PRACTICAL WIRELESS

MARCH
1975

30p

FREE INSIDE

FREQUENCY ALLOCATION WALL CHART

PW 'Easybuild' ELECTRONIC ORGAN

PART 1

PW FREE Competition

£500 worth of HEATHKIT equipment to be won!

PRACTICAL WIRELESS

VOL. 50 NO. 11
ISSUE 817
MARCH 1975

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

Editor
Lionel E. Howes, G3AYA

Assistant Editor
Eric Dowdeswell, G4AR

Art Editor Peter Metalli

Production & News Editor
Colin R. Riches

Technical Sub-Editor Bill Tull

Technical Artist Alan Martin

Secretarial Jenny Maunder
01-634 4292 Susan King

Adverts. Manager
01-634 4293 Roy Smith

Classified Adverts.
01-634 4301 Colin R. Brown

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

SUBSCRIPTIONS
Publisher's Subscription Rate for one year to the UK is £3·85 and to the rest of the world £4·95 ($13·50 USA/CAN) including postage. Enquiries to Subscription Department, IPC Magazines Ltd., Carlton House, 68 Gt. Queen Street, London, WC2 5DD. Phone 01-242 4477. International Giro facilities Account No. 5122007. Please state reason for payment "message to payee".
Binders (£1·34) and indexes 30p (inc. VAT) can be supplied by the Binders Dept at the same address.

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

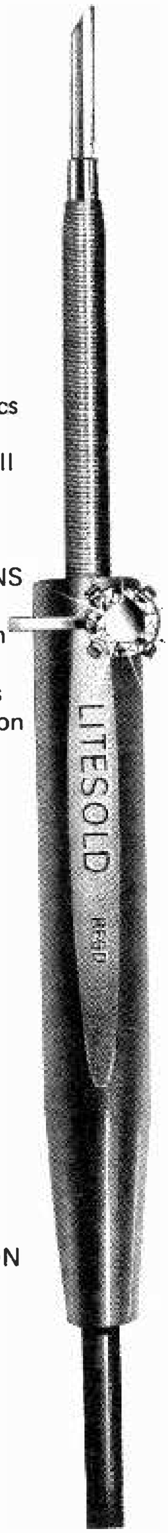
● NEWS & COMMENT

● CONSTRUCTIONAL

● OTHER FEATURES

If you're interested in electronics You'll like the NEW LITESOLD SUPER IRONS

We've been supplying the electronics industry with soldering irons for many years and we have now put all our experience into an iron for the electronics enthusiast.



The new LITESOLD SUPER IRONS have all the features you have been looking for; a neon indicator which glows only when the supply is connected correctly and the iron is safely earthed, an unbreakable nylon handle, a burn-proof mains lead, a special oxydised binding, a long life element, a range of bit shapes to suit every job and a special bench stand.

There are three SUPER IRONS

the S90
12 watts for miniature jobs
at £4.77
the S142
20 watts for medium jobs
at £4.85
the S187
24 watts for heavy jobs
at £4.89
and the special spring stand at **£2.24**.

Get your LITESOLD SUPER IRON direct from

Light Soldering Developments Limited
97-99 Gloucester Road
Croydon Surrey
Telephone 01-689 0574

All prices include postage, packing and VAT but not the diamond ring.

16 CHERRY LANE BRISTOL BS1 3NG

THE RADIO SHOP

TELEPHONE 0272-421196

TRIACS

1·6AMP PLASTIC TO5

NAS0161W	100V	·27
NAS0161X	100V	·26
NAS0162W	200V	·30
NAS0162X	200V	·28
NAS0164W	400V	·40
NAS0164X	400V	·38
NAS0166W	600V	·55
NAS0166X	600V	·52

6·5AMP ISOLATED TAB

NAS0651W	100V	·46
NAS0651X	100V	·44
NAS0652W	200V	·58
NAS0652X	200V	·56
NAS0654W	400V	·84
NAS0654X	400V	·80
NAS0656W	600V	1·05
NAS0656X	600V	1·00

10AMP ISOLATED TAB

NAS1001W	100V	·63
NAS1001X	100V	·60
NAS1002W	200V	·78
NAS1002X	200V	·74
NAS1004W	400V	1·09
NAS1004X	400V	1·04
NAS1006W	600V	1·34
NAS1006X	600V	1·28

3AMP "CLIPPED TAB"

NAS0301W	100V	·30
NAS0301X	100V	·28
NAS0302W	200V	·36
NAS0302X	200V	·34
NAS0304W	400V	·52
NAS0304X	400V	·50
NAS0306W	600V	·70
NAS0306X	600V	·66

8·5AMP ISOLATED TAB

NAS0851W	100V	·52
NAS0851X	100V	·50
NAS0852W	200V	·67
NAS0852X	200V	·64
NAS0854W	400V	·97
NAS0854X	400V	·92
NAS0856W	600V	1·20
NAS0856X	600V	1·14

16AMP ISOLATED METAL

NAS1601W	100V	·90
NAS1601X	100V	·82
NAS1602W	200V	·95
NAS1602X	200V	·88
NAS1604W	400V	1·40
NAS1604X	400V	1·32
NAS1606W	600V	1·85
NAS1606X	600V	1·75

Devices with Internal Trigger have "W" suffix. "X" denotes Standard Triac.

THYRISTORS

1·6 AMP MIN. TO5

NAS006P	50PIV	·25
NAS006Q	100PIV	·28
NAS006R	200PIV	·31
NAS006S	400PIV	·40
NAS006T	600PIV	·52

4 AMP ISOLATED TAB

NAS106P	50PIV	·26
NAS106Q	100PIV	·30
NAS106R	200PIV	·36
NAS106S	400PIV	·57

6 AMP ISOLATED TAB

NAS206P	50PIV	·37
NAS206Q	100PIV	·42
NAS206R	100PIV	·50
NAS206S	100PIV	·77

8 AMP ISOLATED TAB

NAS306P	50PIV	·41
NAS306Q	100PIV	·47
NAS306R	200PIV	·59
NAS306S	400PIV	·85

16 AMP ISOLATED TAB

NAS806P	50PIV	·50
NAS806Q	100PIV	·58
NAS806R	200PIV	·73
NAS806S	400PIV	1·15

Quantity prices on application, S.A.E.

NE 555 integrated circuit timer 8 pin dil only 62p.
MULTITURN POTENTIOMETERS EX. EQUIPMENT RELCON 1k + or − % good condition 25p.
2½in 75 ohms or 40 ohm miniature speaker 45p each.

Please add 8% VAT to all listed prices. Postage & packing 15p per order. Send 13p for latest catalogue. Callers welcome.

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 Dept. WB35, P.O. Box 156, JERSEY

NAME : ____________________

ADDRESS : ____________________

____________________ BLOCK CAPS please

no extras
all prices inc VAT
FREE delivery

Buy it with Access
BARCLAYCARD

ALL ITEMS SUBJECT TO MANUFACTURERS INCREASE AND AVAILABILITY
Personal Callers are Welcome!

JOSTY KIT
High Quality Construction Kits, stocked at all branches Send for catalogue!

AMPLIFIERS
Teleton SAQ307 8+8 watt £27·00
Rotel RA211 £43·95
RA311 £54·95
RA611 £86·95
Leak Delta 30 £54·75
Samsui AU101 £48·25
AU505 £74·95
Sinclair 2000 £34·95
Sinclair 4000 £45·95

TUNERS & RECEIVERS
Leak Delta AM/FM £58·75
Sinclair 2000/4000 Tuner £34·95
Rotel RT222 £42·75
Rotel RX150A Tuner/Amp. £59·95
Rotel 152A £69·95
Sansui
210 AM/FM/MPX £84·25
310 AM/FM/MPX £99·50
350A AM/FM/MPX £106·95

RECORD DECKS
SP25 Mk III £11·00
Garrard SP25 MkIV £12·95
BSR MP60 £11·95
BSR Invicta P & C/SC7M £9·95
Garrard
SP25 MkIV P & C G/800 £21·00
AP76 Module £30·00
Goldring GL78 P & C/G800E £59·95
Connoisseur
BD1 Kit £13·50
BD2 Chassis/SAU2 £32·50
SAU2 £14·25
SCU1 £5·95

TAPE DECKS (Insurance 2·00)
Akai
4000DS Reel to Reel £93·95
4000DB Reel to Reel Dolby £149·50
1721L Special Offer £77·95
GXC36D £82·00
GXC38D £103·95
C533D £79·95
Akai CR81D 8-track Rec. player £73·95

SPEAKERS
Chassis Speakers
EMI (Plain) 13in x 8in, 3, 8 or 15 ohm Bass unit £2·30
with Single Tweeter (only 8ohm) £2·45
with Twin Tweeter £3·95
Type 350 Kit 15 watt 8 ohm £8·25
13in x 8in Bass unit 15 watt 8 ohm £4·95
8in x 5in 5 watt 3, 8 or 15 ohm £1·50
8in x 5in 10 watt Dualcone 8 ohm £2·50
6½" 10 watt 8 ohm £2·65
8in 10 watt 8 ohm £3·90
12in 20 watt 8 ohm £6·95
Fane 8in 4 or 15 ohm £2·25
Fane 7in x 4in 3 or 8 ohm £1·20
Elac 8in 8 ohm Dualcone £2·50
Elac 10in 8 ohm Dualcone £3·75
Goodman 6½in 8 ohm Dualcone £2·40
Baker Group 25 12in 8 or 15 ohm £7·95
Adastra 'Top 20' 12in 25 watt 8 or 15 ohm £8·25
Adastra 'Hi-Ten' 10in 10 watt 8 or 15 ohm £3·60
Also 5in 8 ohm speaker £0·99
2½in 8 or 64 ohm speaker £0·50

WHARFEDALE SPEAKER BARGAINS
Denton 1 pr. £26·75
Denton 2 pr. £32·00
Linton 2 pr. £40·75
Glendale 3 pr. £60·95
Kingsdale 3 ea. £64·95
Dovedale 3 ea. £44·95

KITS
Linton 2 pr. £20·95
Glendale 3 pr. £35·95
Dovedale £55·50

SPEAKER CABINETS IN KIT FORM (Teak Veneer)
12in x 8in x 6in (8 x 5 or 7 x 4 cutout) £2·50
14in x 12in x 9in (10", 8 x 5, 8", 6½" & 3½") £3·75
18in x 11in x 9in (8" x ¾" or 13 x 8) £4·95
22in x 14in x 9in (12" & ¾" or 13 x 8) £6·25

TWEETERS & CROSSOVERS
EMI 3½" c/magnet in 3 or 8 ohm £1·25
Cone Tweeter 10 watt 8 or 15 ohm (K2006) £2·70
Cone Tweeter 3 watt 8 ohm (K2003) £1·55
Horn Tweeter 8 ohm (K2007) £6·50
Dome Tweeter 8 ohm (K2011) £5·50
2-way Crossover (CN23, CN28, CN216) £1·30
3-way Crossover (CN38) £2·75

CARTRIDGES & STYLII

	Cart. £	D/D Styli £
ACOS		
GP91/2SC or 3CS (ster. comp)	1·10	1·25
GP93/1 or 95/1 ster. cryst.	1·35	1·25
GP94/1 or 96/1 ster. ceram.	1·75	1·25
GP101 cryst. comp.	90	—
GP104 ster. ceram.	1·75	1·25
BSR		
X5M or X5H cryst. comp.	1·75	1·25
SX6M or SX6H cryst. ster.	2·00	1·25
SC5M ster. ceram.	2·75	1·25
SONOTONE		
9TAHC or 9TAHC/G (Diam.)	1·85	1·25
3509 Magnetic	1·90	1·25
AUDIO TECNICA		
AT55	1·95	—
EMPIRE 999 REX	3·95	—
GOLDRING		
G850	2·95	1·95
G800	3·95	1·95
G800H	3·95	1·95
G800E	6·99	3·95
SHURE		
M44G	4·95	3·95
M55E	6·25	4·95
M75ED Type 2	11·75	8·25
MJ5EJ Type 2	9·75	6·25
V15 Type 3	32·25	—

MICROPHONES
UD130 50K/600 ohm uni-dir. ball metal £5·95
UD147 £9·25
Condenser Mic. 600 ohm uni-dir £9·50
Cassette Stick Mic. with R/Control £1·60
Mic-Mixers Mono/stereo £5·50
AKAI ADM14 £5·95

HEADPHONES
Rotel
RH430 £4·75
RH 630 £7·75
RH 700 £11·50
Koss
K711 £10·95
KRO711 £10·95
K6 £11·50
K6LC £14·00
KO727B £16·00
KO747 £20·75
HV1 £21·95
PRO4AA £26·95
PRO54 £29·95
K6LCQ £26·00
Sansui SS10 £14·20
*Headphone adaptor (Junction box) £2·50
extension lead 2ft curly £1·35

CASSETTES

	C40	C60	C90	C120
Low Noise	—	35p	45p	55p
Philips	—	55p	75p	110p
Memorex	65p	79p	110p	155p
Ampex (360)	45p	55p	70p	99p
Ampex (20-20+)	59p	65p	99p	135p
Chromium Dioxide	—	99p	140p	—

Casette Head Cleaner 45p
Ampex Head CleanerDemag £1·65
BIB Stereo Test Cassette £2·15
Cassette Racks (hold 6) £0·45
Cassette Rotating Racks (hold 20) £3·50
Cassette Carrying Case (BIB) (hold 12) £1·60

8-Track Cartridge Blanks

	C40	C64	C80
Ampex	80p	95p	£1·10

8-track H/Cleaner Demagnetiser £1·90
8-track Carrying Cases (BIB) £1·65

TAPES & CASSETTES

	Stnd	LP	DP	Cases
5"	55p	65p	1·00	20p
5¾"	65p	86p	1·35	25p
7"	80p	110p	1·85	30p
High frequency Ampex				
5"	—	1·40p	1·55p	
7"	—	1·90p	2·95p	

AKAI Metal Reel 7" £1·99

CALCULATORS
Sinclair Cambridge Build £19·95
Scientific £29·95

SINCLAIR PROJECT 80
Stereo Pre-amp. £11·95
Active Filter Unit £6·95
Z40 15 watt Amp £5·45
Z60 25 watt Amp £6·95
P25 Power Supply for 240 £4·98
P26 Power Supply for 240 £7·98
P28 Power Supply for 260 £7·98
FM Tuner £11·95
Stereo Decoder £7·45
Q16 Speaker £7·10

PORTABLE RADIOS
Vega Jade £5·75
Vega Zircon £8·25
Vega Sapphire £7·25
Vega VEF206 £13·95
Micado LM/MW/FM/5SW £18·95
Murphy
B833 MW/VHF £9·95
BA838 LW/MW/VHF M/Batt £18·50
MA5003 Head Set Radio LW £7·95
Bush
VTR165 LW/MW/VHF £22·00
VTR127 LW/MW/VHF £15·50
VTR178 VHF/MW/2SW/AIR M/Batt £27·50
VTR 175 LW/MW/VHF £13·95
VTR188 LW/MW/VHF/25W M/Batt £31·95
BY5661 LW/MW/VHF £14·95

CLOCK RADIOS
Bush CR128 LW/MW £13·60
Bush CR232 MW/VHF £24·95
Murphy MV5600 MW/VHF £22·95

CASSETTE RECORDERS
Murphy BA206 £16·95
Bush TP66 M/Batt £25·75
Murphy BA200 M/Batt £22·75
Bush BT8504 (miniature) £25·50

RADIO CASSETTES (Mains/Batt.)
Micado 8155 AM/FM £25·95
Murphy BA209 MW/VHF £33·50

STEREO RECORD PLAYER & SYSTEM
Bush SPR58 £29·50
Bush SPR59 £31·50
Bush A1005 £56·50
Hanimex H101 £39·95
Hanimex HRC5060 8-track AM/FM/MPX+Speaker £116·95

CAR AUDIO
Bush Car Cassette BT8501 £36·75
Hitachi Car Radio
WM702R LW/MW £16·50
KM1510 LW/MW/VHF £32·50
Hitachi Car Cassette C5114 £45·00

ALL ITEMS SUBJECT TO MANUFACTURERS INCREASE AND AVAILABILITY

PERSONAL CALLERS WELCOME

ALL MERCHANDISE FULLY GUARANTEED

NEWMART ELECTRONICS

Mail Order Dept PW/3
Belmont St, Monton, Eccles, Manchester.
Tel: 061-789 5268

Manchester
30-32 Shudehill. tel 061-832 7710
Leeds
4 New Market St tel 0532 42708
Liverpool
15 Whitechapel tel 051-236 0738

BENTLEY ACOUSTIC CORPORATION LTD.

7a GLOUCESTER ROAD, LITTLEHAMPTON, SUSSEX

All prices inclusive of V.A.T. **Telephone 6743**

OB2	.40
OZ4	.47
1A3	.45
1A5GT	.50
1A7GT	.65
1B3GT	.50
1H5GT	.60
1L4	.28
1N5GT	.65
1R5	.45
1S4	.33
1U4	.60
1U5	.75
2D21	.45
2GK5	.55
2X2	.60
3A4	.50
3D6	.40
3Q4	.60
3Q5GT	.55
3S4	.40
3V4	.70
4CB6	.55
5CG8	.55
5R4GY	.80
5U4G	.40
5V4G	.50
5Y3GT	.45
5Z3	.75
5Z4G	.45
5Z4GT	.45
6/30L2	.80
6A8G	1.25
6AC7	.49
6AG5	.37
6AH6	.60
6AJ5	.65
6AK5	.40
6AK6	.60
6AM8A	.65
6AN8	.70
6AQ5	.45
6AR5	.60
6AS7	1.00
6AT6	.45
6AU6	.30
6AV6	.45
6AW8A	.95
6AX4	.75
6B8G	.30

6BA6	.28
6BC8	.60
6BE6	.35
6BH6	.60
6BJ6	.55
6BK7A	.60
6BQ7A	.55
6BR7	1.00
6BR8	1.50
6BS7	1.40
6BW6	.80
6BW7	.70
6BZ6	.49
6C4	.35
6C5G	.50
6C6	.40
6C9	1.00
6CD6G	1.25
6CG8A	.75
6CL6	.65
6CL8A	.80
6CM7	.75
6CU5	.75
6CW4	1.00
6DE7	.75
6DT6A	.75
6EW6	.75
6E5	1.00
6F1	.75
6F6G	.50
6F13	.70
6F14	.75
6F15	.65
6F18	.55
6F23	.80
6F24	.85
6F25	1.00
6F28	.67
6F32	.50
6G6G	.50
6GH8A	.75
6GK5	.65
6GU7	.75
6H6GT	.25
6J5GT	.45
6J6	.30
6J7G	.30
6JU8A	.75
6K7G	.30
6K8G	.45

6L1	2.00
6L6GT	.58
6L7	.50
6L18	.55
6L19	2.00
6LD20	.75
6N7GT	.60
6Q7G	.50
6Q7GT	.50
6Q7(M)	.55
6R7G	.60
6R7M	.75
6SA7	.44
6SC7GT	.33
6SG7	.44
6SH7	.44
6SJ7	.55
6SK7GT	.44
6SQ7GT	.45
6V6G	.17
6V6GT	.45
6X4	.40
6X5GT	.45
7B6	.75
7B7	.70
7H7	.75
7R7	.80
7Y4	.75
7Z4	.80
9D7	.65
10C2	.65
10DE7	.75
10F1	.75
10F9	.65
10F18	.55
10LD11	.70
10P13	.75
10P14	2.00
12A6	1.00
12AC6	.70
12AD6	.65
12AE6	.65
12AT6	.40
12AU6	.45
12AV6	.50
12BA6	.45
12BE6	.50
12BH7	.50
12E1	3.00
12J7GT	.60

12K5	1.00
12K7GT	.50
12Q7GT	.45
12SC7	.50
12SG7	.40
12SH7	.65
12SJ7	.44
12SQ7	.65
12SR7	.75
14H7	.65
14S7	.80
19AQ5	.50
19G6	6.00
20F2	.75
20L1	1.10
20P3	.80
20P4	1.00
20P5	1.30
25A6G	.60
25L6G	.60
25Y5G	.70
25Z4G	.40
25Z5	.80
25Z6G	.70
28D7	1.00
30A5	.65
30C15	.80
30C17	.80
30C18	.80
30F5	.80
30FL1	.67
30FL2	.67
30FL12	.90
30FL13	.55
30FL14	.78
30L15	.75
30L17	.70
30P4MR	1.00
30P12	.80
30P19/30P4	.75
30PL1	.85
30PL13	.95
30PL14	1.10
30PL15	.90
35A3	.65
35C5	.75
35D5	.75
35L6GT	.75

35W4	.50
35Z3	.75
35Z4GT	.70
35Z5GT	.75
42	.50
43	1.00
50B5	.85
50C5	.60
50CD6G	1.25
50EH5	.75
50L6GT	.65
85A2	.60
85A3	.60
90AG	2.50
90C1	.75
90CG	2.40
150B2	.75
215SG	.50
807	1.00
5702	1.00
6057	1.00
6060	1.00
6067	1.00
7193	.53
9002	.50
9006	.30
ACPEN	1.00
AC2/PEN/DD	1.00
AC6PEN	.60
AC/TH1	£1
AL60	1.00
ATP4	.50
AZ1	.25
AZ31	.60
AZ41	.25
BL63	2.00
CL33	1.60
CY1C	1.00
CY31	.50
DAF91	.30
DAF96	.50
DC90	.60
DF91	.30
DF96	.50
DK40	.70
DK92	.70
DK96	.60
DL96	.55
DM70	.60

DM71	1.50
DY87/6	.35
DY802	.35
E80CC	2.20
E80F	1.40
E83F	1.30
E88CC	.75
E92CC	.60
E180F	1.00
E182CC	1.25
E1148	.53
EA50	.27
EA76	1.00
EABC80	.33
EAC91	.75
EAF42	.75
EAF801	.75
EB34	.25
EB91	.20
EBC41	.75
EBC81	.35
EBF80	.30
EBF83	.43
EBF89	.32
EBL21	2.00
EC86	.70
EC88	.70
EC92	.45
ECC33	1.50
ECC35	.95
ECC40	1.00
ECC81	.34
ECC82	.33
ECC83	.33
ECC84	.35
ECC85	.40
ECC86	.65
ECC88	.44
ECC189	.65
ECF80	.45
ECF82	.45
ECF86	.75
ECF804	2.25
ECH21	2.00
ECH35	1.25
ECH42	.70
ECH81	.33
ECH83	.44
ECH84	.44

ECL80	.55
ECL82	.34
ECL83	.70
ECL84	.60
ECL85	.60
ECL86	.40
EF22	1.50
EF40	.75
EF41	.70
EF42	.70
EF73	1.50
EF80	.26
EF83	1.00
EF85	.34
EF86	.45
EF89	.27
EF91	.37
EF92	.50
EF97	.80
EF98	.80
EF183	.30
EF184	.35
EF804	1.25
EH90	.55
EL32	.50
EL34	1.00
EL35	2.50
EL37	2.50
EL41	.90
EL81	.60
EL83	.55
EL84	.31
EL85	.44
EL86	.38
EL91	.50
EL360	1.20
EL506	.90
ELL80	1.25
EM80	.45
EM81	.65
EM82	.55
EM84	.40
EM85	1.00
EM87	.70
EMM803	£2
EY51	.40
EY81	.40
EY83	.54
EY84	.70

EY87/6	.33
EY88	.40
EY91	.58
EZ40	.50
EZ41	.55
EZ80	.28
EZ81	.29
GY501	.70
GZ32	.50
GZ33	1.25
GZ34	.60
GZ37	1.00
HABC80	.60
HL23	.60
HL23DD	.75
HL41	1.00
HL41DD	£2
HL42DD	£2
HN309	1.50
HVR2	1.00
HVR2A	1.00
KT41	1.00
KT44	1.00
KT66	2.50
KT81	2.00
KTW61	1.50
KTW62	1.50
KTW63	1.00
MHLD6	£1
P61	.50
PABC80	.33
PC86	.60
PC88	.60
PC95	.60
PC97	.38
PC900	.48
PCC84	.40
PCC85	.44
PCC88	.60
PCC89	.50
PCC189	.57
PCF80	.40
PCF82	.40
PCF84	.59
PCF86	.60
PCF801	.50
PCF802	.50
PCF806	.50
PCH200	.80

PCL82	.38
PCL83	.50
PCL84	[illegible]
PCL86	.47
PCL805	.55
PEN45	.80
PEN45DD	.80
PEN46	.50
PEN453DD	2.00
PENDD-4020	2.00
PFL200	.70
PL33	.50
PL36	.60
PL81	.50
PL81A	.55
PL82	.37
PL83	.45
PL84	.40
PL504/500	.75
PL505	1.45
PL508	.90
PL509	1.45
PL802	.95
PY33/2	.50
PY81	.35
PY82	.35
PY83	.38
PY88	.40
PY500	.95
PY500A	.95
PY800	.40
PY801	.40
PZ30	.48
QQV03/10	1.75
QS75/20	1.00
QS95/10	1.00
QV04/7	1.00
R19	.60
TH233	1.00
TP2620	1.00
UABC80	.40
UAF42	.60
UBC41	.60
UBC81	.45

UBF80	.40
UBF89	.40
UBL21	.77
UC92	.45
UCC84	.75
UCC85	.45
UCF80	.70
UCH21	2.00
UCH42	.75
UCH81	.40
UCL82	.33
UCL83	.55
UF41	.70
UF42	.70
UF80	.35
UF85	.44
UF86	1.00
UF89	.40
UL41	.75
UL84	.42
UM80	.44
UY41	.45
UY85	.35
U10	1.00
U12/14	1.00
U19	2.50
U25	.85
U26	.66
U33	1.50
U35	1.50
U81	.80
U191	.75
U251	.80
U301	.65
U403	.75
U404	.55
U801	.85
U4020	.60
VP23	.75
VU111	.80
VU120	1.00
VU120A	1.00
VU133	.80
W107	1.00
W729	1.00
X65	1.25
X101	2.00
Z759	5.00

Transistors & Diodes

1N4744	·15
2N404	·20
2N966	·53
2N1756	·55
2N2147	·94
2N2297	·25
2N2369	·15
2N3053	·36
2N3121	2·75
2N3703	·21
2N3709	·22
AA119	·17
AA120	·17
AA129	·17
AAZ13	·20
AC107	·17
AC113	·23
AC126	·14
AC127	·19
AC128	·23
AC132	·22
AC154	·28
AC156	·22
AC157	·23
AC165	·23
AC166	·23
AC168	·42
AC176	·61
AC177	·31
ACY17	·23
ACY18	·22
ACY19	·21
ACY20	·20
ACY21	·21
ACY22	·17
ACY28	·20
AD140	·40
AD149	·55
AD161	·50
AD162	·50
AF114	·23
AF115	·17

AF117	·21
AF121	·33
AF124	·23
AF125	·19
AF126	·20
AF180	·53
AF186	·61
BA115	·15
BA116	·20
BA129	·14
BA130	·11
BA153	·17
BC107	·14
BC108	·14
BC109	·14
BC113	·23
BC115	·17
BC116	·23
BC118	·25
BCY10	·50
BCY12	·55
BCY33	·22
BCY34	·25
BCY38	·25
BCY39	·23
BCZ11	·42
BF158	·20
BF159	·23
BF163	·22
BF173	·42
BF180	·33
BF181	·44
BF185	·44
BF194	·17
BFY50	·25
BFY51	·21
BFY52	·22
BY100	·20
BY114	·20
BY126	·17
BY127	·20
BYZ10	·28
BYZ11	·23
BYZ12	·28

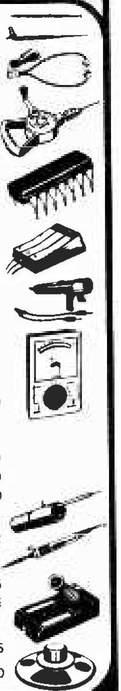
BYZ13	·28
FSY11A	·25
FSY41A	·25
OA9	·14
OA10	·47
OA47	·11
OA70	·17
OA73	·17
OA79	·10
OA81	·10
OA85	·09
OA90	·14
OA91	·10
OA95	·10
OA200	·10
OA202	·11
OC44	·11
OC45	·12
OC46	·17
OC70	·14
OC71	·12
OC72	·12
OC74	·25
OC75	·12
OC76	·17
OC77	·30
OC78	·17
OC78D	·17
OC81	·12
OC81D	·12
OC82	·12
OC82D	·12
OC83	·22
OC84	·26
OC123	·25
OC139	·25
OC169	·25
OC172	·39
OC200	·30
OC201	·42
OC202	·47
OC203	·33
OC204	·33
OC205	·47

MATCHED TRANSISTOR SETS:—
LP15 (AC113, AC154, AC157, AA120) ·58p per pack. 1—OC81D & 2—OC81, 47p. 1—OC44 & 2—OC45, ·47p. 1—OC82D & 2—OC82 ·53p. Set of 3—OC83 ·72p.

VALVES ALSO REQUIRED FOR CASH. LOOSE OR BOXED, BUT MUST BE NEW. OFFERS MADE BY RETURN.

All goods are unused and subject to the standard 90 day guarantee. Cash or cheque with order only. Despatch charges:—Orders below £5, add 10p total to cover up to three items, then each additional item 3p extra. Orders between £5 and £10 add 25p total. Orders over £10 are post free. Same day despatch. Any parcel insured against damage in transit for only 3p per parcel extra. Terms of business free on request. Many others in stock too numerous to mention.
Please enclose S.A.E. for reply to any correspondence.

CJL PRICES INCLUDE P&P AND V.A.T.



- ☐**AERIAL**, telescopic, 15-120cm. £1.20
- ☐**AERIAL**, telescopic, h and v swivel, 15-80cm. £1.78
- ☐**EARPHONE**, stethoscope style, 8 ohm dynamic. £1.00
- ☐**HAND DRILL**, (Leytool), Compact precision drill, 5/16" chuck. Gears totally enclosed. S/L bearings. £2.90

INTEGRATED CIRCUITS

- ☐AUDIO POWER AMPLIFIER (National) LM380 £1.00
- ☐A.M. RADIO RECEIVER (RCA) CA3123E £1.40
- ☐F.M. STEREO DECODER (Motorola) MC1310P £2.80
- ☐I/C TIMER (Signetics) NE555V £0.78
- D.I.L. SOCKETS (pk of 3) ☐8 pin £0.50 ☐14 pin £0.55
- ☐**KEYNECTOR**, rapid connect-single/multiple leads to mains. Built-in piano switches, neon & 13A fuse. £3.20
- ☐**MICROPHONE**, lightweight dynamic, remote start/stop 200 ohms, 100-10,000Hz, 6mV average output. £1.80
- ☐**MULTIMETER**, small and attractive, Vdc-10.50,250, 1,000. Vac-10.50,250,1,000. Idc-100mA. R-150k. £4.95

POWER SUPPLY COMPONENTS

- ☐SILICON BRIDGE RECTIFIER, 100 P.I.V./2A £0.40
- ☐ELECTROLYTIC CAPACITOR, 2,200uF/50V £0.57
- ☐ELECTROLYTIC CAPACITOR, 5,000uF/25V £0.63
- ☐SILICON POWER TRANSISTOR, 2N3055 £0.60
- ☐VOLTAGE REGULATOR (Fairchild) uA7805 £1.70
- ☐VOLTAGE REGULATOR (Signetics) NE550A £0.80
- ☐**SIGNAL INJECTOR** produces audio through video signals, excellent-servicing amplifiers, radios, televisions, etc. £3.92
- ☐**SOLDERING IRON 25 WATT**, (Antex), X25, 240V, Very low leakage, 1/8" long life bit (interchangeable). £1.85
- ☐3/32" bit £0.45 ☐3/16" bit £0.45 ☐Element £0.95
- ☐**STAND**, (Antex), ST3, High grade base, chrome plated spring, sponges and accomodation for spare bits. £0.95
- ☐**SPEAKER**, miniature, 8 ohms, 70mm dia. £0.80

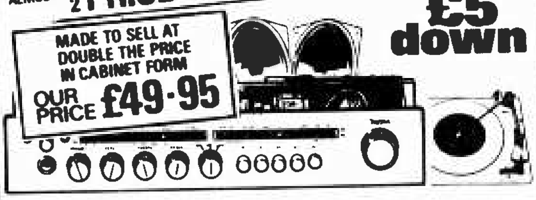
CJL CJL LTD. P.O. BOX 34, CANTERBURY, CT1 1YT

QUALITY* STEREO SOUND

SOLENT AUDIO SYSTEM

ALMOST ½ PRICE OFFER!

