERSONIC 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 8 to 15 ohms. Compact design, all parts supplied including drilled metalwork high quality ready drilled printed circuit board with component identification clearly marked, smart 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 80mV into 1M Ω . 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" w. \times 8" d. \times 2 1/2" h.

Fully detailed 7 page construction manual and parts list free with kit or send 25p plus large S.A.E.

AMPLIFIER KIT £13.50 P. & P. 65p (Magnetic input components 33p extra)

POWER PACK KIT £4.85 P. & P. 85p

CABINET £4.85 P. & P. 85p

SPECIAL OFFER—only £22.50 if all 3 items ordered at one time plus £1 p. & p.

Full after sales service

Also available ready built and tested £29.25. P. & P. £1.



3-VALVE AUDIO AMPLIFIER HA34 MK II

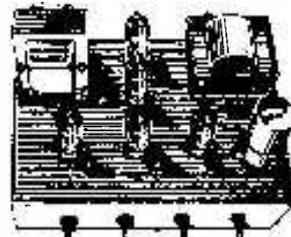
Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7 1/2" w. \times 4" d. \times 4 1/2" h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 8 ohm

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 £7.90. P. & P. £1.00.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc £7.00 P. & P. £1.00.

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 3-15 Ω 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 35p + SAE (Free with parts) All parts sold separately. ONLY £11.25 P. & P. £1.35. Also available ready built and tested £15.20 P. & P. £1.35.

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-25KHz. Gain 26dB. Solid encapsulation size 1 1/2" \times 1 1/2" \times 3/4". Brand new complete with instructions. Price £1.60 P. & P. 15p.

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.

Open 9.30-5.30 Monday to Friday. 9.30-5 Saturday Closed Wednesday.

All prices and specifications correct at time of press and subject to alteration without notice.

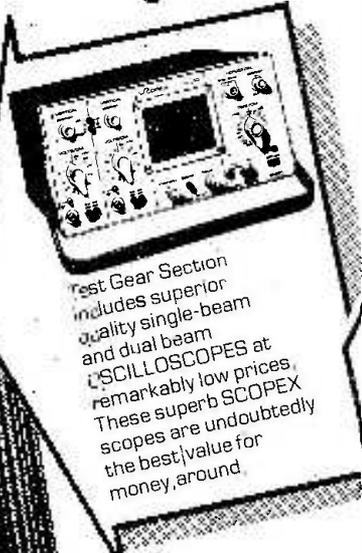
HARVERSON SURPLUS CO. LTD.

(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

The new Maplin Catalogue is no ordinary catalogue...

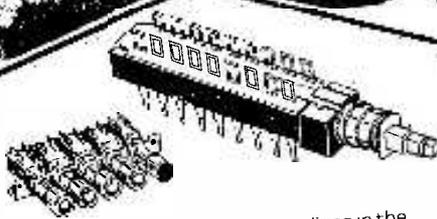


Test Gear Section includes superior quality single-beam and dual beam SCILLOSCOPES at remarkably low prices. These superb SCOPEX scopes are undoubtedly the best value for money around.



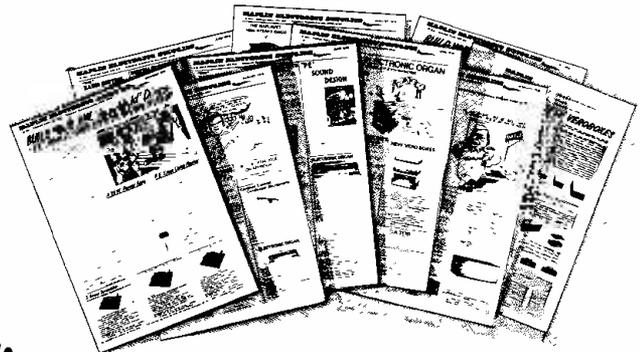
MULTI-CHANNEL MIXER

Projects section includes complete construction details of a professional quality MULTI-CHANNEL MIXER with modular sections for complete flexibility. Extremely low noise and distortion AND low cost.



Just one of the hundreds of new lines in the component section. A new range of FULLY INTERLOCKING PUSH BUTTON SWITCHES - high quality - low price - large range.

Catalogue includes a very wide range of components: hundreds of different capacitors; resistors; transistors; I.C.'s; diodes; wires and cables; discotheque equipment; organ components; musical effects units; microphones; turntables; cartridges; styli; test equipment; boxes and instrument cases; knobs, plugs and sockets; audio leads; switches; loudspeakers; books; tools - AND MANY MANY MORE.



* Our bi-monthly newsletter keeps you up to date with latest guaranteed prices - our latest special offers (they save you pounds) - details of new projects and new lines. Send 30p for the next six issues (5p discount voucher with each copy).

SEND THIS COUPON FOR **YOUR** COPY OF OUR CATALOGUE ON APPROVAL! Price 50p - SEND NO MONEY NOW. Please rush me a copy of your brand new 1977/78 catalogue the instant it is published. Only if I am completely satisfied that it is worth every penny, will I send 50p within 14 days of receipt. If I am not satisfied, I may return the catalogue to you within 14 days without obligation. I understand that I need not purchase anything from your catalogue should I choose to keep it.

NAME _____

ADDRESS _____

PW 1.

Maplin Electronic Supplies P.O. Box 3, Rayleigh, Essex, SS6 8LR

Owing to delay in completion of larger warehouse, catalogue will be delayed by up to four weeks - so there's still time to order before publication and get your pack of ten super special offer coupons, giving big discounts on ten different popular items. YOU COULD SAVE POUNDS! - SO DON'T DELAY - FILL IN AND POST COUPON NOW!

MAPLIN

ELECTRONIC SUPPLIES
P.O. BOX 3, RAYLEIGH, ESSEX SS6 8LR

Shop: 284, London Road, Westcliff-on-Sea, Essex
(Closed on Monday) Telephone: Southend (0702) 44101