£5 down



*Stereo Tuner Amplifier chassis with AM/FM radio covering long medium short and Stereo FM wavebands. Separate Base and Treble controls. 30 watts total power output (frequency response 25-20,00 Hz) Tape record and playback facilities. Dimensions 18" x 8½" x 3½". The very latest BSR automatic record deck with cue and pause control. Two matching elliptical speaker units.

Order early limited stocks available cash price £49·95. Credit Sale £5·00 deposit 9 monthly payments of £5·75 (Total Credit price £56·75). P. & P. £2·50. Send £7·50 today.

Chassis only available for cash at £35·00.

Full 12 months Guarantee.

CALLERS WELCOME.

Stereo headphones supplied with every complete order

PW/3/75

LEWIS radio 100 CHASE SIDE SOUTHGATE LONDON N14 5PL Telephones: 01-882-1644

BI-PRE-PAK

Bargains in Semi-Conductors, components, modules & equipment.

Bargains from our FREE Catalogue

20 large pages, filled with real bargains in transistors, I.Cs, components, equipment, etc. Send large S.A.E. with 6p stamp for your FREE copy of 6th Edition by return. Meanwhile, for prompt delivery order from this month's ad. NOW.

BPP TRANSISTOR PACKS ALL AT 50p EACH TESTED & GUARANTEED

B79	4	IN4007 Sil. Rec. diodes. 1,000PIV 1 amp. plastic
B81	10	Reed Switches, 1" long ⅛" dia. High-speed P.O. type
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked
H38	30	Short lead Transistors, NPN Silicon Planar types
H39	6	Integrated circuits 4 gates BMC 962, 2 flip flops BMC 945
H41	2	BD131/BD132 Complementary Plastic Transistors
H65	4	40361 Type NPN Sil. Transistors TO-5 can comp. to H66
H66	4	40362. Type PNP Sil. Transistors TO-5 can comp. to H65

UNMARKED & UNTESTED

B1	50	Germanium Transistors PNP, AF and RF
B66	150	Germanium Diodes Min. glass type
B83	200	Transistors, manufacturers' rejects, AF, RF, Sil. and Germ.
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202
B86	100	Sil. Diodes sub. min. IN914 and IN916 types
H20	20	BY126/7 Type Silicon Rectifiers 1 amp. plastic. Mixed volts
H34	15	Power Transistors, PNP. Germ. NPN Silicon TO-3 Can
H67	10	3819N Channel FET's plastic case type

PLASTIC POWER TRANSISTORS—2 ranges

In NPN or PNP at shattering low prices sold to you under our Tested and Guaranteed terms.

	Range 1. VCE. Min 15. HFE Min 15			Range 2. VCE. Min. 40. HFE Min 40		
	1-12	13-25	26-50	1-12	13-25	26-50
40 Watt	20p	18p	16p	30p	28p	26p
90 Watt	24p	22p	20p	35p	33p	30p

Please state NPN or PNP on order.

NEW X-HATCH GENERATOR Mk.2

Essential for Colour T.V. alignment of 4 patterns. Featuring plug in IC's and a more sensitive sync. pick-up circuit. The case is virtually unbreakable—ideal for the engineer's toolbox—only measures 3" x 5¼" x 3". Operates from 3 U.2 type batteries (extra).

Complete kit **£7·93** Ready built unit only **£9·93**

OVER 1,000,000 TRANSISTORS

of all most needed types in stocks including power, diode, rectifier, etc., etc., marked, tested and guaranteed. Hundreds of worthwhile bargains will be found in our FREE CATALOGUE (6th edition). Also Zener diodes, I.Cs, etc.

SUNDRY

Metrication Pocket Charts **12p.** 8 assorted relays **£1·00.** Rev. counter device (for cars) **£1·00.** U.H.F./TV Tuner Units **£2·50.** L.M.380 Audio I.C. **£1·00** and technical books of all kinds.

TERMS OF BUSINESS

V.A.T. Prices shown do not include V.A.T. Please add 8% to total value of your order including postage. No. V.A.T. on overseas orders.

POSTAGE Except where stated, add 15p for postage & packing in U.K. Overseas—add £1, any difference being charged or refunded.

PAYMENT Cash with order, Cheque or money order. Minimum value—50p. You can also pay by ACCESS.

IMPORTANT—*Every effort is made to ensure accuracy of prices and description at time of preparing this advertisement and going to press. Prices are subject to alteration without notice.*

BI-PRE-PAK LTD

Co Reg No 820919

222 224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SS0 9DF.

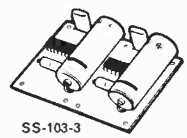
TELEPHONE: SOUTHEND (0702) 46344.

WRITE ORDER SEPARATELY AND ATTACH COUPON IF REQUIRED

challenging values !

Stirling Sound

STIRLING SOUND AUDIO MODULES come to you as basic units assembled on P.C.Bs enabling you to add required components in layouts of your own choice. Modules are tested and boxed before despatched and include well printed instructions.

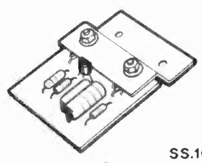


SS-103-3

AMPLIFIER MODULES

Pre-amplifiers; tone control

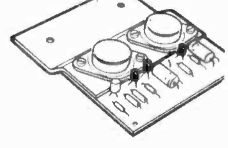
SS.100	Active tone control unit to provide bass, treble, balance and volume controls	£1·60
SS.101	Pre-amp for ceramic cartridge, tape and radio	£1·60
SS.102	Pre-amp for low output magnetic cartridge, tape and radio. With R.I.A.A. correction ±1dB at 1K	£2·25



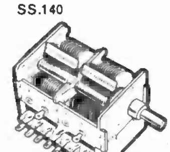
SS.105

POWER AMPLIFIERS

SS.103	Compact I.C. amp. with 3 watts R.M.S. output. Operating voltage 6 to 22. Size 3" x 2"	£1·75
SS.103-3	Stereo version of above using one I.C. on each channel	£3·25
SS.105	A compact and useful all-purpose amplifier which will run excellently on a 12V supply. With 5 watt output, two make a good stereo amp. Size 2¼" x 1½"	£1·95
SS.110	Similar in size to SS.103 but with a 10 watt output. Ideal for many domestic and small-size P.A. applications. Operates from 26 to 32V.	£2·40
SS.140	Excellently designed 40 watt R.M.S. (into 4 ohms) hi-fi amplifier. S/N ratio better than 75dB. THD better than 0·2%. Power requirements—45V. d.c. With 0·15" centre edge connections. Two can be bridged to give 80 watts R.M.S. into 4 ohms	£3·60



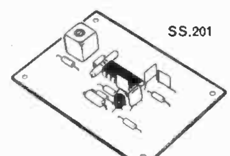
SS.140



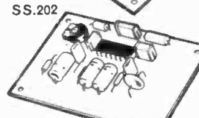
TUNER MODULES

SS.201	Ganged tuning condenser with accurately engineered slow-motion drive in rugged housing. Excellent sensitivity. Tunes 88-108MHz. With A.F.C. facility. Operates from 6V—16V	£6·25
SS.202	I.F. stage (with I.C.) Pre-tuned. A.F.C. connection. Operates from 4·5 to 14V	£5·25
SS.203	Stereo Decoder. Designed essentially for use with SS.201 and 2, this module can also be used in most mono FM tuners. A LED may be attached. Operating voltage 9-16V. d.c.	£5·62

SS.201



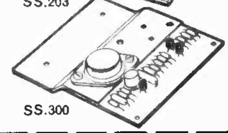
SS.202



POWER SUPPLY STABILIZER

SS.300	Add this to an unstabilised supply (say typically 45V output) to obtain a steady powerful working output adjustable from 12 to 60V. Essential or your audio and special systems. Money saving and very reliable	£3·25

SS.203



SS.300

- **ALL MODULES TESTED AND GUARANTEED**
- **WITH WELL PRINTED INSTRUCTIONS**
- **FULL RANGES OF ANCILLARY COMPONENTS AVAILABLE—SEE CATALOGUE**

To BI-PRE-PAK, 224-226 WEST RD., WESTCLIFF-ON-SEA, ESSEX

Please send ....

for which I enclose .... inc. V.A.T.

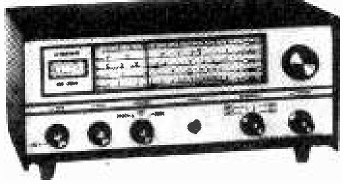
Name ....

Address ....

.... PW3

LISTEN TO **CODAR**® THE WORLD!

★CR70A



★MADE TO ORDER!

£37·15!
VAT PAID
CARR. 85p

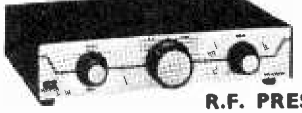
COMMUNICATION RECEIVER

The CODAR CR70A is an outstanding general coverage communication receiver, ideal for the keen S.W.L.
It tunes from 540 metres medium through to 10 metres with no gaps. Covers shipping, coastguard and distress frequencies, all six amateur bands 160-10 metres, International broadcast, Met. stations etc. etc. giving world-wide reception. Exclusive features include Air-spaced CODAR-COIL Hi-"Q" Aerial input, illuminated Meter and Slide Rule Scale, Two Speed vernier tuning. Switched B.F.O. for CW/SSB signals. Separate output for Tape recorder.
Ready to plug in to 200/240 volts A.C. it only needs your aerial and a 2/3 ohm loudspeaker to bring the world to your finger tips. 12 months full guarantee.

★ IMPORTANT NOTE

This fine receiver is not a mass produced item, but each set is hand built to your order, individually checked and air tested. Please allow for this when ordering—your delivery date will be shown on your receipt, sent by return.

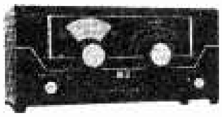
P.R.40★



£10·93!
VAT PAID
CARR. 32p

R.F. PRESELECTOR

The PR40 R.F. Preselector is the solid state version of the world famous PR30 which it now supersedes.
It employs Silicon "N" Channel FET (Field Effect Transistor) front end followed by silicon NPN Broad Band R.F. Amp., and will substantially improve receiver performance over the range 1·5 to 35 MHz, providing a considerable increase in gain up to an overall average of 30dB, with improved image rejection and noise ratio.
Supplied complete with co-ax plug (less standard 9 volt PP6 Battery). 12 months Guarantee . . .



MULTIBAND—6★

SHORT WAVE RECEIVER KIT

£16·90! CARR. 43p

All transistor T.R.F. Receiver tunes 550 KHz to 30 MHz (540 to 10 metres) complete coverage—no gaps. Medium waves—Trawlers—Ship / Shore Telephone—All Six Amateur Bands 160–10 metres—International Broadcast from Australia, Far East, Russia, USA etc. using 4 miniature plug in Coils. Hi-Gain FET Regen. Det./AF/AF Module giving full loudspeaker output to any external 2/3 ohm speaker. Receives AM/CW/SSB.
Separate Electrical Bandspread, Calibrated Main Tuning.
A Quality CODAR-KIT with 12 months Guarantee. No technical knowledge required, simple to build, printed circuit and Pictorial Instruction Manual, fully detailed step by step.
Complete Kit with 4 Coils (less standard PP6 battery).

ILLUSTRATED LEAFLETS FREE ON REQUEST

ON THE DESIGN STAFF—
G3SZM G3IRE

CODAR®

TO COPE WITH INCREASING DEMAND – PLEASE NOTE NEW SALES OFFICE TEL No. 02-73-38345 MON-THURS-9.30 a.m.-4.30 p.m.

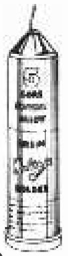
VALCON WORKS · BURRELL BUILDINGS · CHURCHILL INDUSTRIAL ESTATE · LANCING · SUSSEX
BN15 – 8TZ
WORLD-WIDE MAIL ORDER—EXPORT QUOTES FREE.

ERSIN
Multicore
5 CORE SOLDER

for fast easy reliable soldering
EASY TO USE DISPENSERS AND REELS
IDEAL FOR HOME CONSTRUCTORS

Ersin Multicore Solder contains 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux is required.

SAVBIT handy solder dispenser



A coil of Ersin Multicore Savbit Solder in a dispenser 7ft 6 in of 18 s.w.g. (2.2 metres of 1.22mm). The Solder that reduces the wear of soldering iron bits.

Size 5 32p

SAVBIT solder for general purpose work

A handy plastic reel of SAVBIT alloy. 63ft of 18 s.w.g. (19.2 metres of 1.22mm)

Size 12 £1.72

ALU-SOL for soldering aluminium

New Multicore Alu-sol flux-cored solder in 16 s.w.g. No extra flux needed. Plastic reel holds 36ft. Supplied with full instructions. Also available in solder dispenser.

Size 4 £2.32

Fine gauge solder for soldering small components

Fine gauge solder for soldering small components 138ft of 22 s.w.g. (42.0 metres of 0.71mm) Ersin Multicore 5 core solder wound on a plastic reel. Suitable for intricate work and small components.

Size 10 £1.44

For soldering fine joints

Dispensers of Ersin Multicore Solder make those small jobs easier. 21ft of 22 s.w.g. (6.4 metres of 0.71mm) solder, specially suitable for soldering fine wires, small components and for repairing printed circuits.

Size 15 36p

Or size 19A for kit wiring or Radio and T.V. repairs 7ft. (2.1 metres) of 18 s.w.g. (1.22mm) Ersin Multicore Solder.

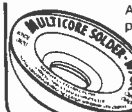
Size 19A 34p

NEW BIB WIRE STRIPPER & CUTTER

Fitted with unique 8 gauge selector with handle locking device and easy grip handles. Spring incorporated for automatic opening. Strips insulation from flex and cables in seconds and can also be used as a cutter.

Model 8B. 70p

NEW SOLDER WICK



Absorbs solder instantly, from tags and printed circuits. Only needs 40 to 50 Watt soldering iron. Quick and easy to use. Does not need flux and is non-corrosive.

Size 18 90p

Bib Hi-Fi Accessories Limited,
Sole U.K. Sales Concessionaires, P.O. Box 78 Hemel Hempstead, Herts. HP2 7EP

Prices shown are recommended retail excluding V.A.T.
From Electrical and Hardware Shops. If unobtainable, send 15p P&P.
Prices and specifications subject to change without notice.

TRANSFORMERS

POWER UNIT Type A125

Supplying 6 or 9 Volt DC at 200 mA.

In moulded case forming a 2 pin 5A mains plug.

2 metre output lead with 4-way mutlplug giving 2·1 and 2·5 mm sockets and 3·5 mm plugs.

Price £2·25. Post 10p.

2" and 4" PANEL METERS

2"		4"	
SIZE: 60mm Wide x 45mm High x 40mm Deep.		SIZE: 110mm Wide × 82mm High × 43mm Deep.	
Movement	I.R. Ohms	Movement	I.R. Ohms
0–50 micro A.	1250	0–50 micro A.	1400
0–100 micro A.	580	0–100 micro A.	730
0–500 micro A.	170	0–500 micro A.	200
0–1 mA	170	0–1 mA	200
0–5 mA	170	0–5 mA	200
0–10 mA	6	0–10 mA	6
0–50 mA	0·5	0–50 mA	0·5
0–100 mA	0·5	0–100 mA	0·5
0–500 mA	0·5	0–500 mA	0·5
0–1 AMP	0·5	0–1 AMP	0·5
0–2 AMP	0·5	0–2 AMP	0·5
0–25 Volt	15K	0–25 Volt	15K
0–50 Volt	50K	0–50 Volt	50K
0–300 Volt	300K	0–300 Volt	300K
"g" Meter	170	"g" Meter	200
VU Meter	5250	VU Meter	5250

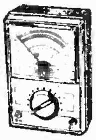
VU Meters are complete with detectors. Modern wide view.
Price 2" £3·15 Post 10p. Price 4" £4·15 Post 10p. Lamps 75p per set.

¼ watt CARBON FILM RESISTORS

¼ watt at 70°C E 12 range 10 Ω–1M Ω 5% tol above 470 K Ω 10% tol at 95p per 100.

C1000 MULTIMETER

Special Offer



Compact General Purpose Mini Multimeter.
Input Resistance 1000 ohms per volt
Ranges:
AC Volts 0–15, 50, 250, 1000 V
DC Volts 0–10, 50, 250, 1000 V
DC Current 0–1 mA, 0–100mA
Resistance 0–150K ohms
Size 60 × 24 × 90 mm

Complete with Batteries, Test Prods, Instructions. Special price £3·20 Post 20p.

C1001 MULTIMETER

Input Resistance 20,000 ohms per volt
Overload protection
150 μA movement, clear scale
Ranges—AC Volts 0–10, 50, 250, 1000V
DC Volts 0–5, 25, 125, 500, 2500V
DC Current 0–50 mA
Resistance 0–60 Kohms, 0–6 Mohms
Decibels −20 to +22 dB.
Carrying Case. Test Prods and Batteries included.
Size: 11·5 × 8·3 × 2·7 cm.
Price £9·85. Post 20p.

CASED TRANSFORMERS

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

SAFETY ISOLATING

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

VA (watts)	Ref No.	Price Cased £	Price Plugs 2 Pin 1 Earth	Price Open £	Post £
60	149	7·35	0·80	4·00	0·38
100	150	8·22	0·80	4·60	0·52
200	151	10·20	0·80	7·40	0·52
250	152	11·68	0·80	8·88	0·65
350	153	14·10	0·80	10·80	0·80
500	154	15·68	0·80	12·38	1·00
750	155	24·63	1·00	18·72	1·20
1000	156	32·19	1·00	26·50	1·20
1500	157	38·18	1·00	30·34	O.A.
2000	158	45·20	2·40	34·68	O.A.
3000	159	66·50	2·40	53·35	O.A.

12 & 24 Volts Prim. 200–240V.

Amps 12V	Amps 24V	Ref. No.	Price £	Post £
0·3	0·15	242	1·34	0·22
0·5	0·25	111	1·38	0·22
1	0·5	213	1·58	0·22
2	1	71	2·09	0·22
4	2	18	2·58	0·38
6	3	70	3·80	0·42
8	4	108	4·20	0·52
10	5	72	4·80	0·52
12	6	116	5·01	0.52
16	8	17	6·22	0·52
20	10	115	9·47	0·69
30	15	187	11·95	0·97
40	20	232	13·26	1·00
50	30	226	15·30	1·10

30 Volts

Prim. 200 240V. Sec. 12. 15. 20. 24. 30V.

Amps	Ref. No.	Price £	Post £
0·5	112	1·72	0·22
1	79	2·21	0·38
2	3	3·26	0·38
3	20	4·10	0·42
4	21	4·68	0·52
5	51	5·80	0·52
6	117	6·50	0·52
8	88	8·50	0·67
10	89	8·97	0·67

AUTO TRANSFORMERS

VA Watts	Ref. No.	Price Cased £	Price Plugs 2 & 3 pin	Price Open £	Post £
Tapped at 115, 220, 240 Volts					
20	113	3·00	0·15	1·55	0·30
Tapped at 115, 200, 220, 240 Volts					
150	4	5·80	0·15	3·98	0·39
200	65	6·40	0·15	4·50	0·40
300	66	7·27	0·15	5·28	0·52
500	67	9·99	0·15	8·29	0·67
750	83	12·56	0·75	9·76	0·82
1000	84	15·70	0·75	12·40	0·82
1500	93	19·88	0·75	16·58	1·50
2000	95	30·10	1·44	22·05	1·50
3000	73	43·58	1·90	32·00	1·90

50 Volts

Prim. 200 240V.
Sec. 19. 25. 33. 40. 50V.

Amps	Ref. No.	Price £	Post £
0·5	102	2·33	0·30
1	103	3·00	0·38
2	104	4·57	0·42
3	105	5·20	0·52
4	106	6·89	0·52
6	107	11·17	0·67
8	118	14·19	0·97
10	119	15 47	0·97

60 Volts

Prim. 230–240V.
Sec. 24. 30, 40. 48. 60V.

Amps	Ref. No.	Price £	Post £
0·5	124	2·08	0·38
1	126	2·96	0·38
2	127	4·63	0·42
3	125	6·84	0·52
4	123	7·94	0·67
5	40	8·86	0·67
6	120	10·15	0·82
8	121	13·58	1·00
10	122	18·15	1·00
12	189	16·00	1·10

MINIATURE AND EQUIPMENT

Prim. 240V with screen.

Volts Sec. 1	Volts Sec. 2	Milliamps Sec. 1	Milliamps Sec. 2	Ref. No.	Price £	Post £
3–0–3		200		238	1·23	0·10
0–6	0–6	500	500	234	1·30	0·10
0–6	0–6	1000	1000	212	1·93	0·22
9–0–9		100		13	1·23	0·10
0–9	0–9	330	330	235	1·48	0·10
0–8–9	0–8–9	500	500	207	1·75	0·22
0–8–9	0–8–9	1000	1000	208	2·30	0·36
15–0–15		40	—	240	1·23	0·10
0–15	0–15	200	200	236	1·30	0·10
20–0–20		30		241	1·23	0·10
0–20	0–20	150	150	237	1·30	0·10
0–15–20	0–15–20	500	500	205	2·47	0·38
0–20	0–20	300	300	214	1·72	0·22
0–20		3500	NO SCREEN	116	3·00	0·40
20–12–0–12–20		700 (D/C)	—	221	2·31	0·30
0–15–20	0–15–20	1000	1000	206	3·22	0·38
0–15–27	0–15–27	500	500	203	2·73	0·38
0–15–27	0–15–27	1000	1000	204	3·52	0·38

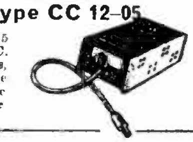
PLASTIC CASED SILICON BRIDGE RECTIFIERS

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

ADD 10p P & P PER ORDER

PLEASE ADD 8% FOR VAT

POWER UNIT Type CC 12–05



Output switched 3, 4·5, 6, 7·5 9 and 12 volts at 500 mA D.C. Operates from 240 V mains, suitable for Radios, Tape Recorders, Record Players etc Size 7·5 × 5·0 × 14·0cm. Price £3·95. Post 25p.

MINIATURE NEONS

6mm dia., 12mm length leads length approx. 20mm. Recommended ballast resistor 150K ohms for 240 Volt operation Price: Packet of 10 for 50p. Postage 10p.

A.S.P. LTD.

DEPT PW 3, SIMMONDS ROAD, WINCHEAP, CANTERBURY, KENT. Tel: (0227) 52436

CRYSTALS

Fast delivery of prototypes and production runs

INCLUDING:

Statek	LF crystals in TO5 package
Buckman	LF, clock, and mobile radio crystals
Astro	Filter crystals
Jan	General purpose crystals

Interface Quartz Devices Limited,
29 Market Street, Crewkerne, Somerset.
Tel: (046031) 2578 Telex: 46283

TTL & DIODES AT LOW PRICES!

ALL DEVICES EX-STOCK. PRICES INCLUDE VAT.

Type	1/24	25/99	Type	1/24	25/99	Type	1/24	25/99
7400	0·15	0·14½	7440	0·15½	0·14½	7480	0·50	0·47
7401	0·15½	0·14½	7442	0·73	0·68	7483	0·95	0·89
7402	0·15½	0·14½	7445	0·99	0·92	7486	0·35	0·34
7403	0·15½	0·14½	7447	0·98	0·98	7489	3·56	3·33
7404	0·18	0·16½	7450	0·15½	0·14½	7490	0·54	0·50
7405	0·18	0·16½	7451	0·15½	0·14½	7492	0·54	0·50
7408	0·18	0·16½	7453	0·15½	0·14½	7493	0·54	0·50
7410	0·15½	0·14½	7454	0·15½	0·14½	7495	0·73	0·68
7412	0·23	0·21	7460	0·15½	0·14½	7496	0·83	0·78
7413	0·33	0·32	7472	0·29	0·27	74107	0·36	0·34
7420	0·15½	0·14½	7473	0·33	0·32	74121	0·36	0·34
7430	0·15½	0·14½	7474	0·36	0·34	74123	0·72	0·67
7432	0·31	0·29	7475	0·51	0·50	74157	0·87	0·81
7437	0·31	0·29	7476	0·35	0·32	74175	1·01	0·95

DIODES 1N4148 4p, 1N4001 4½p, 1N4002 5p, 1N4003 6p, 1N4004 6p

All devices full spec. by famous manufacturers. TTL MAY BE MIXED FOR 25/99 PRICES. S.A.E. for full lists (includes capacitors and transistors). 10p P. & P. on orders under £1, otherwise POST FREE.

J. C. JONES (Dept. PWB)
46 BURSTELLARS, ST. IVES, HUNTINGDON PE17 4XX
(Mail Order only)

The largest selection

BRAND NEW FULLY GUARANTEED DEVICES

AC107	0·22
AC113	0·20
AC115	0·22
AC117K	0·32
AC122	0·13
AC125	0·19
AC126	0·19
AC127	0·20
AC128	0·20
AC132	0·16
AC134	0·16
AC137	0·16
AC141	0·20
AC141K	0·32
AC142	0·20
AC142K	0·28
AC151	0·17
AC154	0·22
AC155	0·22
AC156	0·22
AC157	0·27
AC165	0·22
AC166	0·22
AC167	0·22
AC168	0·27
AC169	0·16
AC176	0·22
AC177	0·27
AC178	0·31
AC179	0·31
AC180	0·22
AC180K	0·32
AC181	0·22
AC181K	0·32
AC187	0·24
AC187K	0·25
AC188	0·24
AC188K	0·25
ACY17	0·28
ACY18	0·22
ACY19	0·22
ACY20	0·22
ACY21	0·22
ACY22	0·18
ACY27	0·20
ACY28	0·21
ACY29	0·39
ACY30	0·31
ACY31	0·31
ACY34	0·23
ACY35	0·23
ACY36	0·31
ACY40	0·19
ACY41	0·20
ACY44	0·39
AD130	0·42
AD140	0·53
AD142	0·53
AD143	0·42
AD149	0·55
AD161	0·39
AD162	0·39

AD161 & AD162(MP)	75
ADT140	0·55
AF114	0·27
AF115	0·27
AF116	0·27
AF117	0·27
AF118	0·39
AF124	0·33
AF125	0·33
AF126	0·31
AF127	0·31
AF139	0·33
AF178	0·55
AF179	0·55
AF180	0·55
AF181	0·55
AF186	0·55
AF239	0·41
AL102	0·72
AL103	0·72
ASY26	0·28
ASY27	0·33
ASY28	0·28
ASY29	0·28
ASY50	0·28
ASY51	0·28
ASY52	0·28
ASY54	0·28
ASY55	0·28
ASY56	0·28
ASY57	0·28
ASY58	0·28
ASY73	0·28
ASZ21	0·44
BC107	0·9
BC108	0·9
BC109	0·9
BC113	0·11
BC114	0·17
BC115	0·17
BC116	0·17
BC117	0·20
BC118	0·11
BC119	0·33
BC120	0·88
BC125	0·13
BC126	0·20
BC132	0·13
BC134	0·20
BC135	0·13
BC136	0·17
BC137	0·17
BC139	0·44
BC140	0·33
BC141	0·33
BC142	0·33
BC143	0·33
BC145	0·50
BC147	0·11
BC148	0·11
BC149	0·13
BC150	0·20

BC151	0·22
BC152	0·19
BC153	0·31
BC154	0·33
BC157	0·20
BC158	0·13
BC159	0·13
BC160	0·50
BC161	0·55
BC167	0·13
BC168	0·13
BC168	0·13
BC170	0·13
BC171	0·16
BC172	0·16
BC173	0·16
BC174	0·16
BC175	0·24
BC177	0·21
BC178	0·21
BC179	0·21
BC180	0·27
BC181	0·27
BC182	0·16
BC182L	0·16
BC183	0·16
BC183L	0·16
BC184	0·22
BC184L	0·22
BC186	0·31
BC187	0·31
BC207	0·12
BC208	0·12
BC209	0·13
BC212L	0·14
BC213L	0·14
BC214L	0·18
BC225	0·28
BC226	0·29
BC301	0·30
BC302	0·27
BC303	0·35
BC304	0·40
BC440	0·34
BC460	0·40
BCY30	0·27
BCY31	0·29
BCY32	0·33
BCY33	0·24
BCY34	0·28
BCY70	0·16
BCY71	0·22
BCY72	0·16
BCZ10	0·22
BCZ11	0·28
BCZ12	0·28
BD115	0·68
BD116	0·88
BD121	0·66
BD123	0·72
BD124	0·76
BD131	0·55
BD132	0·66

BD133	0·72
BD135	0·44
BD136	0·44
BD137	0·50
BD138	0·55
BD139	0·61
BD140	0·66
BD155	0·88
BD175	0·66
BD176	0·66
BD177	0·72
BD178	0·72
BD179	0·77
BD180	0·77
BD185	0·72
BD186	0·72
BD187	0·77
BD188	0·77
BD189	0·83
BD190	0·83
BD195	0·94
BD196	0·94
BD197	0·99
BD198	0·99
BD199	£1·05
BD200	£1·05
BD205	0·88
BD206	0·88
BD207	£1·05
BD208	£1·05
BDY20	£1·10
BF115	0·27
BF117	0·50
BF118	0·77
BF119	0·77
BF121	0·50
BF123	0·55
BF125	0·50
BF127	0·55
BF152	0·61
BF153	0·50
BF154	0·50
BF155	0·77
BF156	0·53
BF157	0·61
BF158	0·61
BF159	0·66
BF160	0·44
BF162	0·44
BF163	0·44
BF164	0·44
BF165	0·44
BF167	0·24
BF173	0·24
BF176	0·39
BF177	0·39
BF178	0·33
BF179	0·33
BF180	0·33
BF181	0·33
BF182	0·44
BF183	0·44

BF184	0·28
BF185	0·33
BF187	0·30
BF188	0·44
BF194	0·13
BF195	0·13
BF196	0·16
BF197	0·16
BF200	0·50
BF222	£1·05
BF257	0·50
BF258	0·66
BF259	0·94
BF262	0·61
BF263	0·61
BF270	0·39
BF271	0·33
BF272	0·88
BF273	0·39
BF274	0·39
BFW10	0·66
BFX29	0·30
BFX84	0·24
BFX85	0·33
BFX86	0·24
BFX87	0·27
BFX88	0·24
BFY50	0·22
BFY51	0·22
BFY52	0·22
BFY53	0·19
BSX19	0·17
BSX20	0·17
BSY25	0·17
BSY26	0·17
BSY27	0·17
BSY28	0·17
BSY29	0·17
BSY38	0·20
BSY39	0·20
BSY40	0·31
BSY41	0·31
BSY95	0·14
BSY95A	0·14
Bu105	£2·20
C111E	0·55
C400	0·33
C407	0·28
C424	0·28
C425	0·55
C426	0·39
C428	0·22
C441	0·33
C442	0·33
C444	0·39
C450	0·24
MAT100	0·21
MAT101	0·22
MAT120	0·21
MAT121	0·22
MJE2955	0·95
MJE3055	0·62

MJE3440	0·55
MPF102	0·46
MPF104	0·41
MPF105	0·41
OC19	0·39
OC20	0·70
OC22	0·52
OC23	0·54
OC24	0·62
OC25	0·42
OC26	0·32
OC28	0·55
OC29	0·55
OC35	0·46
OC36	0·55
OC41	0·22
OC42	0·27
OC44	0·17
OC45	0·14
OC70	0·11
OC71	0·11
OC72	0·16
OC74	0·16
OC75	0·17
OC76	0·17
OC77	0·28
OC81	0·17
OC81D	0·17
OC82	0·17
OC82D	0·17
OC83	0·22
OC139	0·22
OC140	0·22
OC169	0·28
OC170	0·28
OC171	0·28
OC200	0·28
OC201	0·31
OC202	0·31
OC203	0·28
OC204	0·28
OC205	0·39
OC309	0·44
OCP71	0·48
ORP12	0·48
ORP60	0·44
ORP61	0·44
P20	0·55
P346A	0·22
P397	0·46
ST140	0·14
ST141	0·19
TIP29	0·48
TIP30	0·56
TIP31A	0·60
TIP32A	0·73
TIP41A	0·73
TIP42A	0·88
TIS43	0·34
UT46	0·30
ZN414	£1·20
2G301	0·21

2G302	0·21
2G303	0·21
2G304	0·27
2G306	0·44
2G308	0·39
2G309	0·39
2G339	0·22
2G339A	0·18
2G344	0·20
2G345	0·18
2G371	0·18
2G371B	0·13
2G373	0·19
2G374	0·19
2G377	0·33
2G378	0·18
2G381	0·18
2G382	0·18
2G401	0·33
2G414	0·33
2G417	0·28
2N388	0·39
2N388A	0·61
2N404	0·22
2N404A	0·31
2N524	0·46
2N527	0·54
2N598	0·46
2N599	0·50
2N696	0·14
2N697	0·15
2N698	0·27
2N699	0·39
2N706	0·09
2N706A	0·10
2N708	0·13
2N711	0·33
2N717	0·39
2N718	0·27
2N718A	0·55
2N726	0·31
2N727	0·31
2N743	0·22
2N744	0·22
2N914	0·16
2N918	0·33
2N929	0·23
2N930	0·23
2N1131	0·22
2N1132	0·24
2N1302	0·16
2N1303	0·16
2N1304	0·19
2N1305	0·19
2N1306	0·23
2N1307	0·23
2N1308	0·26
2N1309	0·26
2N1613	0·22
2N1711	0·22
2N1889	0·35
2N1890	0·50

2N1893	0·41
2N2147	0·79
2N2148	0·63
2N2160	0·66
2N2192	0·39
2N2193	0·39
2N2194	0·39
2N2217	0·24
2N2218	0·22
2N2219	0·22
2N2220	0·24
2N2221	0·22
2N2222	0·22
2N2368	0·19
2N2369	0·16
2N2369A	0·16
2N2411	0·27
2N2412	0·27
2N2646	0·52
2N2711	0·23
2N2712	0·23
2N2714	0·23
2N2904	0·19
2N2904A	0·23
2N2905	0·23
2N2905A	0·23
2N2906	0·17
2N2906A	0·20
2N2907	0·22
2N2907A	0·24
2N2923	0·16
2N2924	0·16
2N2925	0·16
2N2926(G)	14
2N2926(Y)	12
2N2926(O)	11
2N2926(R)	11
2N2926(B)	11
2N3010	0·77
2N3011	0·16

2N3053	0·19
2N3054	0·51
2N3055	0·45
2N3391	0·16
2N3391A	0·18
2N3392	0·16
2N3393	0·16
2N3394	0·16
2N3395	0·19
2N3402	0·23
2N3403	0·23
2N3404	0·31
2N3405	0·46
2N3414	0·17
2N3415	0·17
2N3416	0·31
2N3417	0·31
2N3525	0·83
2N3614	0·74
2N3615	0·82
2N3616	0·82
2N3646	0·10
2N3702	0·13
2N3703	0·13
2N3704	0·14
2N3705	0·13
2N3706	0·13
2N3707	0·14
2N3708	0·09
2N3709	0·10
2N3710	0·10
2N3711	0·10
2N3819	0·31
2N3820	0·55
2N3821	0·39
2N3823	0·31
2N3903	0·31
2N3904	0·33
2N3905	0·31
2N3906	0·30

2N4058	0·13
2N4059	0·11
2N1060	0·13
2N4061	0·13
2N4062	0·13
2N4284	0·19
2N4285	0·19
2N4286	0·19
2N4287	0·19
2N4288	0·19
2N4289	0·19
2N4290	0·19
2N4291	0·19
2N4292	0·19
2N4293	0·19
2N5172	0·13
2N5294	0·60
2N5457	0·35
2N5458	0·35
2N5459	0·44
2N6221	0·75
2S301	0·55
2S302A	0·46
2S302	0·46
2S303	0·61
2S304	0·77
2S305	0·86
2S306	0·86
2S307	0·86
2S321	0·62
2S322	0·46
2S322A	0·46
2S323	0·62
2S324	0·77
2S325	0·77
2S326	0·77
2S327	0·77
2S701	0·46
40361	0·44
40362	0·50

DIODES AND RECTIFIERS

AA119	0·09	BY128	0·17	OA10	0·15
AA120	0·09	BY130	0·18	OA47	0·08
AA129	0·09	BY133	0·28	OA70	0·08
AAY30	0·10	BY164	0·55	OA79	0·08
AAZ13	0·11	BYX38/300	0·46	OA81	0·08
BA100	0·11	BYZ10	0·39	OA85	0·10
BA116	0·23	BYZ11	0·33	OA90	0·07
BA126	0·24	BYZ12	0·33	OA91	0·07
BA148	0·16	BYZ13	0·28	OA95	0·08
BA154	0·13	BYZ16	0·44	OA200	0·07
BA155	0·16	BYZ17	0·39	OA202	0·08
BA156	0·15	BZY18	0·39	SD10	0·06
BA173	0·16	BVZ19	0·31	SD19	0·06
BY100	0·17	CG62		1N34	0·08
BY101	0·13	(OA91 Eq)	0·06	1N34A	0·08
BY105	0·19	CG651—		1N914	0·06
BY114	0·13	(OA70·79)	0·07	1N916	0·06
BY124	0·13	OA5	0·39	1N4148	0·06
BY126	0·16	OA5 short		IS021	0·11
BY127	0·17	leads	0·28	IS951	0·07

BB104 VARICAP BACK TO BACK 0·16

LINEAR I.C's—FULL SPEC.

Type No.	Price 1	25	100+
72702	50p	48p	45p
72709	25p	23p	20p
72709P	20p	19p	18p
72710	35p	33p	30p
72741	30p	29p	28p
72741C	28p	27p	26p
72741P	30p	29p	28p
72747	85p	80p	75p
72748P	38p	36p	34p
SL201C	59p	45p	40p
SL701C	50p	45p	40p
SL702C	50p	45p	40p
TAA263	80p	70p	60p
TAA293	£1·00	95p	90p
TAA350A	£1·85	£1·80	£1·70
μA703C	28p	26p	24p
μA709C	20p	19p	18p
μA711	35p	33p	30p
μA712	35p	33p	30p
TBA800	95p	93p	90p
76003	£1·50	£1·45	£1·40
760023	£1·50	£1·45	£1·40
76660	95p	93p	90p

INDICATOR TUBES

3015F Minitron .. .. £1·50
MAN 3M. L.E.D. 7-segment 0·127" .. .. .. £1·90
All indicators 0·9 + Decimal point. All side viewing. Full data for all types available on request.

DTL 930 SERIES LOGIC I.C's

Type	Price 1	25	100+
BP930	15p	14p	13p
BP932	16p	15p	14p
BP933	16p	15p	14p
BP935	16p	15p	14p
BP936	16p	15p	14p
BP944	16p	15p	14p
BP945	30p	28p	25p
BP946	15p	14p	13p
BP948	30p	28p	25p
BP951	70p	65p	60p
BP962	15p	14p	13p
BP9093	45p	43p	40p
BP9094	45p	43p	40p
BP9097	45p	43p	40p
BP9099	45p	43p	40p

Devices may be mixed to qualify for quantity price. Larger quantity prices on application. (DTL 930 Series only).

VOLTAGE REGULATORS

TO.3 Plastic 1·5 Amps
μA.7805/L129 5V (Equiv. to MVR5V) £1·35
μA.7812/L130 12V (Equiv. to MVR12V) £1·35
μA.7815/L131 15V (Equiv. to MVR15V) £1·35
μR7818 £1·35

74 Series T.T.L. I.C's

BI-PAK STILL LOWEST IN PRICE. FULL SPECIFICATION GUARANTEED. ALL FAMOUS MANUFACTURERS

Type	Quantities 1 £ p	25 £ p	100+ £ p	Type	Quantities 1 £ p	25 £ 0	100+ £ p	Type	Quantities 1 £ p	5 £2p	100+ £ p
7400	0·16	0·15	0·14	7448	1·10	1·07	1·05	74122	0·70	0·68	0·65
7401	0·16	0·15	0·14	7450	0·16	0·15	0·14	74123	0·75	0·73	0·70
7402	0·16	0·15	0·14	7451	0·16	0·15	0·14	74141	0·85	0·82	0·79
7403	0·16	0·15	0·14	7453	0·16	0·15	0·14	74145	1·30	1·25	1·20
7404	0·16	0·15	0·14	7454	0·16	0·15	0·14	74150	1·50	1·40	1·30
7405	0·16	0·15	0·14	7460	0·16	0·15	0·14	74151	1·10	1·05	1·00
7406	0·39	0·34	0·31	7470	0·32	0·29	0·27	74153	1·20	1·10	1·00
7407	0·39	0·34	0·31	7472	0·32	0·29	0·27	74154	1·70	1·65	1·60
7408	0·25	0·24	0·23	7473	0·41	0·39	0·35	74155	1·20	1·15	1·10
7409	0·25	0·24	0·23	7474	0·41	0·39	0·35	74156	1·20	1·15	1·10
7410	0·16	0·15	0·14	7475	0·60	0·58	0·56	74157	1·00	0·95	0·90
7411	0·25	0·24	0·23	7476	0·44	0·43	0·42	74160	1·40	1·35	1·30
7412	0·28	0·27	0·26	7480	0·60	0·58	0·85	74161	1·40	1·35	1·30
7413	0·32	0·31	0·30	7481	1·10	1·05	1·00	74162	1·40	1·35	1·30
7416	0·30	0·29	0·28	7482	0·90	0·85	0·80	74163	1·40	1·35	1·30
7417	0·30	0·29	0·28	7483	1·20	1·15	1·05	74164	1·80	1·75	1·70
7420	0·16	0·15	0·14	7484	1·00	0·97	0·95	74165	1·80	1·75	1·70
7422	0·30	0·29	0·28	7485	1·60	1·55	1·50	74166	1·60	1·53	1·50
7423	0·40	0·39	0·38	7486	0·35	0·34	0·33	74174	1·60	1·53	1·50
7425	0·40	0·39	0·38	7489	4·00	3·75	3·50	74175	1·10	1·05	1·00
7426	0·40	0·38	0·36	7490	0·65	0·63	0·60	74176	1·25	1·20	1·15
7427	0·40	0·38	0·36	7491	1·10	1·05	1·00	74177	1·25	1·20	1·15
7428	0·45	0·42	0·40	7492	0·74	0·71	0·64	74180	1·25	1·20	1·15
7430	0·16	0·15	0·14	7493	0·74	0·71	0·64	74181	3·95	3·85	3·75
7432	0·40	0·38	0·36	7494	0·85	0·82	0·75	74182	1·25	1·20	1·15
7433	0·42	0·40	0·38	7495	0·85	0·82	0·75	74184	1·80	1·75	1·70
7437	0·35	0·32	0·30	7496	0·96	0·93	0·86	74190	1·95	1·90	1·85
7438	0·35	0·32	0·30	74100	1·50	1·45	1·40	74191	1·95	1·90	1·85
7440	0·16	0·15	0·14	74104	0·60	0·58	0·55	74192	1·95	1·90	1·85
7441	0·74	0·71	0·64	74105	0·60	0·58	0·55	74193	1·95	1·90	1·85
7442	0·74	0·71	0·64	74107	0·44	0·42	0·40	74194	1·30	1·25	1·20
7443	1·20	1·15	1·10	74110	0·60	0·55	0·50	74195	1·10	1·05	1·00
7444	1·20	1·15	1·10	74111	0·90	0·88	0·85	74196	1·20	1·15	1·10
7445	1·60	1·55	1·50	74118	1·00	0·95	0·90	74197	1·20	1·15	1·10
7446	1·20	1·15	1·10	74119	1·50	1·40	1·30	74198	2·75	2·70	2·85
7447	1·10	1·07	1·05	74121	0·50	0·48	0·45	74199	2·50	2·40	2·30

Devices may be mixed to qualify for quantity price. (TTL 74 series only) data is available for the above series of I.C.'s in booklet form. Price 35p.

TRIPLE 66-bit DYNAMO SHIFT REGISTER EDSR 3166

Comprises three 66-bit 2 0 dynamic shift registers with independent inputs and outputs. TTL compatibility and buffered clock lines to reduce the capacitive load presented at the clock pins. A bootstrapped buffer ensures a full logic swing at the output.

NOW ONLY £1 EACH

DUAL-IN-LINE SOCKETS

14 & 16 Lead Sockets for use with DUAL-IN-LINE I.C's. TWO Ranges PROFESSIONAL & NEW LOW COST

PROF. TYPE No.	1-24	25-99	100up.
TSO 14 pin type	33p	30p	27p
TSO 16 pin type	38p	35p	32p
LOW COST No.			
BPS 14	16p	14p	12p
BPS 16	17p	15p	13p
BPS 8 pin type	15p	13p	11p

-the lowest prices!

BRAND NEW TEXAS GERM. TRANSISTORS
Coded and Guranteed

Pak No.			EQVT
T1	8	2G3713	OC71
T2	8	D1374	OC75
T3	8	D1216	OC81D
T4	8	2G381T	OC81
T5	8	2G382T	OC82
T6	8	2G344B	OC44
T7	8	2G345B	OC45
T8	8	2G378	OC78
T9	8	2G399A	2N1302
T10	8	2G417	AF117

All 54p each pak

ND 120 NIXIE DRIVER TRANSISTOR.
Suitable replacement for BSX 21, C 407, 2N 1893 120veb.

1	25	100+
0·19	0·17	0·16

Sil. trans. suitable for P.E. Organ. Metal TO-18 Eqvt. ZTX300 6p each. Any Qty.

GP 100 TO3 METAL CASE GERMANIUM
Vebo = 80V. Vceo = 50V. I.C. = 10 amps. Ptot = 30W. hfe = 30–170. Replaces the majority of Germanium power transistors in the OC, AD and NKT range.

1	25	100+
0·47	0·44	0·40

GP 300 TO3 METAL CASE SILICON
Vebo = 100V. Vceo = 60V I.C. = 15 amps. Ptot = 115W. hfe = 20. 100fT = 1MHz. Suitable replacement for 2N 3055, BDY 11 or BDY 20.

1	25	100+
0·55	0·53	0·51

NEW 9th EDITION
250 pages
TRANSISTOR EQUIVALENTS BOOK. A complete cross reference and equivalents book for European, American and Japanese Transistors. Exclusive to BI-PAK. £2·30 each.

A LARGE RANGE OF TECHNICAL AND DATA BOOKS ARE NOW AVAILABLE EX STOCK. SEND FOR FREE LIST.

GENERAL PURPOSE NPN SILICON SWITCHING TRANS. TO-18 SIM. TO 2N706/8. BSY-27/28/95A. All usable devices no open or short circuits. ALSO AVAILABLE in PNP Sim. to 2N2906, BCY70. When ordering please state preference NPN or PNP.

		£p
20	For	0·54
50	For	1·08
100	For	1·92
500	For	8·25
1000	For	14·30

SIL. G.P. DIODES £p

300mW	30	0·55
40PIV(Min.)	100	1·65
Sub-Min.	500	5·50
Fully Tested	1,000	9·90

Ideal for Organ Builders.

AD161/162
PNP
M/P COMP GERM. TRANS. OUR LOWEST PRICE OF 75p *PER PAIR.*

LOOK FOR OUR AUDIO & ELECTRONIC COMPONENTS ADVERTISEMENTS
PRACTICAL WIRELESS EVERYDAY ELECTRONICS AND RADIO CONSTRUCTOR

FULL RANGE OF ZENER DIODES VOLTAGE RANGE 2-33V. 400mV (DO-7 Case) 9p ea. 1¼W (Top-Hat) 18p ea. 10W (SO-10 Stud) 32p ea.

QUALITY TESTED SEMICONDUCTORS

Pak No.		Price £p
Q1	20 Red spot transistors PNP	0·54
Q2	16 White spot R.F. transistors PNP	0·54
Q3	4 OC 77 type transistors	0·54
Q4	6 Matched transistors OC44/45/81/81D	0·54
Q5	4 OC 75 transistors	0·54
Q6	5 OC 72 transistors	0·54
Q7	4 AC 128 transistors PNP high gain	0·54
Q8	4 AC 126 transistors PNP	0·54
Q9	7 OC 81 type transistors	0·54
Q10	7 LC 71 type transistors	0·54
Q11	2 AC 127/128 Complementary pairs PNP/NPN	0·54
Q12	3 AF 116 type transistors	0·54
Q13	3 AF 117 type transistors	0·54
Q14	3 OC 171 H.F. type transistors	0·54
Q15	7 2N2926 Sil. Epoxy transistors mixed colours	0·54
Q17	5 NPN 2×ST.141 & 3×ST.140	0·54
Q18	4 MADT'S 2×MAT 100 & 2×MAT 120	0·54
Q19	3 MADT's 2×MAT 101 & 1×MAT 121	0·54
Q20	4 OC 44 Germanium transistors A.F.	0·54
Q21	4 AC 127 NPN Germanium transistors	0·54
Q22	20 NKT transistors A.F. R.F. coded	0·54
Q23	10 OA 202 Silicon diodes sub-min	0·54
Q24	8 OA 81 diodes	0·54
Q25	15 IN914 Silicon diodes 75 PIV 75mA	0·54
Q26	8 OA95 Germanium diodes sub-min IN 69	0·54
Q27	2 10A PIV Silicon rectifiers IS425R	0·54
Q28	2 Silicon power rectifiers BYZ 13	0·54
Q29	4 Silicon transistors 2 × 2N696, 1 × 2N697, 1 × 2N698	0·54
Q30	7 Silicon switch transistors 2N706 NPN	0·54
Q31	6 Silicon switch transistors 2N708 NPN	0·54
Q32	3 PNP Silicon transistors 2×2N1131, 1×2N1132	0·54
Q33	3 Silicon NPN transistors 2N1711	0·54
Q34	7 Silicon NPN transistors 2N2369, 500MHz (code P397)	0·54
Q35	3 Silicon PNP TO-5. 2 × 2N2904 & 1×2N2905	0·54
Q36	7 2N3646 TO-18 plastic 300 MHz NPN	0·54
Q37	3 2N3053 NPN Silicon transistors	0·54
Q38	7 NPN transistors 3×2N3703, 2×2N3702	0·54

555 I.C. 65p each

All prices include V.A.T.

MAMMOTH I.C. PACK

APPROXIMATELY 200 PIECES ASSORTED MANUFACTURERS FALL-OUT INTEGRATED CIRCUITS INCLUDING LOGIC 74 SERIES LINEAR and AUDIO AMPLIFIERS MANY CODED also SOME UNKNOWN TYPES — YOU TO IDENTIFY
PAK NO. M.I.C. 200
PRICE £1·25 per PAK including p & p & V.A.T.

KING OF THE PAKS Unequalled Value and Quality

SUPER PAKS — NEW BI-PAK UNTESTED SEMICONDUCTORS

Money back refund if not satisfied

Pak No.	Description	Price £p
U 1	120 Glass Sub-Min. General Purpose Germanium Diodes	0·54
U 2	60 Mixed Germanium Transistors AF/RF	0·54
U 3	75 Germanium Gold Bonded Sub-Min. like OA5, OA47	0·54
U 4	40 Germanium Transistors like OC81, AC128	0·54
U 5	60 200mA Sub-Min. Silicon Diodes	0·54
U 6	30 Sil. Planar Trans. NPN like BSY95A. 2N706	0·54
U 7	16 Sil. Rectifiers TOP-HAT 750mA VLTG. RANGE up to 1000	0·54
U 8	50 Sil. Planar Diodes DO-7 Glass 250mA like OA200/202	0·54
U 9	20 Mixed Voltages, 1 Watt Zener Diodes	0·54
U10	20 BAY50 charge storage Diodes DO-7 Glass	0·54
U11	25 PNP Sil. Planar Trans. TO-5 like 2N1132, 2N2904	0·54
U13	30 PNP-NPN Sil. Transistors OC200 & 28 104	0·54
U14	150 Mixed Silicon and Germanium Diodes	0·54
U15	25 NPN Sil. Planar Trans. TO-5 like BFY51, 2N697	0·54
U16	10 3 Amp Silicon Rectifiers Stud Type up to 1000PIV	0·54
U17	30 Germanium PNP AF Transistors TO-5 like ACY 17-22	0·54
U18	8 6 Amp Silicon Rectifiers BYZ13 Type up to 600 PIV	0·54
U19	25 Silicon NPN Transistors like BC108	0·54
U20	12 1·5 Amp Silicon Rectifiers Top Hat up to 1000 PIV	0·54
U21	30 AF Germanium Alloy Transistors 2G300 Series & OC71	0·54
U23	30 MADT's like MHz Series PNP Transistors	0·54
U24	20 Germanium 1 Amp Rectifiers GJM Series up to 300 PIV	0·54
U25	25 300 MHz NPN Silicon Transistors 2N708, BSY27	0·54
U26	30 Fast Switching Silicon Diodes like IN914 Micro-Min.	0·54
U29	10 1 Amp SCR's TO-5 can, up to 600 PIV CRS1/25-600	1·08
U32	25 Zener Diodes 400mW DO-7 case 3-18 volts mixed	0·54
U33	15 Plastic Case 1 Amp Silicon Rectifiers IN4000 Series	0·54
U34	30 Silicon PNP Alloy Trans. TO-5 BCY26 28302/4	0·54
U35	25 Silicon Planar Transistors PNP TO-18 2N2906	0·54
U36	25 Silicon Planar NPN Transistors TO-5 BFY50/51/52	0·54
U37	30 Silicon Alloy Transistors SO-2 PNP OC200, 28322	0·54
U38	20 Fast Switching Silicon Trans. NPN 400 MHz 2N3011	0·54
U39	30 R.F. Germ. PNP Transistors 2N1303/5 TO-5	0·54
U40	10 Dual Transistors 6 lead TO-5 2N2060	0·54
U43	25 Sil. Trans. Plastic TO-18 A.F. BC113/114	0·54
U44	20 Sil. Trans. Plastic TO-5 BC115/116	0·54
U45	7 3A SCR. TO66 up to 600PIV	1·08
U46	20 Unijunction transistors similar to TIS43	0·54
U47	10 TO220AB plastic triacs 50V 6A	£1·08
U48	9 NPN Sil. power transistors like 2N3055	£1·08
U49	12 NPN Sil. plastic power trans. 60W like 2N5294/5296	£1·08

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

FREE
One 55p Pak of your own choice free with orders valued £4 or over

CADIUM CELLS
ORP12 48p

SIL. RECTS. TESTED

PIV	300mA	750mA		1A	1·5A	3A	10A	30A
50	0·05	0·06	1N4001	0·05	0·08	0·15	0·21	0·60
100	0·05	0·07	1N4002	0·06	0·10	0·17	0·23	0·75
200	0·06	0·10	1N4003	0·07	0·12	0·22	0·25	1·00
400	0·08	0·15	1N4004	0·08	0·15	0·30	0·38	1·35
600	0·09	0·17	1N4005	0·10	0·18	0·36	0·45	1·95
800	0·12	0·19	1N4006	0·11	0·20	0·38	0·55	2·10
1000	0·14	0·30	1N4007	0·12	0·25	0·48	0·65	2·50
1200	—	10·35			0·30	0·58	0·75	3·00

INTEGRATED CIRCUIT PAKS

Manufacturers "Fall Outs" which include Functional and Part-Functional Units. These are classed as 'out-of-spec' from the maker's very rigid specifications, but are ideal for learning about I.C's and experimental work.

Pak No.	Contents	Price	Pak No.	Contents	Price	Pak No.	Contents	Price
UIC00	12 × 7400	0·54	UIC46	5 × 7446	0·54	UIC90	5 × 7490	0·54
UIC01	12 × 7401	0·54	UIC48	5 × 7448	0·54	UIC91	5 × 7491	0·54
UIC02	12 × 7402	0·54	UIC50	12 × 7450	0·54	UIC92	5 × 7492	0·54
UIC03	12 × 7403	0·54	UIC51	12 × 7451	0·54	UIC93	5 × 7493	0·54
UIC04	12 × 7404	0·54	UIC53	12 × 7453	0·54	UIC94	5 × 7494	0·54
UIC05	12 × 7405	0·54	UIC54	12 × 7454	0·54	UIC95	5 × 7495	0·54
UIC06	8 × 7406	0·54	UIC60	12 × 7460	0·54	UIC96	5 × 7496	0·54
UIC07	8 × 7407	0·54	UIC70	8 × 7470	0·54	UIC100	5 × 74100	0·54
UIC10	12 × 7410	0·54	UIC72	8 × 7472	0·54	UIC121	5 × 74121	0·54
UIC20	12 × 7420	0·54	UIC73	8 × 7473	0·54	UIC141	5 × 74141	0·54
UIC30	12 × 7430	0·54	UIC74	8 × 7474	0·54	UIC151	5 × 74151	0·54
UIC40	12 × 7440	0·54	UIC76	8 × 7476	0·54	UIC154	5 × 74154	0·54
UIC41	5 × 7441	0·54	UIC80	5 × 7480	0·54	UIC193	5 × 74193	0·54
UIC42	5 × 7442	0·54	UIC81	5 × 7481	0·54	UIC199	5 × 74199	0·54
UIC43	5 × 7443	0·54	UIC82	5 × 7482	0·54			
UIC44	5 × 7444	0·54	UIC83	5 × 7483	0·54	UICXI	25 Assorted 74's	£1·65
UIC45	5 × 7445	0·54	UIC86	5 × 7486	0·54			

Packs cannot be split, but 25 assorted pieces (our mix) is available as PAK UIC XI.

1975 CATALOGUE NOW READY 10p

NEW LOW PRICED TESTED S.C.R.'s

PIV	1A TO5	3A TO66	5A TO66	5A TO64	7A TO48	10A TO48	16A TO48	30A TO48
50	0·26	0·28	0·39	0·39	0·52	0·55	0·59	1·27
100	0·28	0·37	0·52	0·52	0·55	0·64	0·70	1·54
200	0·39	0·41	0·54	0·54	0·63	0·67	0·83	1·76
400	0·48	0·52	0·62	0·62	0·74	0·83	1·03	1·93
600	0·59	0·63	0·75	0·75	0·85	1·07	1·38	—
800	0·70	0·77	0·88	0·88	0·99	1·32	1·65	4·40

DIACS
FOR USE WITH TRIACS.
BR100 (D32) 25p each

10 amp POTTED BRIDGE RECTIFIER on heat sink. 100PIV. 99p each

TRIACS

VBOM	2A TO-5	6A TO-66	10A TO-48
	p	p	£p
100	33	55	83
200	55	66	99
400	77	83	1·21

2 Amp. BRIDGE RECTS.

50 v RMS	35p each
100 v RMS	40p ,,
200 v RMS	45p ,,
400 v RMS	50p ,,
1,000 v RMS	55p ,,

Size 16 mm × 16 mm.

D1699 NPN SILICON DUAL TRANSISTOR
(Similar to 2N2060)

1	25	100+
0·28	0·26	0·23

LINEAR INTEGRATED CIRCUIT PAKS MANUFACTURERS FALL-OUTS

ULIC709	10 × 709	0·54
ULIC710	7 × 710	0·54
ULIC741	7 × 741	0·54
ULIC747	5 × 747	0·54
ULIC748	7 × 748	0·54

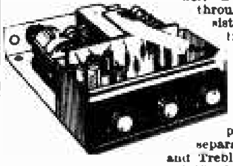
2N3055
115 WATT SIL POWER NPN
45p EACH

Giro No. 388-7006
Please send all orders direct to warehouse and despatch department

BI-PAK

P.O. BOX 6, WARE · HERTS
Postage and packing add 15p. Overseas add extra for airmail.
Minimum order 55p. Cash with order please.
Guaranteed Satisfaction or Money Back

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 ohm. Frequency response 12Hz-30KHz ± 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 × 6" wide × 7½" deep. AC 200/250V. **PRICE £12·50.** P. & P. 50p.

DE LUXE STEREO AMPLIFIER

A.C. mains 200-240 v. Using heavy duty fully isolated mains transformer with full wave rectification giving adequate smoothing with negligible hum. Valve line up:- 2 × ECL86 Triode Pentodes. 1 × 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 300m/v for full peak output of 4 watts per channel (8 watts mono), into 3 ohm speakers. Full negative feedback in a carefully calculated circuit, allows high volume levels to be used with negligible distortion. Supplied complete with knobs, chassis size 11"w × 4"d. Overall height including valves 5". Ready built & tested to a high standard. **£10·75.** P.&P. 50p.

POWER SUPPLY UNIT 200/240v. A.C. input. Four switched fully smoothed D.C. outputs giving 6v. and 7½v. and 9v. and 12v. at 1 amp on load. Fitted insulated output terminals and pilot lamp indicator. Hammer finish metal case overall size 6" × 3¾" × 2¼". Suitable for Transistor Radios, Tape Recorders, Amplifiers etc. etc. Ready built and tested. **PRICE £5·20** P. & P. 35p.

VYNAIR & REXINE SPEAKERS & CABINET FABRICS app. 54 in. wide. Our price £1·30 yd. length. P. & P. 15p per yd. (min. 1 yd.). S.A.E. for samples.

HARVERSON'S SUPER MONO AMPLIFIER

A super quality gram amplifier using a double wound fully isolated mains transformer, rectifier and ECL82 triode pentode valve as audio amplifier and power output stage. Impedance 3 ohms. Output approx. 3·5 watts. Volume and tone controls. Chassis size only 7in. wide × 3in. deep × 6in. high overall. AC mains 200/240v. Supplied absolutely Brand New completely wired and tested with good quality output transformer.
P. & P. 40p BARGAIN PRICE **£4·20**

FEW ONLY!
High grade mains transformer with grain orientated lamination. Primary 200/240 Secondary 18·5 volts at 0·6 amps and 4·6 volts at 0·3 amps. Size 2" h × 2¼" w × 2" d overall. £1·35 plus 25p P. & P.

BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0–210–240v. Secondary combinations 0–5–10–15–20–25–30–35–40–60v. half wave at 1 amp. or 10–0–10, 20–0–20, 30–0–30v. at 2 amps full wave. Size 3in. long × 3½in. wide × 3in. deep. Price £2·60 P. & P. 40p.

MAINS TRANSFORMER. For transistor power supplies. Pri. 200/240v. Sec. 9–0–9 at 500 mA. £1·25. P. & P. 25p. Pri. 200/240v. Sec. 12–0–12 at 1 amp. £1·40. P. & P. 26p. Pri. 200/240v. Sec. 10–0–10 at 2 amp. £2·00. P. & P. 35p.

8 VOLT RELAY
100 m/A single pole normally closed. 2 for 60p + 15p P.& P.

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 1¾" x 1¼" x ¾". Brand new complete with instructions. Price 1·20p. P. & P. 15p.

HANDBOOK OF TRANSISTOR EQUIVALENTS AND SUBSTITUTES
A must for servicemen and home constructors. Including many 1000's of British, U.S.A. European and Japanese transistors. ONLY 40p. Post 5p.

3 Reference Encyclopedias for Electronic Engineers and Designers, covering between them transistor characteristics, diode and transistor equivalents. Many thousands of up to date European types listed. **Diode Equivalents, 90p; Transistor Equivalents, £1·00; Transistor Characteristics, £1·30; POST FREE** All three together, £3·00

NEW ISSUE
Thyristor, Triac, Diac etc. encyclopedias 95p, Post Free

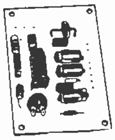
8 pole 3 way 2 bank low loss Yaxley type switches 1¾" sections. Standard spindle. 2 switches 64p + 10p P. & P.

HARVERSONIC MAINS OPERATED SOLID STATE STEREO FM TUNER

Enjoy fabulous stereo radio at this fabulous 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" wide × 8" deep by 2¾" high. Supplied ready built, fully tested and fully guaranteed (not available in kit form).
Price **£23·00** Post and Packing 50p.

STEREO-DECODER



SIZE 2" x 3" x ½" 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. £5·00 plus 10p. P. & P. Stereo beacon light if required 40p extra.

SPECIAL BARGAIN OFFER!
Limited number of BSR C123 Auto Changer De Luxe with lightweight tubular arm and stereo cartridge. **Brand new. ONLY £8·00 + p. & p. 60p.**

LATEST Hi Sensitivity Uni-directional slim-line condenser microphone as used by many professionals. Very low acoustic feedback. Available hi impedance or low impedance. State which required. £13·50 plus 25p P. & P

LATEST ACOS GP91/1SC mono compatible cartridge with t/o stylus for LP/EP/78. Universal mounting bracket. £1·46, P. & P. 15p.
CERAMIC STEREO CARTRIDGE. Universal Mounting brackets and turnover stylus. 70mV per channel output. ONLY £1·75 + 15p P. and P.
SONOTONE 9TAHC COMPATIBLE STEREO CARTRIDGE T/O stylus Diamond Stereo LP and Sapphire 78. **ONLY £2·27** P. & P. 10p. Also available fitted with twin Diamond T/O stylus for Stereo LP. £2·76, P. & P. 15p.
LATEST T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78. £1·60 P. & P. 15p. **LATEST T/O MONO COMPATIBLE CARTRIDGE** for playing EP/LP/78 mono or stereo records on mono equipment. Only £1·47, P. & P. 15p.

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 3 ohm speaker. Size 7in. wide × 3in. deep × 6in. high. Ready built and tested. PRICE £5·50, P. & P. 50p.
ALSO AVAILABLE mounted on board with output transformer and speaker. PRICE £6·70, P. & P. 60p.

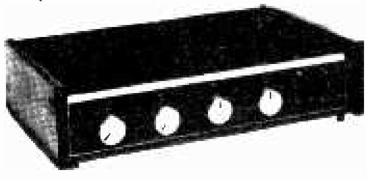
HI-FI LOUDSPEAKER SYSTEM MK II
Beautifully made, simulated teak finish enclosure with attractive slatted front. Size 16½" high × 10½" wide × 9" deep (approx.). Fitted with E.M.I. Ceramic Magnet 13" × 8" bass unit, H.F. tweeter unit and crossover. **AVAILABLE IN NOMINAL** 4 Ohm, 8 Ohm or 16 Ohm impedance (state which).
OUR PRICE £9.50 each Carr. 90p
Cabinet Available Separately £5·00, Carr. 90p
Also available in 8 ohms with EMI 13" × 8" bass speaker with parasitic tweeter £8·00, Carr. 90p.

LOUDSPEAKER BARGAINS
5in. 3 ohm £1·25, P. & P. 15p. 7 × 4in. 3 ohm £1·40, P. & P. 20p. 10 × 6in. 3 or 15 ohm £2·10, P. & P. 30p. E.M.I. 8 × 5in. 3 ohm with high flux magnet £1·70, P. & P. 20p. E.M.I. 13½ × 8in. with high flux ceramic magnet with parasitic tweeter 3, 8 or 15 ohm £3·50, P. & P. 30p. E.M.I. 13 × 8in. 3, 8 or 15 ohm with inbuilt tweeter and crossover network £4·65, P. & P. 30p.
E.M.I. tweeter. Approx. 3½". Available 3 or 8 or 15 ohms, £1·25 + 20p, P. & P.

BRAND NEW. Bakers Loudspeakers at substantial discounts. 12in. 15w. H/D Speakers, 3, 8 or 15 ohms. State which. Current production by well-known British maker. Now with Hiflux ceramic ferrobar magnet assembly £7·50. Guitar models: 25w £7·50, 35w, £7·50, P.&P. 45p.

"POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER
Size 11¾" × 14⁹⁄₁₆" × 1¼" 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 £6·60 each. P. & P. 34p.
NOW ALSO AVAILABLE: 8", 10 watts, r.m.s. 20 watt peak 40Hz-20,000Hz. Overall depth 1". Ideal for Hi-Fi or for use in cars. £4·32 + 25p P. and P.

HARVERSONIC SUPER SOUND 10 + 10 STEREO AMPLIFIER KIT



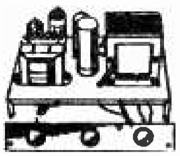
A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Silicon Transistors in the first five stages on each channel resulting in even lower noise, level with improved sensitivity. Integrated pre-amp with Bass, Treble and two Volume Controls. Suitable for use with Ceramic or Crystal 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 5 ohms. Frequency response ±3dB 12-30,000 Hz Sensitivity: better than 80mV into 1MΩ. Full power bandwidth: ±3dB 12-15,000 Hz. Bass boost approx. to ±12dB. Treble cut approx. to −16dB. Negative feedback 18dB over main amp. Power requirements 35v. at 1·0 amp. Overall Size 12"w. × 8"d. × 2¾"h.
Fully detailed 7 page construction manual and parts list free with kit or send 18p plus large S.A.E.

AMPLIFIER KIT	£12·96	P. & P. 30p
(Magnetic input components 33p extra)		
POWER PACK KIT	£4·32	P. & P. 40p
CABINET	£4·32	P. & P. 40p

(Post Free if all units purchased at same time)
Full after sales service
Also available ready built and tested £23·08. Post Free.

Note: The above amplifier is suitable for feeding two mono sources into inputs (e.g. mike, radio, twin record decks, etc. and will then provide mixing and fading facilities for medium powered Hi-Fi Discotheque use, etc.

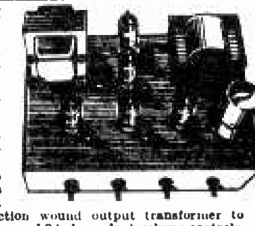
3-VALVE AUDIO AMPLIFIER HA34 MK II



Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7¾"w. × 4"d. × 4¾"h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 4½ watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only £6·50. P. & P. 45p.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc £5·50 P. & P. 45p.

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 base and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet 15p + SAE (Free with parts)' All parts sold separately. ONLY £10·25 P. & P. 60p. Also available ready built and tested £14·00 P. & P. 70p.

HI-FI STEREO HEADPHONES
Adjustable headband with comfortable flexifoam ear-muffs. Wired and fitted with standard stereo ¼in jack plug. Frequency response 30–15,000Hz. Matching impedance 8–16 ohms. Easily converted for Mono. PRICE £3·50, P. & P. 25p.

PRICES INCLUDE VAT

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.

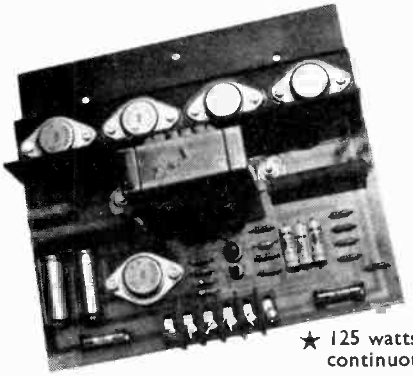
HARVERSON SURPLUS CO. LTD.
(Dept. P.W.) 170 HIGH ST., MERTON, LONDON, S.W.19 Tel.: 01-540 3985
A few minutes from South Wimbledon Tube Station.
SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

(Please write clearly)
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

TUAC

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

NEW TUAC POWER MODULES offering more power and quality than ever before.



Specification on all power, modules: All output power ratings ± 0·5dB; Output impedance 8-15 ohms; THD at full power 2% typically 1%; Input sensitivity 60mV into 10kΩ; Frequency response 20Hz–20kHz ±2dB; Hum and noise better than —70dB.

TP125
7 x 6½ x 3in

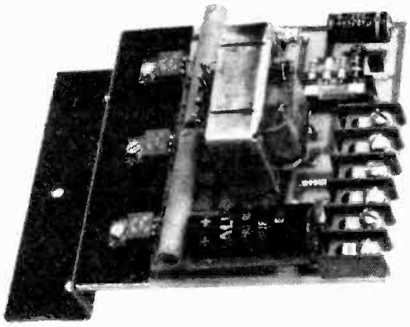
£17·00

★ 125 watts RMS continuous sine wave output

★ 4 R.C.A. 150 watt 15 amp output transistors

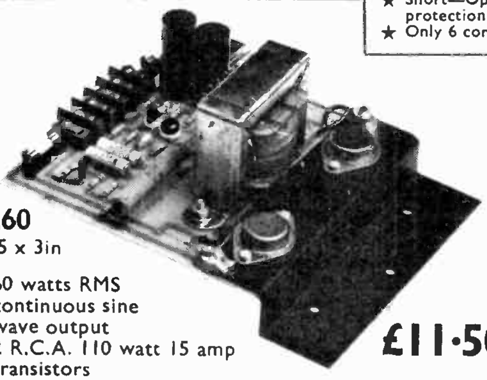
TL30
4 x 5¼ x 2½in

£7·90



★ 30 watts RMS continuous sine wave output
★ 2 R.C.A. 40 watt output transistor

★ Rugged layer wound driver transformer.
★ Short—Open—and Thermal overload protection
★ Only 6 connections



TL60
5 x 5 x 3in

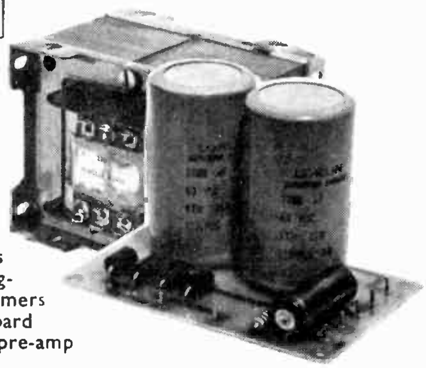
★ 60 watts RMS continuous sine wave output
★ 2 R.C.A. 110 watt 15 amp transistors

£11·50

TL100
5 x 5 x 3in

★ 100 watts R.M.S. continuous sine wave output
★ 2 R.C.A. 150 watt 15 amp transistors

£13·20



Power supplies vacuum impregnated Transformers with supply board incorporating pre-amp supply:

PS 125 ± 50 volts for one TP125	**£11·50**
PS 100 ± 45 volts for one TL100	**£10·50**
PS 60 ± 40 volts for one TL60	**£9·30**
PS 30 + 50 volts for one TL30	**£5·90**
PSU 2 for supplying disco mixer	**£4·65**

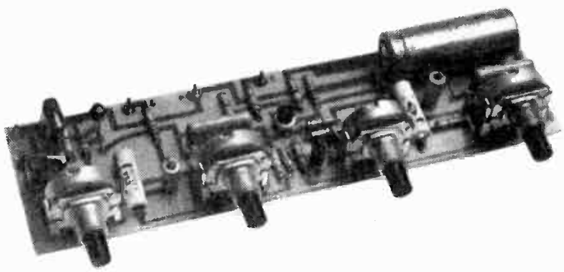
PREAMPLIFIERS

All TUAC audio modules are constructed on glass fibre P.C. board, are ready assembled and fully tested. Low noise silicon and FET transistors together with H.S. carbon film resistors are used throughout. Extensive research has gone into various wide range tone control circuits producing superb sound quality from any signal.

VAO8 Vol. Treble, Mid and Bass controls. Hi. IMP. FET. I/P suitable Mid. Guitar, Radio, Crystal/Ceramic P.U. Sensitivity 4mV. Treble +35dB at 16kHz. Mid +20–15dB at 1Hz Bass + 20· 10dB at 40Hz. **£4·90**

VAO6 Vol. Treble and Bass controls. Sensitivity 8mV. Treble +28–15dB at 12kHz. Bass +18dB at 40Hz. **£4·15**

SVAO1 STEREO PRE AMP; Vol. Treble, Mid and Bass controls. Hi, IMP. FET, I/P suitable Mid, Guitar, Radio, Crystal/Ceramic P.U. Sensitivity 4mV. Treble + 35dB at 16kHz. Mid + 20–15dB at 4kHz. Bass +20 10dB at 40Hz Plus Full Balance Control **£10·00**



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

ACCESS & BARCLAY CARDS ACCEPTED · Just Send or Phone us Your Number · H.P. ARRANGED THROUGH PAYBONDS

Marshall's

A. Marshall & Son (London) Limited Dept. PW
42 Cricklewood Broadway London NW2 3HD Tel: 01-452 0161
& 85 West Regent Street Glasgow G2 2QD Tel: 041-332 4133

Everything you need is in our new 1975 catalogue. Available now price 25p

Trade and export enquiries welcome

PW TELE TENNIS

As featured in PRACTICAL WIRELESS July - November 1974.
Also on BBC Nationwide and in the Daily Mail October 2nd 1974.

This exciting new game is now available in kit form. Due to popular demand we are now able to offer a fantastic saving on list prices. Ideal game for whole family. No need to modify your TV set, just plugs in to aerial socket. Parts list as follows:

A	Resistor Pack	£1·00	p.p. 20p
B	Potentiometer Pack	£1·25	p.p. 20p
C	Capacitor Pack	£3·10	p.p. 20p
D	Semiconductor Pack	£14·50	p.p. 20p
E	IC Sockets	£4·00	p.p. 20p
F	Transformer	£1·15	p.p. 25p
G	PCB's	£7·50	p.p. 20p
H	Switches	£4·50	p.p. 20p
I	UHF Modulator Kit	£7·20	p.p. 20p

Special Prices—complete kit (excluding case) £42·00 p.p. 50p Sections A-F incl. £23·50 plus 30p. Assembly instructions with complete kit of 75p on request.

SN7400	16p	SN7420	20p	SN7453	16p	SN7491	£1·10
SN7401	16p	SN7423	37p	SN7454	16p	SN7492	75p
SN7401AN	38p	SN7425	37p	SN7460	16p	SN7493	65p
SN7402	16p	SN7427	45p	SN7470	30p	SN7494	85p
SN7403	16p	SN7430	16p	SN7472	38p	SN7495	80p
SN7404	24p	SN7432	45p	SN7473	44p	SN7496	£1·00
SN7405	24p	SN7437	35p	SN7474	48p	SN74100	£2·16
SN7406	45p	SN7438	35p	SN7475	59p	SN74107	43p
SN7407	45p	SN7440	16p	SN7476	45p	SN74118	£1·00
SN7408	25p	SN7441	85p	SN7480	75p	SN74119	£1·92
SN7409	33p	SN7442	85p	SN7481	£1·25	SN74121	57p
SN7410	16p	SN7445	£1·59	SN7482	87p	SN74122	80p
SN7411	25p	SN7446	£2·00	SN7483	£1·20	SN74123	72p
SN7412	28p	SN7447	£1·30	SN7484	95p	SN74141	£1·00
SN7413	50p	SN7448	£1·50	SN7485	£1·58	SN74150	£1·44
SN7416	45p	SN7450	16p	SN7486	45p	SN74190	£1·95
SN7417	30p	SN7451	16p	SN7490	65p		

TRY OUR NEW GLASGOW SHOP

Prices correct at October 1974, but all exclusive of V.A.T.
Post and Package 20p postage and package charges

Popular Semi-conductors

2N696	22p	2N3707	13p	AD142	59p	BC309	10p	LM709	48p
2N697	16p	2N3708	70p	AD143	45p	BC327	21p	TO99	38p
2N698	40p	2N3715	£1·50	AD161	50p	BC328	19p	8DIL	33p
2N699	45p	2N3716	£1·80	AD162	50p	BCY70	17p	14DIL	40p
2N1302	19p	2N3771	£2·20	AD161 }	pr	BCY71	22p	LM723C	90p
2N1303	19p	2N3772	£1·80	AD162 }	£1·20	BCY72	13p	LM741	
2N1304	24p	2N3773	£3·20	AF109R	40p	BD123	82p	TO99	40p
2N1305	24p	2N3819	37p	AF115	24p	DB131	40p	8DIL	40p
2N1306	31p	2N3820	38p	AF124	30p	BD132	50p	14DIL	38p
2N1307	22p	2N3823	£1·42	AF125	30p	BD135	42p	LM747	£1·00
2N1308	25p	2N3904	27p	AF126	28p	BD136	49p	LM7805	£2·00
2N1309	36p	2N3905	24p	AF127	28p	BD137	55p	MC1310	£2·92
2N1671	£1·44	2N4036	63p	AF139	39p	BD138	63p	MJ480	90p
2N1671A	£1·54	2N4037	42p	AF178	55p	BD139	71p	MJ481	£1·14
2N1671B	£1·72	2N4216	20p	AF179	65p	BD140	87p	MJ490	98p
2N1671C	£4·32	2N4289	34p	AF180	58p	BF115	25p	MJ491	£1·38
2N2102	50p	2N4921	73p	AF239	51p	BF116	23p	MJE340	45p
2N2147	78p	2N4922	84p	AF240	72p	BF117	43p	MJE2955	£1·12
2N2148	94p	2N4923	83p	AF279	54p	BF154	16p	MJE3055	68p
2N2160	60p	2N5190	92p	AF280	54p	BF163	32p	MFC4000B	40p
2N2218A	22p	2N5191	95p	BC107	16p	BF180	35p	MFC4010A	49p
2N2219	24p	2N5192	£1·24	BC108	15p	BF181	34p	MFC4060	54p
2N2219A	26p	2N5195	£1·46	BC109	19p	BF184	30p	MFC6040	91p
2N2221	18p	2N5245	43p	BC147	12p	BF194	12p	NE555V	70p
2N2221A	21p	2N5457	49p	BC148	13p	BF195	12p	NE560D	£4·48
2N2222	20p	2N5458	45p	BC149	12p	BF196	13p	NE531	£4·48
2N2222A	25p	2N5459	49p	BC167B	13p	BF197	15p	NE565A	£4·48
2N2646	55p	40361	48p	BC168B	13p	BF198	18p	OC28	76p
2N2904	22p	40362	50p	BC168C	11p	BF200	40p	OC42	50p
2N2904A	24p	40363	88p	BC169B	13p	BF237	22p	OC71	20p
2N2905	24p	40406	44p	BC169C	13p	BF238	22p	OC72	25p
2N2905A	26p	40407	33p	BC182	12p	BFX29	30p	SL414A	£1·80
2N2906	19p	40408	50p	BC182L	12p	BFX30	27p	TAA263	£1·00
2N2906A	21p	40409	52p	BC183	12p	BFX84	24p	TBA800	£1·50
2N2907	22p	40410	52p	BC183L	12p	BFX85	30p	TBA810	£1·50
2N2907A	24p	40411	£2·00	BC184	13p	BFX87	28p	TIP29A	49p
2N2926	11p	40602	46p	BC184L	13p	BFX88	25p	TIP30A	58p
2N3053	25p	40604	56p	BC212K	16p	BFX89	45p	TIP31A	62p
2N3054	60p	40669	£1·00	BC212L	16p	BFY19	62p	TIP328	74p
2N3055	75p	AC117	20p	BC214L	21p	BFY51	23p	TIP33A	£1·01
2N3441	97p	AC126	20p	BC237	13p	BFY52	21p	TIP34A	£1·51
2N3442	£1·69	AC127	20p	BC238	13p	BFY90	75p	TIP35A	£2·90
2N3415	10p	AC128	20p	BC239	13p	BRY39	48p	TIP36A	£3·70
2N3416	15p	AC151V	25p	BC257	14p	C106D	65p	TIP41A	79p
2N3417	21p	AC152V	17p	BC258	13p	CA3020A	1·80	TIP42A	90p
2N3702	11p	AC153K	25p	BC259	14p	CA3046	70p	TIP2955	98p
2N3703	12p	AC176	18p	BC300	36p	CA3048	£2·11	TIP3055	60p
2N3704	14p	AC176K	25p	BC301	34p	CA3089E	£1·96	ZTX300	13p
2N3705	12p	AC187K	23p	BC307	11p	CA30900	£4·23	ZTX302	20p
2N3706	9p	AC188K	34p	BC308	12p	LM301A	46p	ZTX500	15p

12" LONG PERSISTANCE CRT. Full spec. Price **£6·50** to include V.A.T. and Carriage.

MAKE YOUR SINGLE BEAM SCOPE INTO A DOUBLE WITH OUR NEW LOW PRICED SOLID STATE SWITCH. 2 Hz to 8 MHz. Hook up a 9 volt battery and connect to your scope and have two traces for ONLY **£6·25**, P. & P. 25p. (Not cased, not calibrated.)

WIDE RANGE WOBBULATOR. 5 MHz to 150 MHz up to 15 MHz sweep width. Only 3 controls, preset RF level, sweep width and frequency. Ideal for 10·7 or TV IF alignment, filters, receivers. Can be used with any general purpose scope. Full instructions supplied. Connect 6 3V A.C. and use within minutes of receiving. All this for ONLY **£6·75**, P.&P. 25p. (Not cased, not calibrated.)

20 Hz to 200 kHz WB.

SINE and SQUARE GENERATOR. Four ranges. Independent amplitude controls, thermistor stabilised. Ready to use, 9V supply required. **£8·85** each, P. & P. 25p. (Not cased, not calibrated.)

GRATICULES 12cm x 14cm high quality plastic **15p** each, P. & P. 5p.

Large quantity of good quality components — **NO PASSING TRADE** — so we offer 3lbs of **ELECTRONIC GOODIES** for **£1·50**. Post paid.

ROTARY SWITCH PACK—6 brand new switches (1 ceramic; 1 off 4pole 2 way etc.). **50p**, P. & P. 20p.

P.C.B. PACKS S. & D. Quantity 2 sq ft—no tiny pieces. **50p** plus **P.** & P. 20p.

CAPACITOR PACK—50 Brand new components, only **50p**, P. & P. 20p.

TRIMMER PACK. 2 Twin 50/200pF ceramic 2 Twin 10/60pF ceramic; 2 min. strip with 4 preset 5/20pF on each; 3 air spaced preset 30/100pF on ceramic base. ALL BRAND NEW. **25p** the lot. P. & P. 10p.

PHOTOCELL equ. OCP71, **13p** each. **MULLARD** OCP70—**10p** each.

DELIVERED TO YOUR DOOR 1 cwt of Electronic Scrap chassis, boards, etc. No rubbish. FOR ONLY **£4·00**.

MODERN TELEPHONES type 706. Two-tone grey, **£3·75** each. Two-tone green **£3·75** each. Black **£3·75** each. P. & P. 35p.

Ideal **EXTENSION TELEPHONES** with standard GPO type dial, bell and lead coding. **£1·75** each, P. & P. 35p.

HANDSETS — complete with 2 Inserts and lead **75p** each, P. & P. 37p. **DIALS ONLY 75p** each, P. & P. 25p.

HIGH VALUE—PRINTED BOARD PACK. Hundreds of components, transistors, etc.—no 2 boards the same—no short leaded transistor computer boards **£1·75** post paid.

Beehive Trimmer 3/30 pf
Brand new. Qty. 1–9 **13p** ea. P. & P. 15p 10–99 **10p** ea. P. & P. 25p; 100–999 **7p** ea. P. & P. free.

HF Crystal Drive Unit. 19in. rack mount. Standard 240V input with superb crystal oven by Labgear (no crystals) **£5** ea. Carr. **£2·00**

1000pf FEED THRU CAPACITORS only sold in packs of 10, **30p**, P. & P. 10p.

ALWAYS some **CHEAP SCOPES AVAILABLE**—or build your own—send for our tube list with a S.A.E.

PLEASE ADD V.A.T. AT 8%
OPEN 9 a.m. to 6.30 p.m. ANY DAY

Use Access here

CHILTMEAD LTD

BARCLAYCARD

7/9 ARTHUR ROAD, READING, BERKS.
(near Tech. College) Tel.: Reading 582605/65916

YOUR CAREER in *RADIO & ELECTRONICS?*

Big opportunities and big money await the qualified man in every field of Electronics today—both in the U.K. and throughout the world. We offer the finest home study training for all subjects in radio, television, etc., especially for the CITY & GUILDS EXAMS (Technicians' Certificates); the Grad. Brit. I.E.R. Exam.; the RADIO AMATEUR'S LICENCE; P.M.G. Certificates; the R.T.E.B. Servicing Certificates; etc. Also courses in Television; Transistors; Radar; Computers; Servo-mechanisms; Mathematics and Practical Transistor Radio course with equipment. We have OVER 20 YEARS' experience in teaching radio subjects and an unbroken record of exam. successes. We are the only privately run British home study College specialising in electronics subjects only. Fullest details will be gladly sent without any obligation.

To: British National Radio & Electronics School, Dept W.C. 35, P.O. Box 156, Jersey, C.I.

Please send FREE BROCHURE *to*

NAME .... Block

ADDRESS .... Caps.

.... Please

....

BRITISH NATIONAL RADIO AND ELECTRONICS SCHOOL

ALL OUR PRICES INCLUDE V.A.T.

£5·50 Post 25p.

R.C.S. DISCO DECK
SINGLE RECORD PLAYER

Fitted with auto stop complete with cartridge. Baseplate. Size 11in × 8½in. Turntable. Size 7in. diameter. A/C mains. 200/250V motor has a separate winding 14 volt to power a small amplifier. Three speeds. Plays all records.

COMPACT PORTABLE STEREO HI-FI

Two full size loudspeakers 13½ × 10 × 3½in. Player unit clips to loudspeakers making it extremely compact. Overall size only 13½ × 10 × 8½in. 3 watts per channel, plays all records 33 rpm, 45 rpm. Separate volume & tone controls. 240v AC mains.

Attractive Teak finish Weight 13lbs. Bargain Price **£25** 85p carriage

SPECIAL OFFER

SMITH'S CLOCKWORK 15 AMP TIME SWITCH 0–60 MINUTES
Single pole two-way, Surface mounting with fixing screws. Will replace existing wall switch to give light for return home, garage, automatic anti-burgular lights, etc. Variable knob. Turn on or off at full or intermediate settings. Makers last list price £4·50. Brand new and fully guaranteed. Fully insulated. OUR PRICE £2·20 Post 25p

WEYRAD P50—TRANSISTOR COILS

RA2W Ferrite Aerial..85p	Printed Circuit, PCA1..85p
I.F. P50/2CC 470 kc/s..40p	J.B. Tuning Gang ..£1·20
3rd I.F. P50/3CC......40p	Weyrad Booklet 10p
Spare Cores 3p	OPT1 ....65p
P50/IAC 60p	Driver Trans. LFDT4..65p

Ferrite Rod 8 × ⅜in. 20p 6 × $\frac{5}{16}$in. 20p 3 × ⅜in. 10p

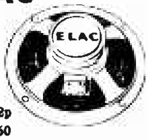
VOLUME CONTROLS

5 K. ohms to 2 Meg. LOG or LIN. L/S 20p. D.P. 35p. STEREO L/S 55p. D.P. 75p. Edge 5K.S.P. Transistor 25p

80 Ohm Coax 5p. yd.

BRITISH AERIALITE AERAXIAL-AIR SPACED 40 yd. £2; 60 yd. £3. FRINGE LOW LOSS Ideal 625 & colour **10p yd.**

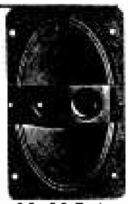
8in or 10 x 6in ELAC HI-FI SPEAKER



Dual cone plasticised roll surround. Large ceramic magnet. 50–16,000 c/s. Bass resonance 55 c/s. 8 ohm 10 watt. **£3·75** Each Post 52p

10 inch 12 watt Twin Cone, 8 ohm £4:50

E.M.I. 13½ × 8in. SPEAKER SALE!



With twin tweeters and crossover, 10 watt. State 3 or 8 or 15 ohm. (As illustrated) **£4·50** Post 25p

With flared tweeter cone and ceramic magnet. 10 watt. Bass res. 45–60 c/s. Flux 10,000 gauss. State 3 or 8 or 15 ohm. Post 25p **£3·25**

BOOKSHELF CABINET Size 16 × 10 × 7in. teak finish **£6·60** Post 45p

E.M.I. 13 × 8 in. BASS WOOFER. 20 WATTS RUBBER CONE SURROUND. £5·50 Post 25p.

BLANK ALUMINIUM CHASSIS. 18 s.w.g. 2½in. sides 6 × 4in. 45p; 8 × 6in. 53p; 10 × 7in. 65p; 12 × 8in. 85p; 14 × 9in. 90p; 16 × 6in. 90p; 12 × 3in. 50p; 16 × 10in. £1. ALUMINIUM BOXES 3 × 3 × 3in. 60p; 4 × 4 × 4in. 70; 6 × 4 × 4in. 80p; 9 × 4 × 4in. £1; 12 × 4 × 4in. £1·30. ALUMINIUM PANELS 18 s.w.g. 6 × 4in. 12p; 8 × 5in. 19p; 14 × 3in. 20p; 10 × 7in. 24p; 12 × 5in. 25p; 12 × 8in. 34p; 16 × 6in. 34p; 14 × 9in. 40p; 12 × 12in. 47p; 16 × 10in. 60p PAXOLIN PANEL 10 × 8in. 30p.

SPECIAL OFFER

100 ohm 20W Rheostat 2½in. diam. Ceramic Former, screw terminals, ¼in. diam. spindle. 95p, post 25p.

ANOTHER RCS BARGAIN!

ELAC 9 × 5in. HI-FI SPEAKER. TYPE 59RM. THIS FAMOUS AND WIDELY USED UNIT NOW AVAILABLE AT BARGAIN PRICE 10 WATT, 8 OHM. CERAMIC MAGNET. **£2.95**

R.C.S. STABILISED POWER PACK KITS

All parts and instructions with Zener Diode, Printed Circuit, Bridge Rectifiers and Double Wound Mains Transformer. Input 200/240V a.c. Output voltages available 6 or 9 or 12 or 15 or 18 or 20V d.c. at 100mA or less. PLEASE STATE VOLTAGE REQUIRED. Details S.A.E. Size 3½ × 1½ × 1¼in. **£2·20** Post 20p

R.C.S. GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

Ideal for Mike, Tape, P.U., Guitar, etc. Can be used with Battery 9–12v. or H.T. line 200–300V. d.c. operation. Size 1½" × 1¼" × ½". Response 25 c/s. to 25 Kc/s, 26 dB gain. For use with valve or transistor equipment. Full instructions supplied. Details S.A.E. **£1.25** Post 20p

TEAKWOOD LOUDSPEAKER GRILLS. Will easily fit to baffle board. Size 18½ × 10½in—75p. 10½ × 7½in—45p.

E.M.I. WOOFER AND TWEETER KIT

Woofer 10½ × 6½in. Ceramic Magnet, 44oz. 18,000 lines. Tweeter 3½in. square, 10,000 lines. Crossover condenser full instructions supplied. Impedance 8 ohms. Power 12 watts. **£5·75** Post 45p.

BRITISH FM/VHF TUNING HEART

88 to 108 M/CS British made. 2 Transistors ready aligned requires 10·7 M/CS I.F. Complete with tuning gang. Connections supplied but some technical experience essential **Our price £3·95** 10·7 M/Cs IF Strip £4·95

DECODER = £4·75

MAINS TRANSFORMERS

All post 25p each

250-0-250 8mA. 6·3V 2amp..........................£2·00
250-0-250 80 mA. 6·3V 3·5A 6·3V 1A or 5V 2A......£2·50
350-0-350 80 mA 6·3V 3·5A, 6·3V 1A or 5V 2A....£3·00
300-0-300V 120mA, 6·3V 4A C.T.; 6·3V 2A........£4·25
MINIATURE 200V 20mA, 6·3V 1A £1
MIDGET 220V 45mA, 6·3V 2A £1.10
HEATER TRANS. 6·3V ½ amp 85p. 3 amp £1·20
GENERAL PURPOSE LOW VOLTAGE. Trapped outputs at 2 amp. 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24 and 30V £4·00
1 amp, 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 £4·00
2 amp, 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 £6·00
3 amp, 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 £7·50
5 amp, 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 £9·75
3, 5, 8, 10, 13V or 5-0-5V 5 amp. £1·50; 6-0-6V 500mA 90p 9V 1 amp 95p 12V 300mA 75p 12V 500mA 85p 12V 750mA 95p. 12, 36, 48V 2 amp £2. 20V 3 amp £2. 40V. 3A £2·50. 22.0.22V 4A £3. 16V ½ amp. 95p. 16V 2 amp £1·85.
AUTO TRANSFORMERS, 115V to 230V or 230V to 115V 150W £4; 500W £7·50; 750W £15; 1000W £18.
BATTERY CHARGERS. Ready built with leads and clips 1½ amp £2; 4 amp £4; 5 amp. £4·50.
FULL WAVE BRIDGE CHARGER RECTIFIERS; 6 or 12V outputs. 1½ amp 40p; 2 amp 55p; 4 amp 85p.

MAINS ISOLATING TRANSFORMER

Primary 0-110-240V. Secondary 0-240V. 3A. 720W. Insulated terminals. Varnish impregnated. Fully enclosed in steel case with fixing feet. OUR PRICE **£12** Carr. 95p Famous make. (Value £19)
Can be used as 800W auto transformers 240-110V.
IDEAL FOR COLOUR T.V. OR GARDEN TOOLS.

NEW ELECTROLYTIC CONDENSERS

2/350V ..	14p	100/25V ..	10p	50+50/300V ..	50p
4/350V ..	14p	250/25V ..	14p	350+50/325 ..	85p
8/350V ..	22p	500/25V ..	20p	32+32/350V ..	40p
16/350V	25p	100+100/275V	65p	32+32/450V ..	60p
32/450V	35p	150+200/275V	70p	32+32+32/350V	65p
32/500V	50p	8+8/450V ..	22p	32+32+32/450V	85p
25/25V ..	10p	8+16/450V	25p	900/350V ..	95p
50/50V ..	10p	16+16/450V	40p	4700/63V ..	95p

LOW VOLTAGE ELECTROLYTICS
1, 2, 4, 5, 8, 16, 25, 30, 50, 100, 200mF. 15V. 10p.
500mF. 12V. 15p; 25V. 20p; 50V. 30p.
1000mF. 12V. 20p; 25V. 35p; 50V. 47p; 100V. 70p.
2000mF. 6V. 25p; 25V. 42p; 50V. 57p.
2500mF. 50V. 62p; 3000mF. 25V. 47p; 50V. 65p.
5000mF. 6V. 25p; 12V. 42p; 25V. 75p; 35V. 85p; 50V. 95p.

MICRO SWITCH. Single Pole Change Over. 20p.
MICRO SWITCH. Sub Min 25p.

CERAMIC 1pF to 0·01mF, 4p. Silver Mica 2 to 5000pF, 4p. PAPER 350V–0·1 7p, 0·5 13p; 1mF 15p; 2mF 150V 15p. 500V-0·001 to 0·05 4p; 0·1 10p; 0·25 13p; 0·47 25p. TWIN GANG. "0–0" 208pF+176pF, £1·20; 500pF standard 75p; 365+365 with 25+25pF Slow motion drive 50p. SHORT WAVE, SINGLE. 10pF 30p; 25pF 55p; 50pF 55p. NEON PANEL INDICATORS. 250V AC/DC Amber 25p. RESISTORS. ¼W, ½W, 1W, 20% 1p; 2W, 5p. 10 Ω to 10M. HIGH STABILITY. ½ w. 2% 10 ohms to 6 meg., 10p. Ditto 5% Preferred values 10 ohms to 10 meg., 4p. WIRE-WOUND RESISTORS. 5 watt, 10 watt, 15 watt 10 ohms to 100K 10p each. TAPE OSCILLATOR COIL. Valve Type 35p.

NEW MODEL "BAKER LOUDSPEAKER" 12in. 50 watt GROUP 50/12 8 or 15 ohm high power full range. Professional quality. **£12·95**

BAKER MAJOR 12" £8·50

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 20 watts. NOTE: 3 or 8 or 15 ohms must be stated.

Module kit, 30–17,000 c/s with tweeter, crossover, baffle and instructions. **£10·95** Post free
Please state 3 or 8 or 15 ohms.

BAKER "BIG-SOUND" SPEAKERS

'Group 25'	'Group 35'	'Group 50'
12 inch 25 watt **£7·75** 3 or 8 or 15 ohm	12 inch 35 watt **£8·50** 3 or 8 or 15 ohm	15" 50 w **£17·80** 8 or 15 ohm

TEAK VENEERED HI-FI SPEAKER CABINETS
For 12in. or 10in. dia. speaker 20 × 13 × 9" £10·50 Post 75p
For 13 × 8in. or 8in. speaker 16 × 10 × 7" £6·60 Post 45p
For 8 × 5in. speaker 16 × 8 × 6" £4·95 Post 35p
For 6in. and tweeter 12 × 8 × 6" £4·00 Post 35p
LOUDSPEAKER CABINET WADDING 18in. wide, 20p ft

EMI 6½in. HI-FI WOOFER

8 ohm, 10 watt. Large ceramic magnet. Special Rubber cone surround. Frequency response 30–12,000 c/s. Ideal P.A. Columns, Hi-Fi Enclosure Systems, etc. Suitable cabinet 12 × 8 × 6 £4·00. Suitable Tweeter £2·00. **£4**

ELAC CONE TWEETER

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 c/s to 18,000 c/s. Size 3½ × 3½ × 2in. deep. Rating 10 watt, 8 ohm Suitable Crossover £1·30 **£1·90** Post 20p

SPEAKER COVERING MATERIALS. Samples Large S.A.E. Horn Tweeters 2–16kc/s, 10W 8 ohm or 15 ohm £1·95 CROSSOVERS TWO-WAY 3000cps 3 or 8 or 15 ohm £1·30 LOUDSPEAKERS 8 OHMS. 7 × 4in. £1·25; 6½in. £1·50. 8 × 5in. £1·60 8in. £1·75; 10 × 6in. £1·90; 10in. £2·00. SPECIAL OFFER: 80 ohm, 2½in.; 2¾in. 35 ohm. 3in., 25 ohm. 2½in. dia., 5in. dia, 6" × 4" 15 ohm, 3½in. dia.; 6 × 4in.; 7 × 4in.; 8 × 5in. 8 ohm, 2½in.; 2¾in.; 3½in.; 5in. dia. (6 × 4in. 8 ohm £1·50) **£1 EACH TYPE** RICHARD ALLAN TWIN CONE LOUDSPEAKERS. 8 in. diameter 4 watt £2·50. 10in. diameter 5 watt £2·95; 12 in. diameter. 6 watt £3·50. VALVE OUTPUT TRANS. 40p; MIKE TRANS. 50:1 40p. Mike trans. mu metal 100:1 £1·25.

MAJOR 100 WATT ALL PURPOSE GROUP OR DISCO AMPLIFIER

All purpose transistorised. Ideal for Groups, Disco and P.A. 4 inputs speech and music. 4 way mixing. Output 8/15 ohm. a.c. Mains. Separate treble and bass controls. **£49** Carr. £1·00
MAJOR 50 WATT 4 INPUTS. 2-WAY MIXING £39·95 IDEAL FOR DISCO OR PA.

3-WAY CROSSOVER 950 CPS and 3000 CPS with leads ready assembled **£1·95**

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER. Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt. **£4·50**
TWO CHANNEL STEREO VERSION **£5·95**

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built, with volume, treble and bass controls 18v. DC operation. **£3·95**

COAXIAL PLUG 10p. PANEL SOCKETS 10p. LINE 18p COAXIAL OUTLET BOXES, surface, 35p. BALANCED TWIN FEEDER 300 ohms 7p yard. JACK SOCKET Std. open-circuit 15p, closed-circuit 23p. Chrome Lead Socket 45p. Phono Plugs 8p. Phono Socket 8p. JACK PLUGS Std. Chrome 20p; 3·5mm Chrome 12p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 25p. DIN PLUGS 3-pin 18p; 5-pin 25p. VALVE HOLDERS. 5p; CERAMIC 10p; CANS 5p.

REVERSIBLE 4 POLE MOTOR £2·25

1,400 r.p.m. Reversible 42 Watt, Post 25p spindle 1½" × 7/32", size 3½" × 3". As illustrated. With Cooling Fan 240V A.C.

E.M.I. GRAM MOTOR £1·00

120v. or 240v. A.C. 2,400 rpm. 2-pole 70mA. Size 2¼ × 2½ × 2½ in. Post 25p.

RADIO COMPONENT SPECIALISTS

337 WHITEHORSE ROAD, CROYDON
Open 9—6 Wed. 9—1 Sat. 9—5 (Closed for lunch 1.15—2.30)
Buses 50, 68, 159. Rail Selhurst. Tel. 01-684 1665

Minimum post 20p. Illustrated Brochure, Radio Books & Components Lists 10p.

MAPLIN ELECTRONIC SUPPLIES

Get your 1975 CATALOGUE!

Includes dozens of useful & interesting circuits you can build; data; hundreds of pictures, transistor equivalents list and hundreds of new lines. Packed with information. Only 35p.

SUPERSONIC SAME-DAY-SERVICE-MEANS QUALITY COMPONENTS-FAST!

● RESISTORS

CARBON FILM

⅓W 1 Ω to 1M: 5%, IM2 to 10M: 10% E12
½W 1Ω to 10Ω: 5%, IM2 to 10M: 10%
E12 11 Ω to 910k: 5% E12 & E24 1p each

METAL OXIDE

½W 10 Ω to 1M: 2% E12 & E24 4p each

WIREWOUND

3W 0·22 Ω, 0·27 Ω, 0·33 Ω, 0·47 Ω: 10%, 1 Ω5% 17p each
1·2 Ω to 270 Ω: 5% E12 13p each
Other ranges stocked. See our catalogue for details.
E12: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82 and decades.
E24: 11, 13, 16, 20, 24, 30, 36, 43, 51, 62, 75, 91 and decades.

● POTENTIOMETERS

Rotary miniature carbon track ¼" spindle.
Values available: 5k, 10k, 25k, 50k, 100k, 250k, 500k, 1M, 2M.
Log. Single-gang 16p
Lin, Single-gang (+ 1K) 16p
Log. or Lin. Single-gang with switch 33p
Log. or Lin. Dual-gang without switch 49p
Slider 60mm track. Metal-cased: overall length 86·15mm (knob extra 7p)
Log. or Lin. Single-gang 1k, 5k, 10k, 25k, 50k, 100k 36p each
Log. or Lin. Dual-gang 1k, 5k, 10k, 25k, 50k, 100k 45p each
Presets: 0·1W Vertical or Horizontal.
100 Ω, 220 Ω, 470 Ω, 1K, 2k2, 4k7 10k, 22k, 47k, 100k, 220k, 470k, 1M 7p each

● CAPACITORS

Sub-miniature
Axial lead electrolytic

Mfd	V	Price	Mfd	V	Price	Mfd	V	Price
1	63	6p	68	6·3	6p			
1·5	63	6p	68	16	6p			
2·2	63	6p	68	63	14p			
3·3	63	6p	100	4	6p			
4·7	63	6p	100	10	6p	470	6·3	6p
6·8	40	6p	100	25	6p	470	10	14p
6·8	63	6p	100	40	6p	470	25	16p
10	25	6p	100	63	16p	470	40	25p
10	63	6p	150	6·3	6p	680	6·3	14p
15	16	6p	150	16	6p	680	16	16p
15	40	6p	150	25	6p	680	25	25p
15	63	6p	150	40	14p	680	40	28p
22	10	6p	150	63	16p	1000	4	14p
22	25	6p	220	4	6p	1000	10	16p
22	63	6p	220	10	6p	1000	16	25p
33	6·3	6p	220	16	6p	1000	25	28p
33	16	6p	220	25	14p	1500	6·3	16p
33	40	6p	33	40	6p	1500	10	25p
47	4	6p	220	63	25p	1500	16	28p
47	10	6p	330	4	6p	2200	6·3	25p
47	25	6p	330	10	6p	2200	10	25p
47	·0	6p	330	16	14p	3300	6·3	28p
47	63	6p	330	63	28p	4700	4	28p

● MAINS CONNECTORS

P360 3-pin 1·5A Chassis Plug with Line Socket 30p
SA2190 3-pin 5A Chassis Plug 22p
SA1862 Line Socket for SA2190 25p
P437 3-pin 5A Chassis Socket with Line Plug 55p

● TRANSISTORS & DIODES

AC127	18p	BY126	13p
AC128	18p	BY127	13p
AC176	17p	BY164	49p
AD161/162 MP	93p	BZY88 series	13p
BA100	9p	MPF102	36p
BA145	22p	OA91	6p
BC107	10p	OA200	7p
BA108	10p	OC71	20p
BC109	13p	SC146D	88p
BC109C	15p	T1843	28p
BC142	23p	WOO5	30p
BC143	26p	WO4	33p
BC147	10p	1N914	4p
BC148	10p	1N4001	6p
BC149	12p	1N4002	6½p
BC168C	12p	1N4003	7p
BC169C	12p	1N4004	7½p
BC178	17p	1N4005	8p
BC182L	10p	1N4006	8½p
BC183L	12p	1N4007	9p
BC184L	12p	1N4148	4p
BC212L	14p	2N1302	20p
BC213L	15p	2N1303	20p
BC214L	18p	2N1304	30p
BCY71	22p	2N1711	24p
BD131	45p	2N2219	25p
BD132	54p	2N2646	45p
BD131/BD132 MP	£1·20	2N2905	33p
		2N2926 Or, Ye, or Gn	10p
BD135	36p		
BD139	49p	2N3053	18p
BD140	69p	2N3055	49p
BF258	35p	2N3819	22p
BF259	25p	2N5459	51p
BFX29	30p	7400	16p
BFX30	33p	7413	39p
BFX84	30p	7447	£1·10
BFX85	36p	7473	54p
BFX87	30p	7474	45p
BFX88	25p	7490	93p
BFY50	20p	7493	93p
BFY51	22p	74121	39p
BFY52	20p		

L.E.D. RED
2mcd ⅛" only 15p
Panel mtg. clip 5p
(Other colours and 7-seg. displays in our catalogue)

● INTEGRATED CIRCUITS

CA3046 (14-pin DIL) 69p
LH0042CH (TO99) £4·25
MC1310P (14-pin DIL) £2·50
MC1496 (UA796) (14-pin DIL) 95p
MFC4000B 59p
MFC6040 83p
NE555V (8-pin DIL) 65p
SC1495 (14-pin DIL) £2·70
SG3402 (14-pin DIL) £1·69
µA741C (8-pin DIL) 36p
µA741C (14-pin DIL) 45p
µA747C (14-pin DIL) £1·05
µA748C (8-pin DIL) 39p
ZN414 (TO18) £1·20

VOLTAGE REGULATORS

µA7805 5V 1·5A (TO3) £1·75
µA7815 15V 1·5A (TO3) £2·30
MVR 5V, 12V, 15V, 500mA (TO3) £1·60
µA78MO5 5V 500mA (Plastic power) £1·30
µA78M15 15V 500mA (Plastic power) £1·30
µA78LO5 5V 100mA (TO92) 60p
µA78L15 15V 100mA (TO92) 60p
µA723C Variable 2 to 37V (TO99 or 14-pin DIL) 75p
Our catalogue contains application circuits and data for all the above I.C.'s and many more

● DISCOUNTS

Details in our catalogue. Start collecting MES Discount Vouchers NOW!

● SWITCHES

Rotary adjustable stop. 1 pole, 2 to 12 way; 2 pole, 2 to 6 way; 3 pole, 2 to 4 way; 4 pole, 2 or 3 way 36p each
Slide Sub-min DPDT 9p
Slide Min. DPDT 13p
Push to make Non-locking SPST 14p
Push-on, Push-off Locking DPDT 250V 4A 48p
Rocker White DPST 250V 10A 40p
Rotary Mains DPST 250V 2A 20p
Toggle with ON/OFF plate DPDT 250V 1·5A 25p

BCD OUTPUT SLIDE SWITCH
Marks the end of the old-fashioned thumb-wheel switch With 7-segment type read-out. Full details in our catalogue. £1·38

● PLUGS & SOCKETS

DIN	PLUG	CHASSIS SOCKET
2-pin	8p	6p
3-pin	9p	7p
4-pin	10p	7p
5-pin A (180°)	10p	7p
5-pin B (240°)	10p	7p
6-pin	10p	9p

JACK PLUGS
¼in. Std. Mono Plastic Barrel 13p
¼in. Std. Mono Metal Barrel 24p
¼in. Std. Stereo Plastic Barrel 18p
¼in. Std. Stereo Metal Barrel 30p
2·5mm Plastic Barrel 9p
2·5mm Metal Barrel 15p
3·5mm Plastic Barrel 9p
3·5mm Metal Barrel 15p

JACK CHASSIS SOCKETS
2·5mm Open-type metal 9p
3·5mm Open-type metal 9p
¼" Std. Mono Open-type metal 10p
¼" Std. Mono Moulded with 2 break contacts 14p
¼" Std. Stereo Open-type metal 15p
¼" Std. Stereo Moulded with 3 break contacts 18p

PHONO
Plastic-topped Plug 5p
Screened Plug 12p
Chassis Socket Single 4p
Chassis Socket Twin 6p

● TRANSFORMERS

LT700 min. output. Pri. 1k2; Sec. 5 Ω 200mW 50p
Sub-min mains 6-0-6V 100mA 95p; 12-0-12V 50mA 95p
(Size both approx. 30 × 27 × 25mm)
Min. mains
0-6V 500mA, 0-6V 500mA £1·36
0-12V 250mA, 0-12V 250mA £1·36
0-20V 150mA, 0-20V 150mA £1·36
0-24V 125mA, 0-24V 125mA £1·36
Mains MT3AT: Sec: 12-15-20-24-30V 2A £3·60
Mains MT206AT: Sec: 0-15-20V 1A, 0-15-20V 1A £3·98

● ORGAN CONSTRUCTION

A Full Scale Electronic Organ that you can Build to Your Own Specification.

FULL CONSTRUCTIONAL DETAILS IN OUR LEAFLETS

Leaflet MES 51: Price 15p, describes a fully polyphonic basic organ which can later be used as the basis of a large sophisticated instrument. Leaflet MES 52: Price 5p continues the description of the MES 50 series organs and shows you how to add a second keyboard with lots more stops.

● THE AMAZING DMO2

A ready-built, tested and guaranteed digital master oscillator. Accurately generates the top 13 notes for your organ system and reduces the complete tuning of your organ to ONE SIMPLE adjustment. New design gives selectable C to C output ranges of (approx.) 4k to 8k (highest) or 2k to 4k or 1k to 2k, etc. right down to 16Hz to 32Hz! And this new compatible design is even smaller:—only 3·5in × 3·7in including gold-plated edge connexion.
DMO2T includes built in variable depth and rate frequency shift tremulant.
DMO2 £12·25 DMO2T £14·25
SAJ 110: 7-stage frequency divider in 14-pin DIL package. Sine or square wave input. Square wave output may be converted to saw-tooth. £1·80 each or 6 for £9·94 or 12 for £18·16.
Keyboards high quality, fully sprung.
Flat-front 48-note F to E £15·95
Sloping-front 49-note C to C £15·95
Sloping-front 61-note C to C £20·44
Swell pedal with 10k log, pot £5·93
*Spring Line Unit (Short) £3·05
*Spring Line Unit (Long) £7·59
*Reverberation Driver Module £5·34
* S.A.E. please for full details: leaflet MES 24.
Gold-clad phosphor-bronze wire 30p per yd.
Palladium earth bar 15p per octave length.
Contact Blocks 2-make (GB2) 22p
Stop Tabs rocker type not engraved (white, red, grey or black) with DPDT switch 49p

SPECIAL OFFER

5W Audio Amp 1C TBA 810S with Data and Circuits Price £1.00.

"ELECTRONICS TODAY INTERNATIONAL"

4600 SYNTHESISER

We stock all parts for this brilliantly designed synthesiser. This includes all the P.C.B.s, metal-work and drilled and printed front panel giving a truly professional finish. Authoritative opinions agree the E.T.I. International Synthesiser is technically superior to most of today's models. Complete constructional details in our booklet, available shortly. S.A.E. please for price list and specification.

We also stock all parts for the P.E. Synthesiser and Minisonic.

P.O. BOX 3, RAYLEIGH, ESSEX. Tel.: Southend-on-Sea (0702)44101

VAT Please add 8% to the final total. Post and packing FREE in U.K. (15p handling charge on orders under £1).

First-class post pre-paid envelope supplied free with every order.

Thou shalt not listen!

HOW many of our readers have tuned their radio receivers over the long, medium, short and v.h.f. wavebands and have often paused to identify and listen to the many different transmissions that can be received?

There are many radio transmissions that can be picked up on domestic receivers that if received by you—and it is necessary to listen, to identify these transmissions—you would by listening, be committing an indictable offence under Section 5 of the 1949 Wireless Telegraphy Act.

Pause for a moment to think—how many of us have listened to either the police, fire brigade, taxis or aircraft transmissions that suddenly appear—often breaking through on top of other stations—as we tune our v.h.f./f.m. receivers or tuners? You are all GUILTY of the offence of LISTENING and the penalties for this offence are severe!

We have recently received, from a department of the Home Office, a letter which draws attention to the receiver design, *Low Frequency and Marine Receiver* by Charles Heath, that appeared in the January 1975 issue of this magazine. This receiver, if constructed and used for listening to transmissions from other than broadcast or licensed Amateur stations, render the listener liable for prosecution. It was requested that we should draw this interpretation of the 1949 Act to the attention of our readers.

Many of our wavebands—especially the Amateur bands are operated on a shared basis. This means that you—members of the public—may listen to licensed Amateur stations within these bands but not to the unending garble that emanates from the transmitters of the so-called "privileged" user. Take for example, one form of privileged transmission that litters the 80m Amateur band—not Amateur stations—they have no privilege: we refer to the never-ending "traffic" between North Sea oil rigs and their base stations. These stations, operating within the 80m Amateur band transmit without any identification for *prolonged* periods. Thou shalt not listen to them!

Quite recently, there was a spate of station closure notices, some served without prior warning, upon licensed Amateur stations (the non-privileged) by the Home Office—for what could only be, in the opinion of many, minor infringements of the regulations.

Licensed Amateur stations are required to identify themselves regularly during transmission times. Hands up anyone who has heard the station operators on oil rigs identify themselves? Remember, we are now discussing transmissions from "privileged" users in an Amateur band. These are but a few of the many "privileged" transmissions that, in the opinion of the Home Office, are entitled to a degree of privacy of transmission. These regulations are seeking to preserve the confidential nature of the messages which are not intended for reception by members of the public. There is no privacy or sanctuary for the licensed radio Amateur.

During a recent BBC television programme (Barlow, BBC-1, Jan. 8th, 1975) it was stated that it was *not illegal* to listen to public service broadcasts!! Poor Barlow—who will have whom on the carpet this time?

A recent report in the *Daily Express* (see Letters on page 1036 of this issue "Plane Spotters Beware") brings forth comment from one of our readers.

Listeners, beware!!

LIONEL E. HOWES—Editor.

NEWS...

Frequency List from the United States

THE most casual twirl of the dial of an all-band receiver reveals hundreds of radio signals that are neither broadcasters nor radio amateurs. Many of these signals are unintelligible meaningless sounds, and although your curiosity may be aroused to wonder who they are, finding out has, up to now, not been a simple or easy task. The purpose of this book is to shed some light on the question of identification of these many signals—predicated upon information not generally available in print.

The title of this book, Confidential Frequency List, is not intended to be facetious. In every country around the world there are prohibitions about "listening in" or "monitoring" the stations listed in this book. These prohibitions range from extreme to extreme: including outright forbidding (with penalties) to simple warnings that the content of the broadcasts must not be revealed to a third party. Although it is problematical how some of these prohibitions can be enforced—and what useful purpose they serve—it is NOT the desire, nor intent, of the author and/or the publisher to encourage circumvention.

This handbook is the distillation of various data from a great number of sources: private commercial, governmental and off-the-air monitoring. Although every effort possible has been made to verify these data, it is not to be expected that this book is 100% accurate. However, in the opinion of the author and publisher, it is the best that can be done without specifically violating some governmental radio security, although "classified" radio stations can frequently be overheard on many ordinary radio receivers.

Copies of the Confidential Frequency List are available from the publishers, *Ham Radio Magazine, Greenville, New Hampshire, U.S.A.* for £1·70. Payment may be made either by international money order or a British cheque.

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

Calculator programmer

A NEW programming device, developed by Advance Electronics Limited for use with the 162P low-cost programmable calculator extends the capabilities of this machine for dealing with routine, repetitive calculations. Programmes are punched onto a plastic strip which is fed through a slot in the calculator to load the programme into the machine. Thus standard programmes of up to 40 steps in length can be held in permanent form. In addition, a simple mechanical "punch" is available for users to write their own programmes.

On the standard 162P calculator, programmes are fed into the machine directly from the keyboard, and the calculator can retain two programmes at any one time: one of up to 30 steps and one of up to ten steps in length.

Although these limitations are not significant for many applications, there are cases where users are continually carrying out several standard calculations, and clearly these users will benefit from having the programme in a permanent form ready to load into the machine.

In operation, the new programming device bypasses the indentations on a sprocketed plastic strip, which is fed over a sensing device by a miniature drive motor. A novel principle is used in the patented sensing device; the indentations in the plastic strip are 'detected' by a row of miniature ball bearings which then depress a strip of electrically conductive rubber onto a row of contacts.

The plastic strips are about 30cm long (the exact length depends on the number of programme steps required), and are shaped so that pushing the strip into the slot on the calculator starts up the drive mechanism.

The 162P calculator fitted with the new programming mechanism and complete with the programming punch costs £249 (Plus V.A.T.). The mechanical punch for writing the programmes is available separately at a cost of £15. In addition, Advance Electronics is making available a series of commonly used programmes, as well as providing an advisory service to users who wish to write their own programmes. More information from: *Advance Electronics Ltd., Calculator Division, Raynham Road, Bishop's Stortford, Herts.*

Heathkit catalogue

THE new Heathkit catalogue contains details of a great range of kits—many available for the first time in this country, like GR-1075 AM/FM Digital Electronic Alarm Clock-Radio; IC-2100 Desktop Slide-rule Calculator; GC-1093 Digital Electronic Car Clock/Timer; CI-1080 Exhaust Gas Analyser; CM-1073 Tune-Up Meter; IO-4510 Triggered, Dual-Trace Oscilloscope; IG-1271 Function Generator; SB-104 Solid-State SSB Transceiver with Digital Readout; HP-1144 AC Power Supply for the SB-104; SB-604 Station Speaker for the SB-104; SB-230 Linear Amplifier; SB-614 Station Monitor for the SB-104; SB-634 Station Console for the SB-104; SB-644 Remote VFO for the SB-104.

There is an article included which tells about kit building "The Heathkit Way" and shows how easy it is to construct a kit.

If you would like a copy of this new catalogue, which is free, write to *Heath (Gloucester) Limited, Bristol Road, Gloucester, GL2 6EE.* If you want to phone for one the number is Gloucester (0452) 29451.

Pressure transducers

SE LABS, EMI's instrumentation and measurement company have added the EPI-080 series transducers to their range.

These miniature pressure transducers are capable of measuring static and dynamic pressures where small size and minimum pressure sensing area are of prime importance. The transducers incorporate semiconductor techniques which represents a significant advance in micro-circuitry.

Price increase
Like so many other magazines, *Practical Wireless* has become a victim of the ever-increasing world paper shortage resulting in large increases in the cost of raw materials. So that we can maintain our high standard of providing technical information and projects for readers, we have been forced to increase our cover price to 30p.

"Exhibition madness" says APAE man

THE President of the Association of Public Address Engineers, Keith Monks appealed recently to all interested parties to get together and sort out the "exhibition madness that is overtaking the audio industry".

He pointed out to members of the Press that in 1975 there are seven exhibitions of interest to everyone in the audio industry. All these shows take place within six weeks of one another.

Mr. Monks said that even if it was not possible to arrange a single venue, common dates should be arranged. If this were done, foreign visitors could make one visit to Great Britain and cover all the shows.

The APAE Exhibition, or "Sound 75 International Exhibition" will take place from 11-13th March at the Bloomsbury Centre Hotel, London.

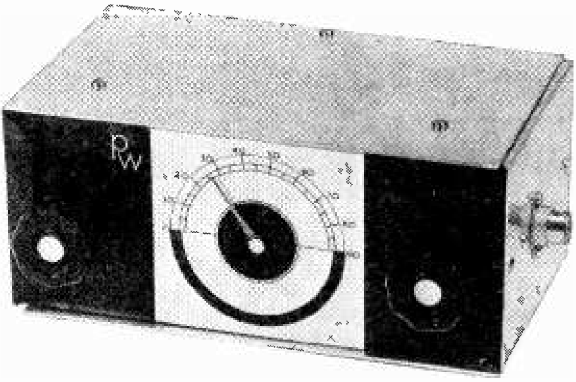
Among exhibitors there for the first time, will be firms from Japan and Finland.

2 VHF Converters

PART 1

G. SEVERN

USED in conjunction with a communications receiver, either of these converters will give VHF reception, bringing in amateur and other transmissions and in some cases TV sound programmes, using only a simple dipole aerial. The simpler converter is tunable and the more complex converter is crystal controlled, so a few notes on the advantages and limitations of each method should prove helpful.



TUNABLE CONVERTER

This is relatively simple, inexpensive and can be used over a wide band by adjusting the pre-set tuning. Though only two transistors are used, little gain is expected from an RF stage at these frequencies, so that sensitivity is quite good without this stage. An important advantage arises from the fact that the receiver can be tuned to a frequency where breakthrough of unwanted transmissions is minimal and tuning carried out on the converter. With the equipment used in this wav. the receiver acts as a fixed tuned IF amplifier.

CIRCUIT

This is shown in Fig. 1. The aerial feeder is connected to L1 while L2 is adjusted to the wanted band by trimmer TC1. As L2 tunes broadly TC1 need not be adjusted except when setting up for a different band. Tr2 is the local oscillator tuned by the 4·5pF variable capacitor VC1, operated by a cord drive. TC2 is a trimmer for the oscillator coil L5, with injection via C4 to gate 2 of the dual-gate mixer Tr1. (Gates 1 and 2 must not be reversed.)

Output from Tr1 goes to L3 which is tuned to about 10MHz. The coupling winding L4 provides a means of connecting a screened co-axial lead to the receiver, while the frequency of L3 can be adjusted by tuning its core for best signal strength at around the receiver frequency to be used. The latter, of course, should be free from unwanted short wave signals.

CIRCUIT BOARD

The components, **with the exception of Tr1,** are placed as shown in Fig. 2 and the board turned over so that their leads can be soldered. Two tags are bolted on at the point MC. All leads should be as short as reasonably practicable.

When wiring of this board is finished, with the exception of Tr1, take Tr1 and check that the collar. spring or binding of thin wire which shorts its four leads is present. Adjust the leads with a matchstick so that they come through the board as shown, and solder them. The means of shortening the four leads can then be removed. Touching the leads of Tr1 with a metal or plastic tool, or the fingers, can be expected to damage this transistor, until R1, R2 and R3 are connected, thereby protecting the insulated gates against static charges

PANEL ASSEMBLY

The panel is a 7 x 3in flanged universal chassis member with VC1 mounted centrally. Fit the on-off switch and drive cord spindle at $2\frac{1}{2}$in distance each

★ components list

TUNABLE CONVERTER

Resistors

R1	100kΩ	R5	1kΩ
R2	2·2kΩ	R6	10kΩ
R3	100kΩ	R7	10kΩ
R4	15Ω		All 5 or 10% $\frac{1}{4}$ or $\frac{1}{8}$W

Capacitors

C1	22pF	C5	0·02μF
C2	1000pF	C6	1000pF
C3	39pF	C7	5pF
C4	5pF	C8	5000pF

All disc or tubular ceramic preferred
TC 1/2 30pF Philips type airspaced trimmer
VC1 4·5 pF variable (Jackson C804)

Semiconductors

Tr1 3N141 Tr2 BF200

Miscellaneous

L3, former $\frac{7}{16}$in. dia. with core. Drum drive, $2\frac{3}{4}$in. dia. with cord, spring and drive spindle (Home Radio). Casework, 7 × 4 × 3in. universal chassis with extra plate 7 × 4in. (Home Radio). Perspex 7 × 4in, approx $\frac{1}{16}$in. thick. Knobs. Co-axial sockets (2). Veroboard 2 × $\frac{3}{4}$in. 0·15in. Matrix. On-off switch. PP3 battery, terminal clips and holder.

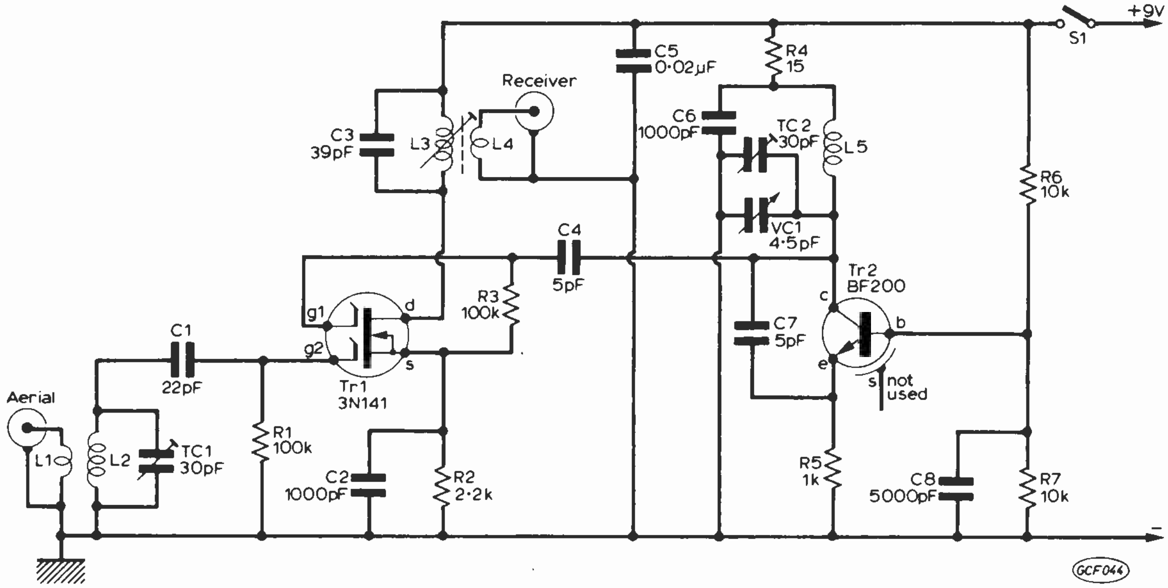


Fig. 1: Two transistors are the basis of this circuit for the tuned converter.

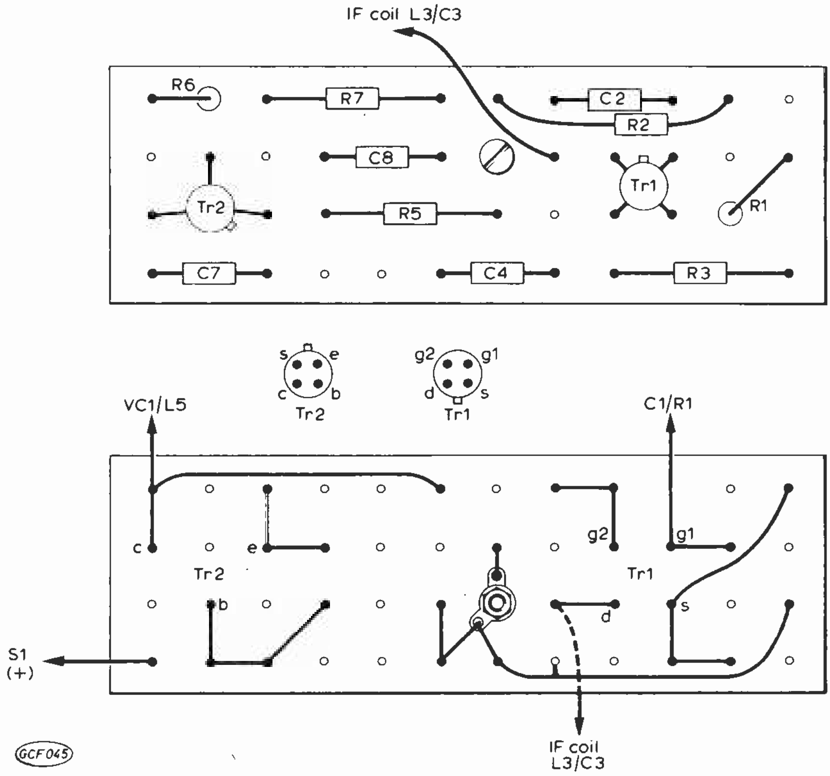


Fig. 2: Layout of components and wiring on the circuit board for Fig. 1.

from VC1. Set VC1 back by extra washers or an extra nut and the drive spindle forward by similar means. (If this is not done, insufficient spindle may project for the tuning knob.)

Solder TC2 directly to VC1 fixed plates and solder a stout wire about 1in long to the moving plates tag of VC1, letting it project backwards. Solder the MC tag of the board to this, as in Fig. 2 and make good other connections. Note that the board is horizontal, behind VC1 (as in the photgraph of the rear of the converter). The shortest possible leads are used to TC1, C1, L2, C6, L5 and TC2.

COILS

L2 consists of 5 turns of 22 swg wire, formed by winding round an object ¼in in diameter, with its ends soldered directly to TC1. L1 comprises 2 turns of similar diameter, supported by taking one end to the co-axial aerial socket, and the other to a stout wire which runs from VC1 to MC, as shown in Fig. 3.

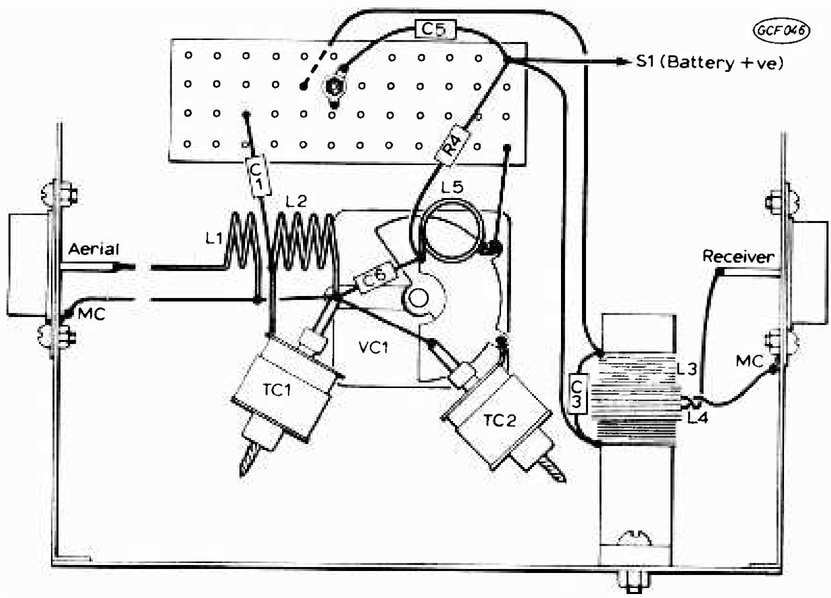
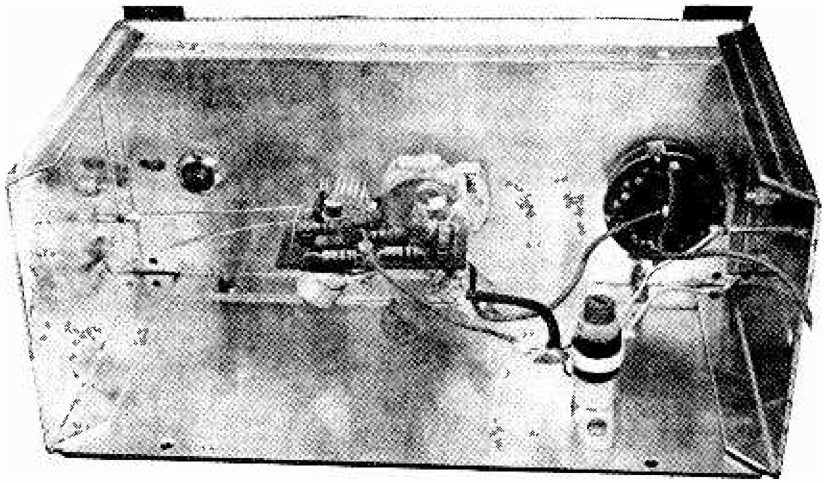


Fig. 3: Arrangement of components in the case. For clarity the circuit board is shown as being vertical. In fact, it is mounted horizontally over the tuning capacitor, as can be seen in the photograph below.

L5 is $1\frac{3}{4}$ turns, directly from VC1 to C6. Quite large changes in frequency can be obtained by TC1 and TC2, while for frequencies outside this limit of adjustment, L2 and L5 would have to be altered.

L3 consists of 21 turns, 24swg enamelled wire, close wound, near the top of the former. The ends only can be secured with thread or adhesive, noting that the whole winding should not be completely covered with adhesive. L4 is 4 turns of insulated connecting wire, wound on L3 as shown in Fig. 3.



CASEWORK

Complete screening is required to avoid troublesome hand-capacity effects. The sides are each 4 x 3in flanged members; bottom and tops are 7 x 4in flat plates, the bottom being fixed with four 6BA bolts which also hold rubber feet. The top is secured with self-tapping screws. Note that the flanged member forming the panel is set back just sufficiently to give clearance for the drum and drive. The flanges have to be cut to allow for this.

Give the cord one complete extra turn round the driving spindle, take it round the drum and draw it tight, tying it with the drum spring under tension. The spindle of VC1 projects through a hole in a card, on which a scale is drawn. A pointer is fixed to VC1 by drilling a hole in the spindle and using a small self-tapping screw, although it could be fixed with adhesive.

A piece of Perspex, 7 x 3in, with holes to clear the switch and drive spindles, is bolted to the front flanges of the side members. The bottom, back and top of the case are not fitted until construction and wiring are finished.

ADJUSTMENTS

TC2 is set to obtain the required band coverage with VC1 and TC1 adjusted for best volume with the receiver AGC switched off. L3 core is aligned for maximum output at the frequency to be used with the receiver. A co-axial lead with the outer braid earthed is used from converter to receiver and should be kept as short as possible.

A suitable aerial can be made from $\frac{1}{4}$in. to $\frac{1}{2}$in. diameter light alloy tubing. Two equal lengths are used, fixed with their inner ends about $\frac{1}{2}$in. apart in an insulated electrical junction box. A length of 75Ω co-axial cable is taken from the box with the inner conductor connected to one element and the outer braid to the other element. A plug is then fitted to match the converter.

Such an aerial can be raised on a pole or mast, or otherwise fixed at a reasonable height. It will have little directivity, while giving reception over quite a wide band of frequencies. Length is not too important but if 2m reception is the primary aim, the aerial should be about 38in. to 39in. overall.

Next month:—A crystal controlled converter

PW 'ASCOT'

STEREO CASSETTE DECK

PART 2

KEITH CUMMINS & TONY FRANCIS*

PLAYBACK

The input and equalisation stages of the playback amplifier are almost identical to those employed in the car cassette player described earlier in this magazine. Instead of driving an output stage, however, the equalisation stage feeds a noise limiting circuit, the output from which is taken to an external power amplifier at suitable level. The circuit of this section is shown in Fig. 5.

Incoming signals from the record/playback head are conveyed to the base of Tr10 by C20. R31 and R32 are the base biasing resistors. The input amplifier is of the complementary type, DC feedback being established by the network R34, R33, AC feedback is set by the ratio of R34:R35 and so the gain is defined at approximately 100. The signal is conveyed to the equalisation stage via C24 and the "set level" pot VR4. This pot is provided so that the gains of the channels can be equalised and set at the correct level for optimum operation of the noise limiter circuit.

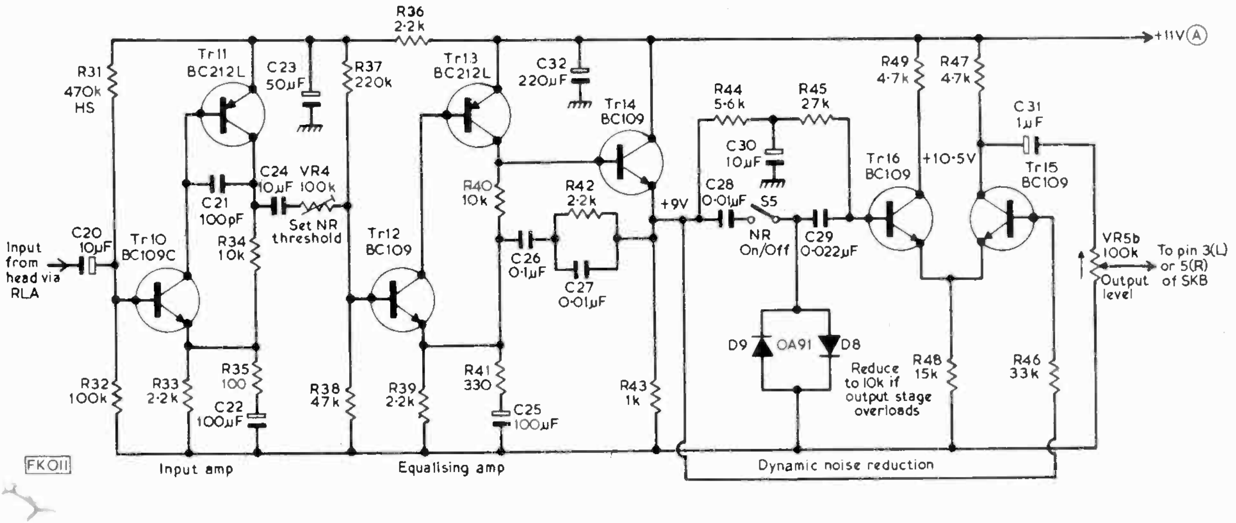
The equalisation stage consists of Tr12, Tr13 and Tr14, the first two forming another complementary stage and the latter an emitter follower. DC feedback to stabilise the working point is applied via R40 and R39, following the same technique as before. The equalisation network consists of C26, C27 and R42, and feeds back from the emitter follower Tr14 to the emitter of Tr12.

Those who have read the previous articles referred to will recall that the equalisation network is necessary to correct the velocity characteristic of the tape replay, that is, every time the frequency doubles, so does the output. This results from the fact that should the frequency double, twice as many molecular magnets are passing the replay head at a given instant, and consequently the rate of change of flux is doubled. As the induced voltage is directly proportional to the rate of change of flux, it follows that the voltage will also be double.

The process of recording and playback equalisation is actually somewhat more complex than this brief description would indicate; head losses at high frequencies result in the output first rising, then falling again. This is why we emphasise the highest frequencies during the recording process.

NOISE REDUCTION

The output from Tr14 emitter is DC-coupled to the noise limiter circuit. The noise limiter employs transistors Tr16 and Tr15, the latter providing the output from the machine.



* Hamilton Electronics Ltd.

Fig. 5: One channel of the input, equalisation and noise limiting stages.

The noise limiter acts as a low pass filter which operates in the absence of high frequency signals. High frequency noise, which occurs in quiet musical passages, or between items, is therefore reduced. Before we discuss the operation of the circuit, we must first establish the principles involved, and the reader is referred to Fig. 6.

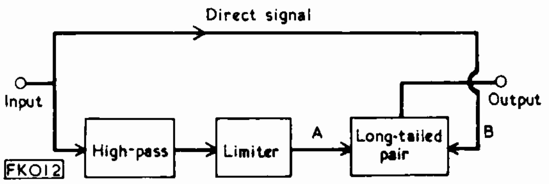


Fig. 6: Block diagram showing the linking of the stages of Fig. 5.

The signal is split into two parts, one containing high frequencies only. Each of these parts is taken to a long-tailed pair circuit, which in our application has two inputs and one output. If the same signal is applied to both inputs of the long-tailed pair no output occurs and the inputs are said to be in common mode. Antiphase signals, or signals appearing at one input only, appear at the output.

High frequency low level signals (principally tape hiss) are present in the direct signal applied to input *B* of the long-tailed pair. These signals are also present at the input *A*, since they come from the same source, and have passed through the high-pass filter. Because they are of low amplitude, they are unaffected by the limiter and so arrive at input *A* to produce the same signal at both inputs. As a result, no significant output is produced from the long-tailed pair and the hiss is effectively reduced.

Higher level high frequency signals are limited by the limiter circuit, after passing through the filter, and so cannot appear at their correct amplitude at input *A* to the long-tailed pair. Consequently, cancellation does not take place and the high frequency signals are present in the output. The circuit can be switched out by opening the signal path to the high-pass filter.

Now to the circuit in detail (Fig. 5). The long-tailed pair consists of Tr16 and Tr15. The non-processed direct signal is taken via R46 to the base of Tr15. The high-pass characteristic required for the input to Tr16 base is achieved by inserting C28 and C29 in the signal path. The bias for Tr16 is provided via R44 and R45 (totalling the same value as R46), but the signal is decoupled via C30.

The junction of the capacitors C28 and C29 is taken to the limiter diodes D9 and D8. The diodes only start to have an effect when the applied signal exceeds about 200mV, so limiting takes place above this level. The halves of the long-tailed pair are basically identical, except that the collector of Tr15 is used to provide the source of output. The emitter circuit is common to both Tr16 and Tr15. It is essential, if a long-tailed pair is to have a high common-mode rejection, for the AC impedance of the emitter circuit to be high. This is achieved by using a large value resistor, but of course this implies that a high emitter voltage will be needed so that the rest of the circuit can operate correctly. For this reason, the output of Tr14 is centred on +9V.

The output signal is taken from Tr15 collector via C31 and applied to the output level control pot VR5. The signal is taken from VR5 slider to the output DIN socket [pins 3(L) and 5(R) for stereo]. The output is then adjusted to suit the amplifier being used.

Note that while the bias oscillator and power supply circuits are common to the two stereo channels, the record and playback circuits each have to be duplicated, hence two sets of components are needed for each of the circuits shown in Figs. 4 and 5.

MOTOR CONTROL

The motor control board contains circuits for two basic functions, motor speed regulation and automatic stopping of the machine at the end of a cassette.

We shall deal first with the motor speed control. It will be seen from the circuit diagram (Fig. 7) that the motor is fed from the nominal 12V supply line via transistor Tr19 and resistors R55, R56 and R58. The base current for Tr19 is formed by the collector current of Tr18, the sensing transistor.

When power is supplied to the system, by inserting a cassette, a potential of just under two volts appears at the junction of resistors R53 and R54. This potential is applied, via diode D10, to the base of Tr18, so

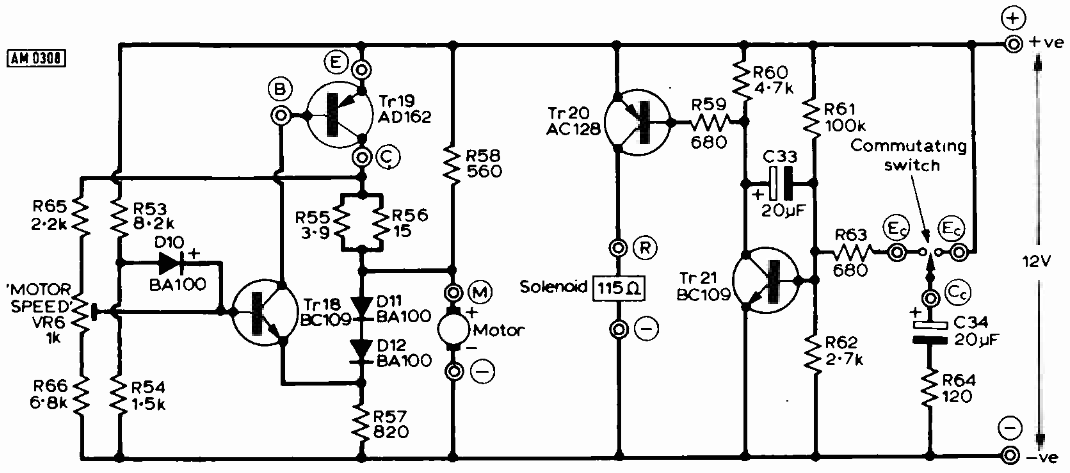


Fig. 7: Circuit of the motor control board. This is identical to that used in the 'Kempton' cassette player (Dec. 74).

turning this transistor on. Collector current flowing in Tr18 provides the base current to turn Tr19 on and the resultant current flows into the motor via R55 and R56 in parallel. The motor starts to turn and diodes D11 and D12 conduct, so clamping the emitter of Tr18 at a fixed voltage negative with respect to the positive side of the motor.

This action results in the emitter of Tr18 moving positive, but the base also moves positive since the collector of Tr19 is connected to Tr18 base via network R65, VR6 and R66. As a consequence, D10 becomes reverse-biased, so disconnecting the starting circuit, R53, R54 from Tr18 base. The emitter-base bias on Tr18 is now a function of the voltage developed across R55 and R56, since the top end of these resistors feeds the base circuit, while the bottom end is clamped to the emitter of Tr18 via D11 and D12.

If the motor load increases, so does its current drain. As a result, the voltage drop across R55 and R56 increases, so increasing the forward bias on Tr18. The increase in Tr18 collector current increases the flow of current in Tr19, so applying more power to the motor to compensate for its increase in load. If the load decreases, the process operates in reverse. Likewise, changes in the supply voltage are accommodated since the only reference required is the measure of current through the resistors in series with the motor, and the apparent DC resistance of Tr19 is adjusted accordingly.

The running speed of the motor is set by VR6 which varies the preset forward bias applied to Tr18. R58 provides a bleed current through the motor in the starting condition and also shunts Tr19, reducing its dissipation.

★ components list

MOTOR CONTROL BOARD

Resistors

R53 8·2kΩ	R58 560Ω	R63 680Ω
R54 1·5kΩ	R59 680Ω	R64 120Ω
R55 3·9Ω	R60 4·7kΩ	R65 2·2kΩ
R56 15Ω	R61 100kΩ	R66 6·8kΩ
R57 820Ω	R62 2·7kΩ	

R55 and R56 are ½W, remainder ¼W 5%
VR6 1kΩ miniature preset

Capacitors
C33 and C34 22μF 25V electrolytic

Semiconductors
D10, 11, 12 BA100 Tr18, 21 BC109 Tr19 AD162
Tr20 AC128

Miscellaneous
Mounting kit for Tr19. Veroboard 3 x 1·4in. 0·1in. matrix

charging of the capacitor. Under these circumstances C33 would eventually become fully charged, and the current would stop flowing, so de-energising the solenoid and releasing the latch. However, this process is not allowed to complete.

LATCHING

As soon as the cassette is inserted, the motor starts to move the tape, and the commutating switch commences operation. C34 is alternatively charged from the 12V supply, and discharged via R63 into

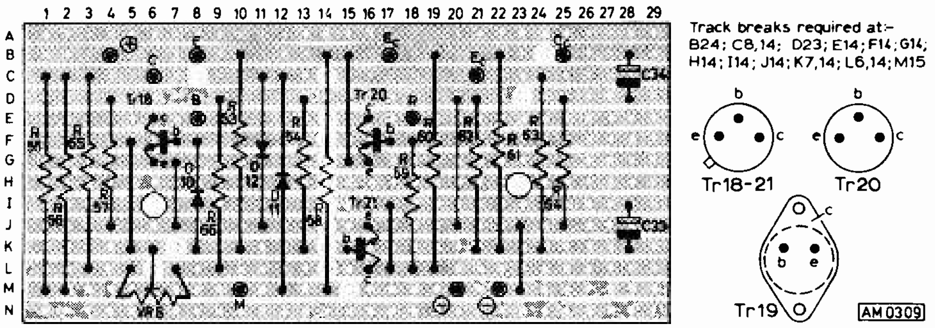


Fig. 8: Component layout of the motor control board, shown here larger than actual size.

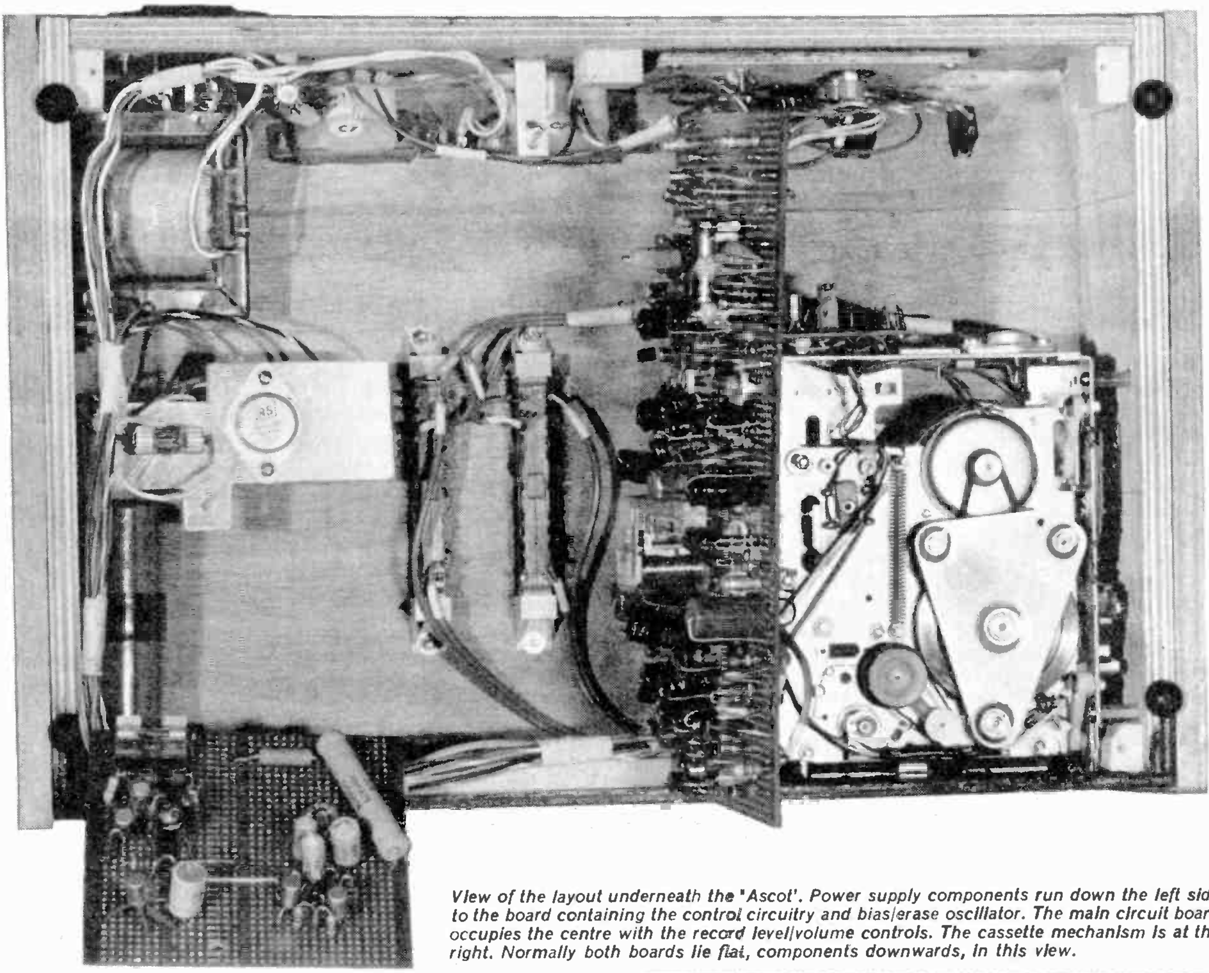
AUTO STOP

Now we come to the autostop mechanism. When the cassette is pushed in, it will only hold in provided the solenoid is energised, to operate the latch. The solenoid is controlled by transistor Tr20. Attached to the cassette feed-spool hub is a commutating switch, below the deck, which constantly switches a common contact between the others provided the hub is rotating.

When power is applied to the circuit by inserting a cassette, capacitor C33 charges via R60, R59 and the base circuits of both Tr20 and Tr21. The resultant collector current in Tr20 energises the solenoid to hold the latch. The flow of collector current in Tr21 reduces the charging voltage applied to C33, so forming a "Miller integrator" circuit linearising the the base of Tr21. The process is integrated by C33 so that a constant hold-in current flows through the solenoid. R64 is included to prevent excessive charging current in C34, with the attendent risk of contact wear and electrical interference.

When the cassette comes to the end, the feed hub stops rotating, and with it the commutating switch. As a result, no current pulses are fed into the base of Tr21, and C33 reaches its point of maximum charge. Current flow in the transistors then ceases, so de-energising the solenoid. The latch drops out releasing the deck mechanism and the cassette is ejected.

Obviously, any attempt to re-insert the cassette without turning it over will be fruitless, since the



View of the layout underneath the 'Ascot'. Power supply components run down the left side to the board containing the control circuitry and bias/erase oscillator. The main circuit board occupies the centre with the record level/volume controls. The cassette mechanism is at the right. Normally both boards lie flat, components downwards, in this view.

commutating switch will be inoperative and the cassette will be promptly ejected again.

CONSTRUCTION

The motor control board, Fig 8, is quite straightforward but take care to cut the tracks in the correct places. When completed, the board is mounted on the rear panel of the cassette mechanism in the position shown in the photograph. Nylon nuts and bolts should be used to avoid shorting or earthing any of the tracks.

The rear panel also acts as the heatsink for Tr19 and is supplied already punched with the necessary pattern of holes. An insulating mounting kit must be used for this transistor.

Part 3, next month, will deal with the construction of the circuit boards, cabinet and general wiring.

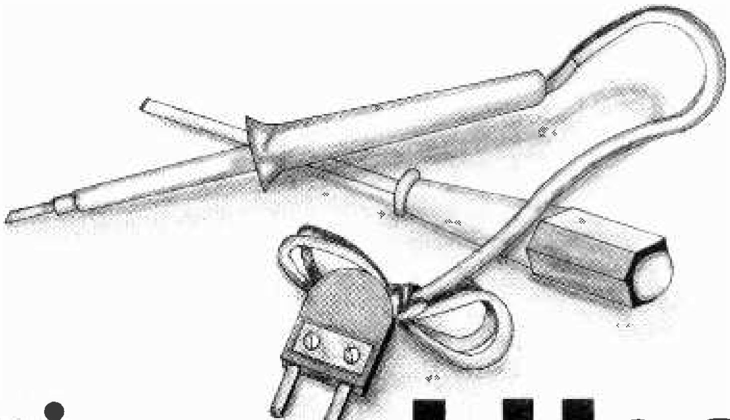
points arising...

ELECTRONIC HOME TELEPHONE EXCHANGE

Feb. 1975. In Fig. 6 page 895 the diode D10 is shown reversed. The bar (+) should go to the +7V line. Note:—the diode is shown correctly on the pcb layout, Fig. 10 page 898.

Also in Fig. 6 the line numbers 1 to 9 are in reverse order, should be 9 at top, down to 1. Relay contacts RLB1 to RLJ1 are in reverse order, should be RLJ1 at top, down to RLB1. The pcb layout is correct, Fig. 10, and these discrepancies do not affect the correct operation of the exchange.

In Fig. 10 C5 polarity is incorrect, the positive side should be at the right, pin 10 IC3. There should be a link between the two pads immediately left of IC2, pin 10 to earth.



This could lead to something big.

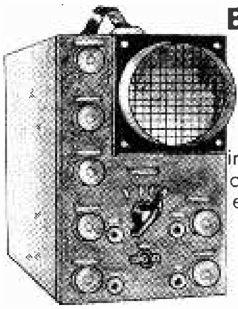
A soldering iron and a screw driver. If you know how to use them, or at least know one end from the other, you know enough to enrol in our unique home electronics course.

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

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

This course is accepted by and used in a large number of schools and colleges and forms an invaluable grounding for professional training in the subject. All the training is planned to be carried out in the comfort of your own home and work in your own time. You send them in when you are ready and not before. These culminate in a final test and a certificate of success.

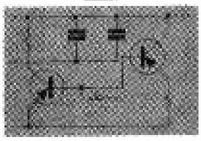
1



Build an oscilloscope.

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

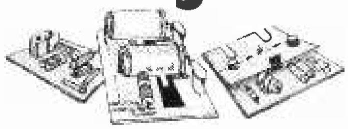
2



Read, draw and understand circuit diagrams.

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

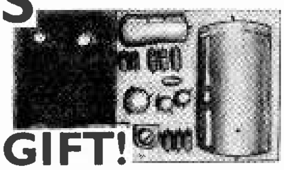
3



Carry out over 40 experiments on basic circuits.

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

PLUS



FREE GIFT!

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

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

WAA

Brochure without obligation to:
BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, Dept WL35
P.O. Box 156, Jersey, Channel Islands.

NAME..

ADDRESS.......................................

....

(Block caps please)

GIRO NO. 331 7056. Access accepted.
C.W.O. only. P. & P. 10p on orders below £5
Discount: £10–10%, £20–15% (except net items)
Export Order enquiries welcome (VAT free)

Official Orders accepted from
Educational & Government Departments
ALL PRICES INCLUDE VAT AT 8%

SPECIAL RESISTOR KITS (Prices include post & packing)

10E12 ⅓W KIT: 10 of each E12 value, 22 ohms—1M, a total of 570 (CARBON FILM 5%), **£3·58 net**
10E12 ½W KIT: 10 of each E12 value, 22 ohms—1M, a total of 570 (CARBON FILM 5%), **£3·77 net**
25E12 ⅓W KIT: 25 of each E12 value, 22 ohms—1M, a total of 1425 (CARBON FILM 5%), **£8·19 net**
25E12 ½W KIT: 25 of each E12 value, 22 ohms—1M, a total of 1425 (CARBON FILM 5%). **£8·28 net**
5E12 ⅛W KIT: 5 of each E12 value, 10 ohms—1M, a total of 305 (METAL FILM 5%), **£2·80 net**
Due to current world shortages, resistor kits may contain some wattage and value substitutions.

MULLARD POLYESTER CAPACITORS C280 SERIES

250V P.C. Mounting: 0·01μF, 0·015μF, 0·022μF, 0·033μF, 0·047μF, **3½p.** 0·068μF 0·1μF, **4½p.** 0·15μF, **4½p.** 0·22μF, **5½p.** 0·33μF, **8p.** 0·47μF, **9p.** 0·68μF, **12p** 1μF, **15p.** 1·5μF, **23p.** 2·2μF, **26p.**

MULLARD POLYESTER CAPACITORS C296 SERIES

400V: 0·001μF, 0·0015μF, 0·0022μF, 0·0033μF, 0·0047μF, **2½p.** 0·0068μF, 0·01μF, 0·015μF, 0·022μF, 0·033μF, **3½p.** 0·047μF, 0·068μF, 0·1μF, **4½p.** 0·15μF, **6½p** 0·22μF, **8½p.** 0·33μF, **12p.** 0·47μF, **14p.**
160V: 0·01μF, 0·15μF, 0·022μF **3p.** 0·047μF, 0·068μF, **3½p.** 0·1μF, **4½p.** 0·15μF, **5p.** 0·22μF. **5½p.** 0·33μF, **6½p.** 0·47μF, **8½p.** 0·68μF, **12p.** 1μF, **14p.**

MINIATURE CERAMIC PLATE CAPACITORS

50V: (pF) 22, 27, 33, 39, 47, 56, 68, 82, 100, 120, 150, 180, 220, 270, 330, 390, 470, 560, 680, 820, 1K, 1K5, 2K2, 3K3, 4K7, 6K8, (μF) 0·01, 0·015, 0·022, 0·033, 0·047, **2½p.** each. 0·1, 30V, **5p.**

POLYSTYRENE CAPACITORS 160V 5%

(pF) 10, 15, 22, 33, 47, 68, 100, 150, 220, 330, 470, 680, 1000, 1500, 2200, 3300 4700, 6800, 10,000, **4½p.**

RESISTORS

CF—High Stab Carbon Film, 5% MF—High Stab Metal Film, 5%.

W.	Type	Range	1–99	100–499	500–999	1000+	Size mm
⅓	CF	22–1M	1	0·75	0·60	0·55	2·4x7·5
½	CF	22–2M2	1	0·75	0·60	0·55	3·9x10·5
1	CF	22–1M	1	0·75	0·60	0·55	5·5x16
⅛	MF	10–2M7	2	1·54	1·32	1·1	3x7
¼	MF	10–2M2	2	1·43	1·21	0·99	4·2x10·8
1	MF	10–10M	3	1·98	1·81	1·65	6·6x13
2	MF	10–10M	4·5	3·52	3·08	2·75	8x17·5

For value mixing prices, please refer to our catalogue. (price in pence each).
VALUES AVAILABLE—E12 Series only. (Net prices above 100.)

PRESET SKELETON POTENTIOMETERS

MINIATURE 0·25W Vertical or horizontal 6p each 1K, 2K2, 4K7, 10K, etc. up to 1M Ω
SUB-MIN 0·05W Vertical, 100 Ω to 220K Ω **5p** each.

B. H. COMPONENT FACTORS LTD.

(P.W.) 59 NORTH STREET, LEIGHTON BUZZARD, BEDS.
Tel.: LEIGHTON BUZZARD 2316 (STD Code 05253)
CATALOGUE No. 3 **20p**

Miniature Mullard Electrolytics

1·0μF	63V	6½p	68μF	16V	6½p
1·5μF	63V	6½p	68μF	63V	12p
2·2μF	63V	6½p	100μF	10V	6½p
3·3μF	63V	6½p	100μF	25V	6½p
4·0μF	40V	6½p	100μF	63V	14p
4·7μF	63V	6½p	150μF	16V	6½p
6·8μF	63V	6½p	150μF	63V	15p
8·0μF	40V	6½p	220μF	6·4V	6½p
10μF	16V	6½p	220μF	10V	6½p
10μF	25V	6½p	220μF	16V	8p
10μF	63V	6½p	220μF	63V	21p
15μF	16V	6½p	330μF	16V	12p
15μF	63V	6½p	330μF	63V	25p
16μF	40V	6½p	470μF	6·4	9p
22μF	25V	6½p	470μF	40V	20p
22μF	63V	6½p	680μF	16V	15p
32μF	10V	6½p	680μF	40V	25p
33μF	16V	6½p	1000μF	16V	20p
33μF	40V	6½p	1000μF	25V	25p
32μF	63V	6½p	1500μF	6·4V	15p
47μF	10V	6½p	1500μF	16V	25p
47μF	25V	6½p	2200μF	10V	25p
47μF	63V	8p	3300μF	6·4V	26p

VEROBOARD

	0·1	0·15
2½ x 5"	36p	36p
2½ x 3¾"	33p	25p
3¾ x 5"	42p	46p
3¾ x 3¾"	36p	36p
2½ x 1"	9p	9p
2½ x 5" (Plain)	—	19p
2½ x 3¾" (Plain)	—	16p
5 x 3¾" (Plain)	—	29p
Insertion tool	73p	73p
Track Cutter	56p	56p
Pins, Pkt. 25	22p	22p

TRANSISTORS

AC127	16½p	BC212L	12p
AC128	22p	BC213L	12p
BC107	11p	BC214L	17p
BC108	12p	OC44	18p
BC109	13p	OC71	13p
BC148	12p	OC81	16p
BC149	12p	OC170	23p
BC182L	12p	TIS43	33p
BC183L	12p	2N2926	11p
BC184L	13p	2N3702	11p

POTENTIOMETERS

Carbon Track 5K Ω to 2M Ω, log or lin (and 1K lin). Single, **16½p** Dual Gang **46p.** Log single with switch **26p.** Slider Pots. 10K, 100K, 500K, semi log 30mm, **34p.** 45mm, **47p.** 60mm, **55p.**

DIODES

1N4001	6½p
1N4002	7½p
1N4003	9p
1N4004	90p
1N4005	12p
1N4006	14p
1N914	7p
1N916	7p
BA100	10p
OA5	42p
OA47	9p
OA81	11p
OA200	8p

PLUGS

DIN 2 Pin	12p
3 Pin	13p
5 Pin 180°	16p
Std. Jack	20p
2.5mm jack	13p
Phono	6p

SOCKETS

DIN 2 Pin	10p
3 Pin	10p
5 Pin 180°	12p
Std. Jack	15p
2.5mm Jack	13p
Phono	6p

ELECTROLYTIC CAPACITORS. Tubular & Large Cans

(uF/V): 1/25, 2/25, 4/25, 4·7/10, 5/25, 8/25, 10/10, 10/50, 16/25, 22/63, 25/25, 25/50, 32/25, 50/25, 100/10, 100/25, **6½p.** 50/50, **8p.** 100/50, 200/25, **11p.** 250/50, **18p.** 500/10. **11p.** 500/25, **15p.** 500/50, **18p.** 1000/10, **15p.** 1000/25, **22p.** 1000/50, **40p.** 2000/10, **20p.** 1000/100, **88p.** 2000/25, **30p.** 2000/100, **93p.** 2500/25, **38p** 2500/50, **61p.** 5000/25, **65p.** 5000/50, **£1·08.**

HI-VOLT: 4/350, **14p.** 8/350, **19p.** 100/100 **20p.** 16/350, **22p.** 16/450, **23p.** 32/350, **33p.** 50/250, **20p.** 100/250, **30p.**

METALLISED PAPER CAPACITORS

250V: 0·05μF, 0·1μF, **6p.** 0·25, **6p.** 0·5μF, **7½p.** 1μF, **9p.** 500V: 0·025, 0·05, **6p.** 0·1, **6p.** 0·25, **7½p.** 0·5, **9p.** 1000V: 0·01, **11p.** 0·022, **13p.** 0·047, 0·1, **15p.** 0·22, **23p.** 0·47, **34p.**

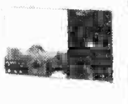
STOP PRESS
Our Retail Shop is now open at 59 North St., Leighton Buzzard

Screened Wire, Metre	6½p
Twin Screened Wire, Metre	12p
Stereo Screened Wire, Metre	12p
Connecting Wire. All colours, Metre	2½p
Neon Bulb, 90V Wire Ended	5 for 24p
Panel Neon. 240V Red, Amber, Clear	20p

NEW KIT
5E12 ⅛W Metal Film.
5 each value 10Ω-1M,
total of 305 £3·7

MULTIMETER U4323

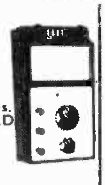
22 Ranges plus AF/IF Oscillator 20,000Ω/Volt.
Vdc—0·5—1000V in 7 ranges
Vac—2·5—1000V in 6 ranges
Idc—0·05—500mA in 5 ranges
Resistance—5Ω—1MΩ in 4 ranges.
Accuracy—5% of F.S.D.
OSCILLATOR—1 KHz and 465 KHz (A, M.) at approx. 1 Volt.
Size—160 x 97 x 40mm.
Supplied complete with carrying case, test leads and battery.
PRICE **£8·30** net p & p 25p.



U4323

MULTIMETER U4341

27 Ranges plus Transistor Tester.
16,700Ω/Volt. Overload protected.
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.
hfe—10—350 in 2 ranges.
Size—115 x 215 x 90mm.
Complete with steel carrying case, test leads, and battery.
PRICE **£11·30** net p & p 30p.



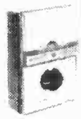
U4341

NEW CAPACITOR KITS

C280 Kit—PC Mounting polyester 250V. 5 of each value: 0·01 0·022, 0·047, 0·1, 0·22μF. 2 of 0·47, 1μF. **£1·30 net.**
C296 Kit—Tubular polyester, 400V. 5 of each value: 0·01, 0·022, 0·047, 0·1, 0·22μF. 2 of 0·47μF. **£1·30 net.**
Ceramic Kit—square plaquette 50V. 5 each value: 22, 33, 47, 100, 220, 330, 470, 1000pF, 2200, 4700pF, 0·01μF. **£1·30 net.**
250V Paper kit—Tubular metal case. 3 of each value: 0·05, 0·1, 0·25, 0·5, 1μF. **90p net.**
500V Paper Kit—Tubular metal case. 3 of each value: 0·025, 0·05, 0·1, 0·25, 0·5μF. **90p net.**
1000V Paper Kit—Tubular metal case. 3 each value: 0·01, 0·025, 0·05, 0·1μF. **£1·10 net.**

MULTIMETER U4324

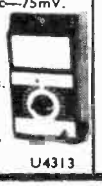
34 Ranges. High sensitivity.
20,000Ω/Volt. Overload protected.
Vdc—0·6—1200V in 9 ranges.
Vac—3—900V in 8 ranges.
Idc—0·06—3A in 6 ranges.
Iac—0·3—3A in 5 ranges.
Resistance—25Ω—5MΩ in 5 ranges.
Accuracy—dc and R—2½% of F.S.D. ac and db—4% of F.S.D.
Size—167 x 98 x 63mm.
Supplied complete with storage case, test leads, spare diode, and battery.
PRICE **£9·95** net p & p 25p.



U4324

MULTIMETER U4313

33 ranges. Knife edge with mirror scale.
20,000Ω/Volt. High accuracy. mVdc—75mV.
Vdc—1·5—600V in 9 ranges.
Vac—1·5—600V in 9 ranges.
Idc—60—120 microamps in 2
Idc—0·6—1500mA in 6 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 steel carrying case, test leads, and battery.
PRICE **£13·40** net p & p 30p.



U4313

S-DeC

S-DeC	£2·14
T-DeC	£3·92
μDeC "A"	£4·30
μDeC "B"	£7·53
2 DeC	£4·72

ANTEX

CCN240	£2·43
CN240	£2·01
X25	£2·01

MULTIMETER U435

32 Ranges, High Sensitivity
20,000Ω/Volt
Vdc–75mV–1000V in 8 rgs.
Vac–2·5–1000V in 7 rgs.
Idc–0·001–2·5A in 6 rgs.
Iac–0·005–2·5A in 5 rgs.
Resistance–3-300K in 3 rgs.
Capacitance scale 0–0·5μF
Accuracy—
dc and R–2½% of F.S.D.
ac and C–4% of F.S.D.
Size–205 x 110 x 84mm
COMPLETE WITH STEEL CARRYING CASE, TEST LEADS AND BATTERY
PRICE £9·45 net p&p 25p

FELSTEAD ELECTRONICS (PW89), LONGLEY LANE, GATLEY, CHEADLE, CHESHIRE SK8 4EE

STYLI. Replacements for virtually all ACOS, BSR, COLLARO, GARRARD, PHILIPS, RONETTE, SONOTONE. Single Tip: Sapphire **19p**, Diamond **37p**. Double Tip: Can be Stereo/LP+78 or ST/LP Sapphire **37p**. Double Tip: Diamond ST/LP+Sapphire 78 **65p**. Diamond ST/LP+Diamond ST/LP **£1·25**. For GOLDRING Diamond G800, G800H and G850 at **£2·10** each. G800E at **£4·10**. Charges 10p any quantity FREE LIST (FOR SAE) FULL DETAILS STYLI AND CARTRIDGE EQUIVALENTS including SHURE, PICKERING, AUDIO-TECH, B & O, AND MANY MORE STYLI FOR MAGNETIC AND CRYSTAL PICK-UPS.

CARTRIDGES. All with styli and fittings. Replacements for ACOS GP/91 SC (Stereo—mono compatible series) at **£1·20**, GP93 Stereo at **£1·60**, GP84 Stereo Ceramic at **£2·20**. Actual GP67-2. Front switch at **£1.10**. for BSR Z3H, X5H and X5M at **£1·50** each. SK5H and SK5M at **£1.80** each. TC8H at **£1.60**. TC8 Stereo, 3 pins **£2.30**; charges 10p any quantity.

RECORDING TAPE. ALL FINEST BRITISH MYLAR 5" 600ft. **40p**: 5" 900ft. **60p**: 5¾" 1200ft. **84p**, 7" 1800ft. **£1·10**. Charges for 5" and 5¾". 1-4 **13p** each; 5 and over, **33p** the ot. Charges for 7", 1-3 **15p** each, 4-5 **35p** the lot, 6 and over **40p** the lot.

SPEAKERS 2½", 3, 8 or 64 ohms (state which) **55p**. Charges 10p each.

CONNECTING WIRE. Pkts of 5 coils, asstd. cols each 5yds. Solid core **19p** Flexible **21p** (Charges 10 per pack).

EARPIECES. Magnetic 2·5mm or 3·5mm plus (state which) **15p**. **CRYSTAL** (3·5mm only) **35p** (all 10p up to 6).

VIBRATORS. 7 pin SYNCIL. (12SR7 type) **75p**. 4-pin NON-synch (121HD4) **45p** (all 10p each).

Send SAE for *free* styli, cartridge, accessories and components list. All prices include VAT.

ELECTRONI-KIT

"....educational kits of exceptional quality"
(AUDIO mag. Dec. 1974)

BUILD AND REBUILD ANY NUMBER OF TIMES:

Radios, microphones, burglar alarms, inter-comms, ferrite detectors, solar cell, photoelectric cell, voice relay, electronic cats, birds, guns, organs, illuminometers, voltmeters, meters of all types, etc., etc., plus your own circuit designs.

COMPLETELY SAFE— suitable for all, from beginners on. 30 different projects £10·45, 100 £20·45, 150 £33·95.

Prices include Manuals, Battery, p & p, VAT, etc. **Cheque/PO (or 7p for catalogues) to DEPT. PW:**

Satisfaction guaranteed.
ELECTRONI-KIT LTD, 408 St. John's Street, London, EC1. (01-278 4579)

I.C. OF THE MONTH

Number 50 — **Fairchild μA720 AM Receiver**

THE Fairchild μA720 device is a new integrated circuit designed for use in AM radio receivers at signal frequencies up to 30MHz. It is encapsulated in a 14 pin dual-in-line plastic package and includes an RF amplifier stage, oscillator, mixer, IF amplifier, AGC detector and a voltage regulator.

In order to make a complete radio receiver using this device, it is only necessary to connect suitable tuned circuits, a detector and an audio power amplifier.

TYPICAL CIRCUIT

A typical μA720 circuit is shown in Fig. 1. It operates as a conventional receiver with an RF stage and an IF of about 475kHz. For simplicity no band switching is shown in the circuit of Fig. 1, but this can be added if a wide frequency coverage is required.

The aerial input is coupled to pin 12 of the device through the input coil L1, while pin 11 is decoupled to ground by C1. After passing through the internal RF amplifier stage, the signal appears at pin 13 and is fed to the coil L2. The tuned circuit comprising VC2 and part of L2, and provides image frequency rejection before the signal is fed to the input of the mixer stage at pin 1.

The oscillator frequency is determined by the value of VC3 and the part of L3 across which, this capacitor is connected. The capacitor C4 provides decoupling of the mixer while the output from this stage appears at pin 14. IFT1 provides much of the adjacent channel selectivity.

The IF signal passes to the input of the IF amplifier at pin 7 while the output of this amplifier is taken from pin 6 to the second IF transformer, IFT2. It is then detected by D1 and filtered by C8, R3 and C9 to provide the audio output. C10 is merely a DC blocking capacitor.

The IF amplifier output at pin 6 is also coupled back into pin 5 of the μA720 where it is demodulated

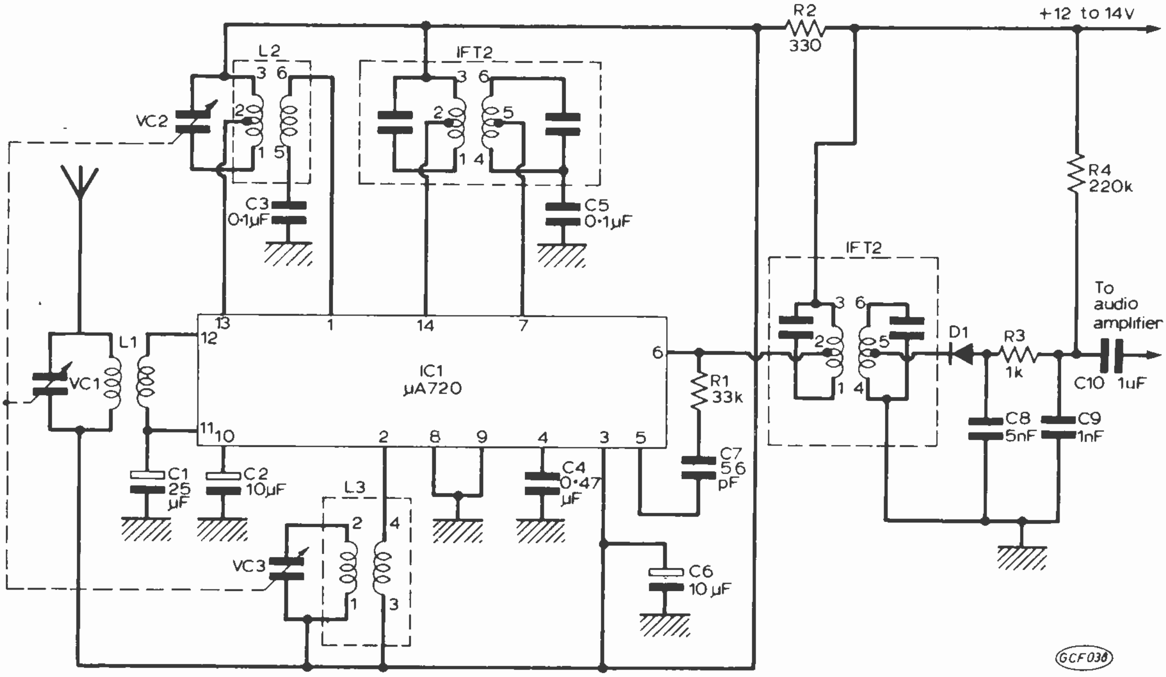


Fig. 1: Circuit of an AM radio receiver built round the μA720 integrated circuit and using variable capacity tuning.

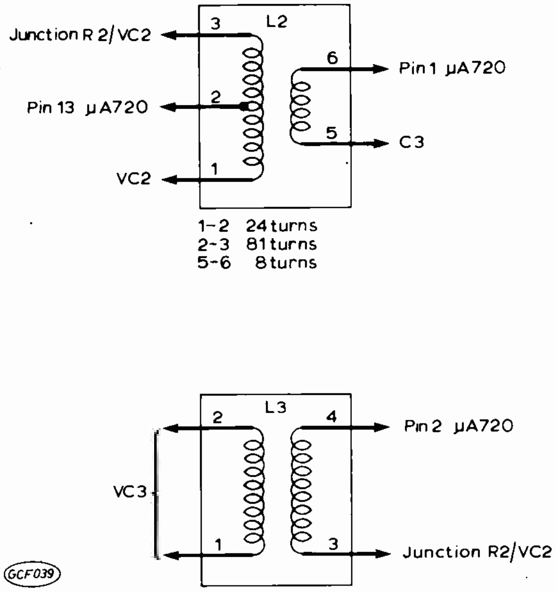


Fig. 2: Details of coils for use in Fig. 1.

by internal diodes and is used to provide the AGC signal.

The audio output from Fig. 1 may be used to drive a Fairchild µA706 IC audio power amplifier, although a somewhat simpler circuit can be made using the National Semiconductor LM380N power amplifier (see *Practical Wireless*, December 1973).

POWER SUPPLY

The absolute maximum permissible voltage which can be applied to the µA720 circuit is 16V. It is wise however to operate the device from a supply of about 12V with a maximum of 14V to allow a reasonable margin of safety. It should be noted that there is no direct connection between any pin of the device, and the positive power supply line. The current required is in the order of 20mA.

COILS

For medium and long wave coverage, the coil L1 may consist of a conventional ferrite rod aerial, but an outdoor aerial is essential for good short wave reception.

Suitable medium wave coils for the RF coil L2 and the oscillator coil L3 are shown in Fig. 2, the diameter of the coil formers being about ⅜″. These coils are designed for a 190pF RF tuning capacitor ganged with an 80pF oscillator capacitor. However, it is more satisfactory to obtain the Toko type YXRS 18576 AQ coil of 100µH for MW use.

Conventional IF transformers may be employed for IFT1 and IFT2. However, it is difficult for the home constructor to wind such coils neatly and obtain the maximum Q factor for optimum selectivity. It is therefore advisable to purchase IF transformers, bearing in mind the writer prefers to use one of the miniature Toko ceramic filters between pins 14 and 7 of this IC.

These ceramic filters provide a selectivity curve with a flat bandpass characteristic and steep sides; this enables one to obtain the best audio quality from a fairly weak station adjacent to that of a much stronger one. The filters are obtainable with bandwidths of 8kHz (type CFT455B), 6kHz (type CFT455C) and 4·8kHz (type CFU60A), all these pass-bands being quoted at 6dB down. At 10kHz away from the centre frequency, the response is 22, 27 and 28dB down for these respective types. Each filter contains a special piezo-ceramic disc and an input and output transformer, both of which are tuned in a similar manner to that of an IF transformer.

—continued on page 1040

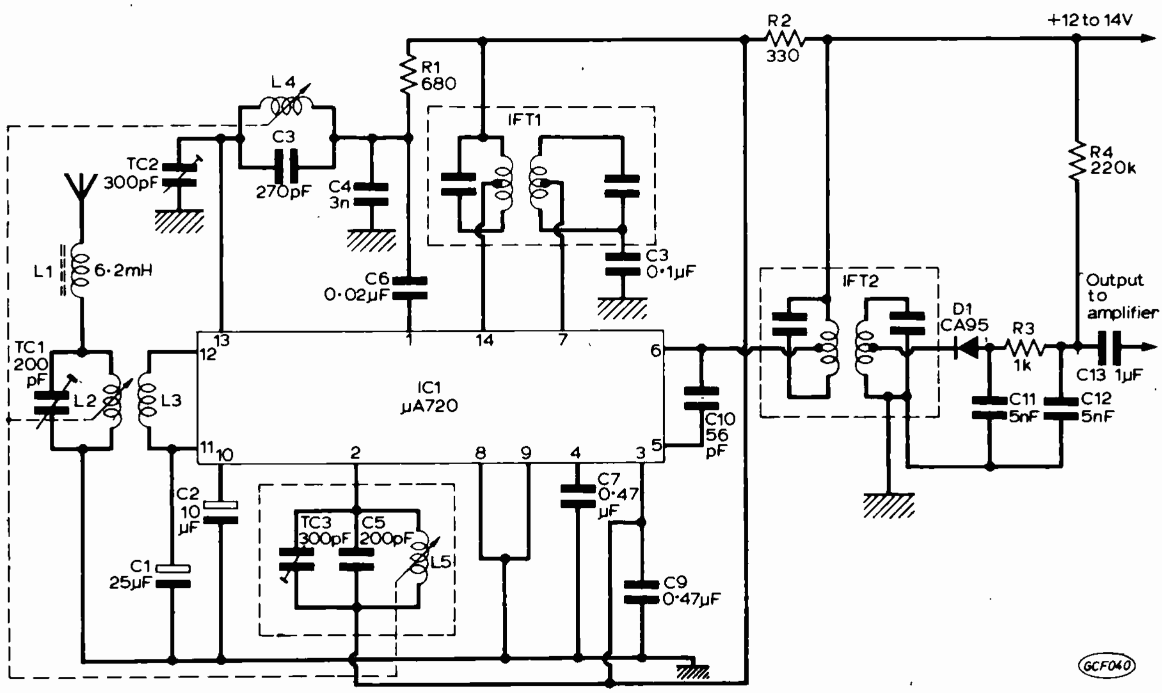
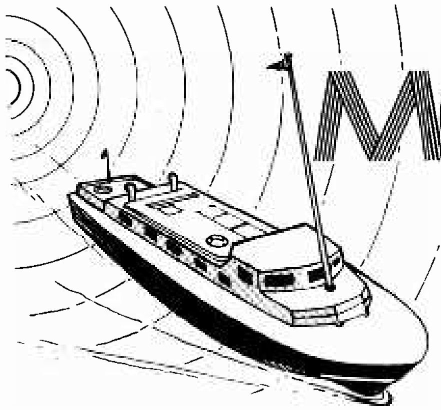


Fig. 3: In this version permeability tuning is employed in place of the capacity tuning of Fig. 1.



MODEL CONTROL BY RADIO

PART 3: ACTUATORS & MONITOR

F. G. RAYER G3OGR

THE model control transmitter and receiver already described provide a radio link with the model. The equipment is designed for single channel operation which allows a relay in the model to be opened or closed at will. This, in turn, operates an actuator which is a device which moves the rudder of a model boat, switches on the propulsion motor or carries out other functions.

Complex mechanical actuators are not easily made but the simpler type of actuator is a straightforward device, quite easy to construct. In this case, it is intended for a model boat. Somewhat similar points apply to the guidance of other types of model.

CONTROL PROVIDED

A model control system can begin in the simplest form, additions being made later. The simplest control provided is probably for steering only. This can be satisfactory with a yacht or other boat guided at will, or with a model plane adjusted to climb when flying straight, lose altitude when turning and glide to land when fuel is exhausted. Propulsion control is easily arranged with an electrical motor and the actuator described here allows turning to port or starboard, sailing straight ahead or stopping the main motor.

The simple type of actuator gives definite degrees of turn either way and this unit is of this type. Proportional and other methods of control are necessary for turns of any particular degree, or a small electric motor with a worm or screw drive to move the rudder can be used.

ACTUATOR CONSTRUCTION

This actuator is based on a small Meccano clockwork motor (available from toy and model shops) though other motors could be used. It provides some hundreds of operations with each winding and is wound before starting the model.

In Fig. 1, the propulsion motor is off and the rudder is straight. End X of the rotating arm is held by A of the escapement. When the transmitter is keyed A is drawn to the core of the electro-magnet. The arm turns until Y engages B, the rudder link moving the rudder. Contacts Z-Z close, completing the circuit to the propulsion motor and battery. To sail straight, the key is released so that Y turns to engage A. To turn the other way, the key is pressed, causing X to engage with B. Any unwanted position can be passed almost immediately by momentary pressure on the key, any of the four positions being held as long as required. Relay circuit current is only drawn when turning the model.

The rotating arm is about 2in long and filed from scrap metal. Several holes allow the crank throw of the rudder link to be adjusted. A short length of $\frac{1}{4}$in diameter rod is drilled to fit on the motor spindle and held with the screw which also opens contacts Z-Z. The rotating arm is soldered to this, high enough to clear the winding spindle. One contact Z is a spring brass strip, soldered to a bracket. The other is a small screw, fixed to a bracket which is in turn held to a paxolin strip by small screws. These contacts close firmly, except when opened by the screw as in Fig. 1.

The escapement is fashioned from a piece of metal about $\frac{3}{8}$in wide by $3\frac{1}{2}$in long. Catch A is formed by bending. Catch B is obtained by cutting away about $\frac{1}{4}$in from the strip. The narrow end continues, meeting a projection on the paxolin, to form a limiting stop. Elastic under tension keeps the escapement in this position until the magnet is energised. If the escapement is not ferrous metal, bolt or solder a

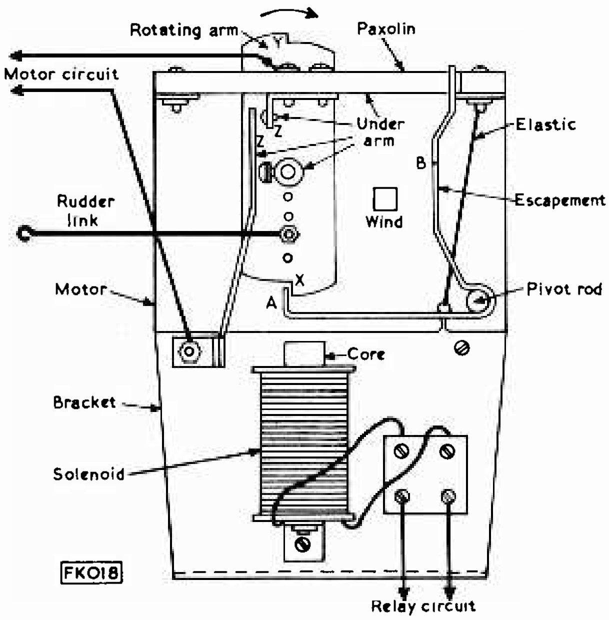
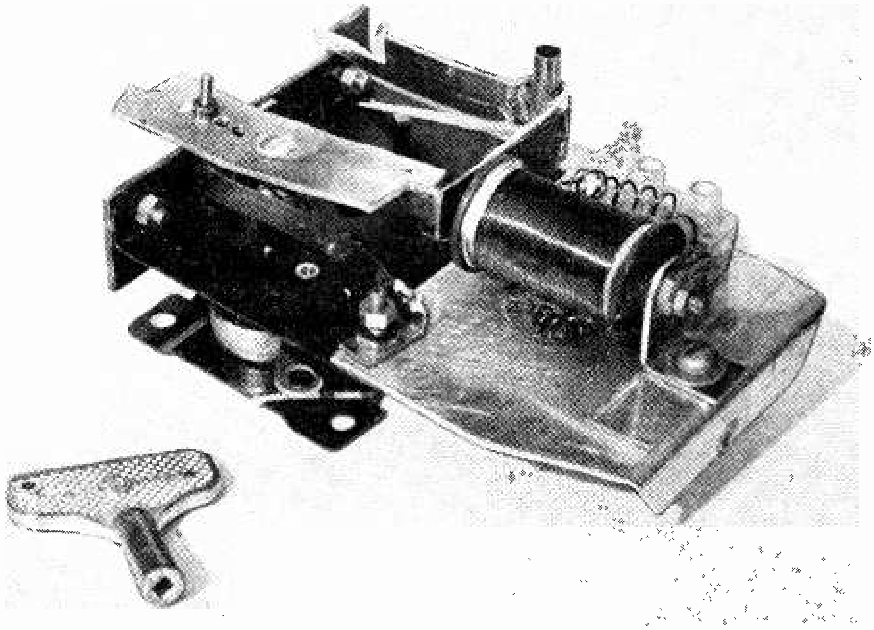


Fig. 1. Diagram showing the construction of a typical actuator, in this case to provide motor control and rudder steering on a model boat.



Actuator made by the author, based on Fig. 1. The motor control contacts are under the rotating arm but shown on top in Fig. 1, for clarity.

piece of iron or mild steel near the core of the solenoid.

The solenoid is fixed to a slotted bracket, to allow adjustment. It can be made from an old bell or buzzer, or it can be a few hundred turns of 26SWG or similar wire on an iron or mild steel core. The large bracket is $2\frac{1}{2}$ x 2in cut from scrap metal, with a flange to allow mounting by a screw at this end, as well as by screws passing through the holes in the clockwork motor.

RUNNING CHECK

Turn the rotating arm to see that ends X and Y project equally. If not, correct this by filing. Bend the escapement so that when A is moved slowly towards the magnet to release X,Y strikes B. Check that the meeting parts are reasonably smooth and that the elastic tension will return the escapement to the position in Fig. 1.

Position the magnet quite close to A. The mechanism should then operate reliably from a 4·5V or similar battery. Finally, with the mechanism mounted in the model, adjust the length of the rudder link so that the rudder is straight with X or Y engaging A. Adjust the crank throw so that a suitable turn is obtained with X or Y engaging B.

ADDITIONAL CONTROL

Fig. 2 shows how the reversing function may be added. The rotating part of the escapement mechanism now has four arms. Its rotation operates the rudder as in Fig. 1. With this form of escapement, the spindle is allowed to move one-quarter of a turn each time the electro-magnet is briefly energised. To make this clear:— when the magnet is energised X is released and a very small rotation brings Y against Z. When the magnet releases, Y turns to the position formerly occupied by X, no holding current being necessary.

The reversing relay is connected to the same circuit. With no relay current present, battery A drives the model forward. The escapement can thus take up any of four positions with the reversing relay not energised. However, if the transmitter key is held, the reversing relay is retained in the position bringing battery B into use, sailing the model astern. It is convenient to use an old or lower voltage battery for astern. For changing battery polarity with a single battery, a double pole relay is necessary for reversing.

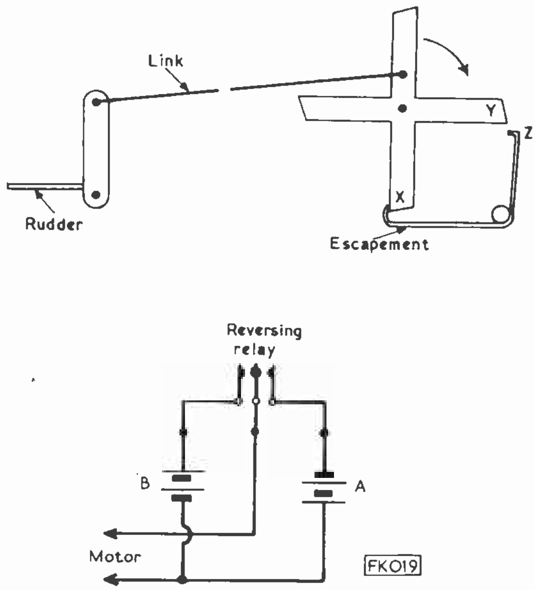


Fig. 2. Modifications to the rotating arm to provide reversing facilities on the propulsion motor.

Propulsion motors, except the larger types, are of permanent magnet construction and can be reversed by reversing the supply polarity. This type of motor gives best efficiency especially with dry cells. If a motor having a field winding is used, this will not be

With the Doram catalogue, even the guarantee is guaranteed.

Doram is an entirely new way of buying electronic components.

So, to succeed, it's got to have something going for it, right?

We agree with you. And where Doram scores is in the security it gives the amateur buyer.

We'll give you peace of mind three ways.

No-quibble guarantee.

Firstly, we guarantee to replace any component which arrives faulty. Absolutely free of charge.

And secondly, our guarantee is backed by the biggest electronics distribution Group in Britain.

7-day service.

Thirdly, we guarantee you'll have your components within 7 days from our receipt of your orders.

We're so confident of our service that if we can't supply the part you want within 7 days we'll give you an immediate refund.

So you'll never get a tedious wait.

You know just where you stand with Doram.

All branded goods.

All goods supplied by Doram are made by big-name manufacturers. And they're all to manufacturer's specifications. They're the best money can buy.

In fact, Doram gives the amateur the sort of service only professionals have enjoyed before.

Millions of components.

All in all, we're big enough to offer you stocks of millions of components, on over 4,000 product lines.

All you do is buy the Doram catalogue for 25p (that's a yearly reference book for the price of a pint of lager) and then take your pick from it.

Use the coupon now. Send today for the first-ever Doram catalogue. It can take a lot of worry out of amateur components buying.

And for 25p that's not bad, is it?

I ENCLOSE 25p.* PLEASE SEND ME THE NEW DORAM CATALOGUE.

Name ....

Address ....

....

....

Doram Electronics Limited,
PO Box TR8,
Wellington Road Industrial Estate,
Wellington Bridge, Leeds LS12 2UF.

*This will be refunded on orders of £5 (less VAT) or more received by us before March 31st, 1975.

DORAM

PW 3/75

reversed when the supply polarity is changed. To reverse this type of motor, a double-pole relay is required, so wired that the supply is reversed to either the field or armature, but not to both.

A system of this kind can be modified by shortening arm Z so that the mechanism can come to rest in any one of eight equally divided positions. This gives half-port and half-starboard steering, as well as full-port and full-starboard. The reversing relay cannot then be held by the same circuit, but can be energised by contacts Z-Z in Fig. 1, giving straight astern as well as straight ahead and two degrees of turn each way.

The mechanism shown in the photograph of the boat is the Graupner Kinematic cascade switcher, which provides motor control by short blips and steering control by holding the transmitter keyed on. It is completely electric. A lightweight escapement suitable for small boats and planes, weighing only 1¼oz and having four positions without holding, is the Rising & Schulz Mark I FR unit. Boat and other model kits, hulls, propulsion motors, steering and other control gear are available from model control equipment shops or large toy shops and model shops.

Hatches off to show the compartments for the propulsion motor, left main batteries, centre, actuator and auxiliary battery, right.

INSTALLATION

It is convenient to use colour-coded leads to run through the model, for the receiver relay and other circuits. It is preferable to use separate batteries for the receiver and any other devices, as this helps avoid interference between the systems. A separate battery is generally required for the main motor. Interference problems can be reduced by keeping the receiver at the front of the model with electromagnetic control devices and motors towards the back. Suppressor capacitors of about 5000pF will usually be necessary across motor, electro-magnet or actuator circuits if interference upsets the receiver. Such interference may be shown by chattering or buzzing of a relay.

Plugs, terminals or other suitable means should be provided for connecting together the various parts of the whole system. On/off switches should be included for the receiver, etc. Fig. 3 shows the whole equipment for the boat illustrated which is typical of a straightforward model of this type.

The receiver, with battery and relay, occupies the forward section of the model. The actuator, with battery, is fitted in the stern near the rudder. Two propulsion batteries are placed forward of this with the propulsion motor near the middle driving the propeller shaft through a flexible coupling in the usual way. For convenience in reaching the equipment, front cabin and decks lift off.

MODEL CONTROL MONITOR

This instrument is almost indispensable for tuning and testing model control transmitters for the 27MHz band. With such transmitters, some indication of the strength of the signal actually radiated is of great help when tuning oscillator and output circuits, or aerial loading coils, when provided. A receiver is not very suitable as an aid to tuning, as usually it gives only an indication that the equipment is in fact working.

If this monitor is placed a small distance from the transmitter adjustments can be made to the transmitter circuits while observing the reading on the monitor meter. The maximum monitor reading corresponds to the strongest radiated signal and thus to best operation of the transmitter and subsequent reliable range.

The monitor also incorporated a headphone socket so that a check can be made on the audio tone or tones produced by the transmitter.

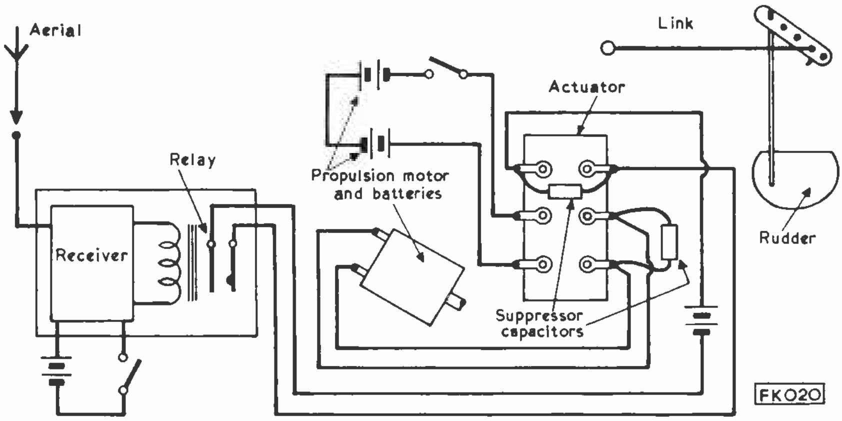
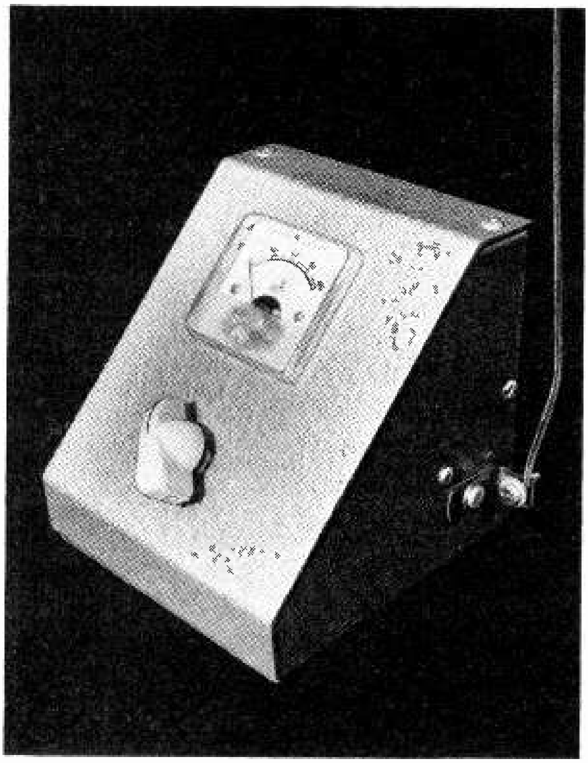


Fig. 3. Interconnection of the various units as arranged in a model boat. The link plate between the link and the rudder post enables the amount of rudder movement to be varied.



The monitor is an invaluable aid in setting up a transmitter for maximum output and hence maximum range of control.

MONITOR CIRCUIT

The arrangement is shown in Fig. 4 and when trimmer TC1 is set so that the tuned circuit resonates at about 27MHz VC1 should be half closed. The required band is then tuned by VC1 which allows compensation to be made for changes in the aerial used. L2 is a coupling winding the diode D1 providing DC for the meter M1. The headphone jack socket is of a type normally closed until a plug is inserted.

CONSTRUCTION

Component values and constructional details are not too important, provided the frequency coverage is suitable. A ready-made Wearite PHF3 coil may be used, or a coil may be wound. For a home-wound coil, use a $^{5}/_{8}$in diameter paxolin tube $1^{3}/_{4}$in long. Ten turns of 20SWG wire are required from points 1 to 2, spaced to occupy $^{7}/_{8}$in as in Fig. 5. The ends are passed through small holes in the tube, and the

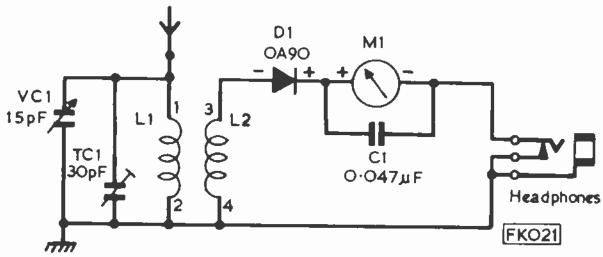


Fig. 4. Circuit of the monitor, in this case for the 27MHz model control band.

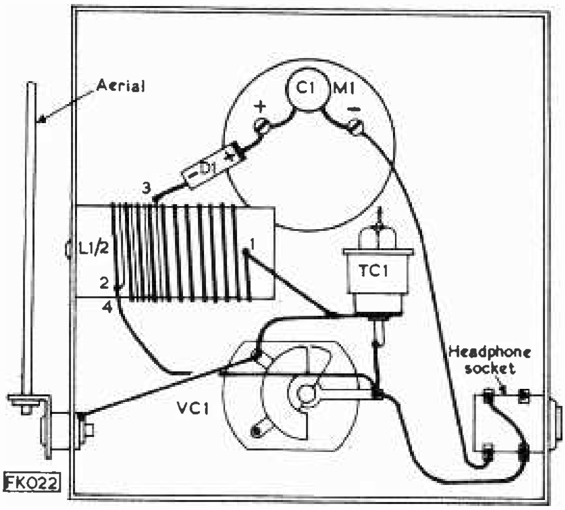
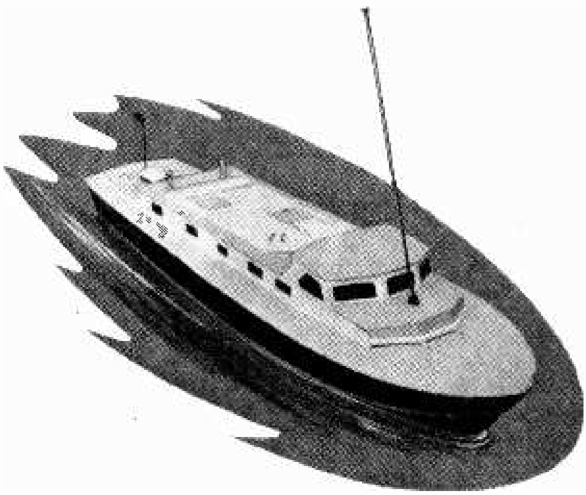


Fig. 5. Internal wiring of the simple monitor and details of the coil windings.

turns can be secured with Bostik 1 or similar adhesive. L2 has four turns of thin insulated wire, between the turns of L1, as shown.

A 200μA indicating instrument is suggested, but if a more sensitive meter should be available it can be fitted which will allow the use of a smaller aerial on the monitor.

A sloping front case is used, as in Fig. 5. The coil is fixed with a bracket, or single 6BA bolt for the PHF3 while TC1 is supported by the wiring and VC1. A bracket is fixed to one side of the case, for the aerial, and insulated from the metal by adding insulating washers or any similar means. A telescopic aerial is ideal and some have a suitable bracket supplied. If so, this is fixed to the case.



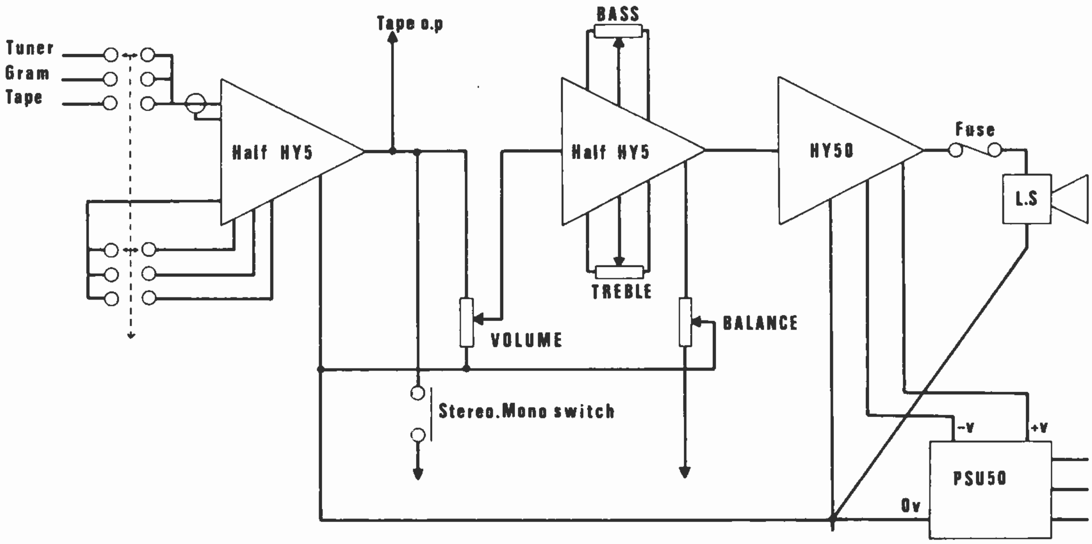
AERIALS

The aerial actually used may be a stiff wire from about 12 to 24in long, a telescopic receiver type aerial, a vertical rod, interlocking tubes or any other self-supporting aerial. When making a first

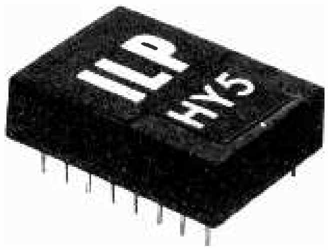
continued on page 1010

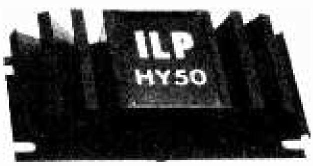
I.L.P. (Electronics) Ltd

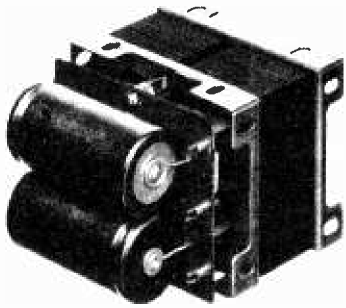
SHEER SIMPLICITY!



MONO ELECTRICAL CIRCUIT DIAGRAM WITH INTERCONNECTIONS FOR STEREO SHOWN







The HY5 is a complete mono hybrid preamplifier, ideally suited for both mono and stereo applications. Internally the device consists of two high quality amplifiers—the first contains frequency equalisation and gain correction, while the second caters for tone control and balance.

TECHNICAL SPECIFICATION
Inputs: Magnetic Pick-up 3mV RIAA: Ceramic Pick-up 30mV; Microphone 10mV; Tuner 100mV; Auxiliary 3–100mV; Input/Impedance 47kΩ at 1kHz. **Outputs:** Tape 100mV; Main output 0db (0·775V RMS). **Active Tone Controls:** Treble ± 12db at 10kHz; Bass ± 12db at 100Hz. Distortion: 0·5% at 1kHz. **Signal/Noise Ratio:** 68db. **Overload Capability:** 40db on most sensitive input. **Supply Voltage:** ± 16–25V.

PRICE £4·50 + 36p VAT P. & P free

The HY50 is a complete solid state hybrid Hi-Fi amplifier incorporating its own high conductivity heatsink hermetically sealed in black epoxy resin. Only five connections are provided, input, output, power lines and earth.

TECHNICAL SPECIFICATION
Output Power: 25W RMS into 8Ω. **Load Impedance:** 4–16Ω. **Input Sensitivity** 0db (0·775V RMS). **Input Impedance:** 47kΩ. **Distortion:** Less than 0·1% at 25W typically 0·05%. **Signal/Noise Ratio:** Better than 75db **Frequency Response:** 10Hz–50kHz ± 3db. **Supply Voltage:** ± 25V. Size: 105 x 50 x 25mm.

PRICE £5·98 + 48p VAT P. & P. free

The PSU50 incorporates a specially designed transformer and can be used for either mono or stereo systems.

TECHNICAL SPECIFICATIONS
Output voltage: 50V (25-0-25V). **Input Voltage:** 210–240V.
Size: L.70. D.90. H.60mm.

PRICE £6 + 48p VAT P. & P. free

TWO YEARS' GUARANTEE ON ALL OUR PRODUCTS

I.L.P. Electronics Ltd.
Crossland House,
Nackington, Canterbury
Kent CT4 7AD

Tel (0227) 63218

Please supply, ...
Total Purchase price ....
I Enclose, Cheque ☐ Postal Orders ☐ Money Order ☐
Please debit my Access account ☐ Barclaycard account ☐
Account number ....
Name & Address ....
....
Signature ....

At Last...
A Perfect
Hi-Fi Match!

our comprehensive matching hi-fi guide will start you assembling a quality system of your own choice to suit your needs and your pocket – and with no dud buys!

Now at last you can see at a glance what components will match up mechanically, electrically – and financially – to produce the best possible sound for your money.
Basic specifications, recommended retail prices, generous discounts and the simplest classification will combine to help you make the best selection from the wide range of different makes available.
This authoritative 'map' of the hi-fi jungle will appear regularly as an updated section in Practical Hi-Fi and Audio every month, starting in the March issue with what makes a perfect match for setups costing less than £150.
NO GUESSWORK! NO MISMATCHING! NO FRUSTRATION!

Plus our regular coverage of hi-fi developments and commonsense advice on hi-fi problems

PRACTICAL
HI-FI & AUDIO
March issue

OUT NOW 30p

GOING BACK...

1970 60 50 40 30 20

COLIN RICHES

Golden Oldies

ONE company that really believes in Going Back is Retrieval Recordings Ltd. which devotes itself exclusively to the reissue of vintage recordings, mainly from the ragtime and the Twenties periods. Using the archive material of the directors (themselves enthusiastic collectors), and employing special equipment of their own design, many historic and rare recordings of the early days of popular music have been preserved for all to hear—and with quite astonishing quality of reproduction.

Most of the LPs are of complete sets of recordings by particular performers arranged in chronological sequence and are backed by liner stories by specialist writers and include complete authenticated recording information. At the moment, the LPs cover vintage jazz, dance music, blues and popular music nostalgia, but other associated idioms are under consideration.

One of the sets of authentic recordings of historic popular music, Fountain FJ-101 includes the legendary sides made by the Original Dixieland Jazz Band in 1917, originally issued on 'hill-and-dale' 78s. This is jazz at the very beginning!

The latest addition to the Fountain/Retrieval catalogue, Fountain FJ-109 (Curtis Hitch and Hoagy Carmichael) is a fine collection of Mid-West jazz from 1923 to 1927. The sub-title 'Indiana Summer' sets the mood for this album of bouncy music recorded in Richmond, Indiana.

Side 1 consists of the complete recorded output of The Happy Harmonists, a collection of lively foot-tapping numbers by a band organised by Curtis Hitch and featuring the spirited cornet playing of Fred Rollison. The last two tracks feature Hoagy Carmichael, who takes over the piano chair from Curtis Hitch.

Side 2 comprises recordings by groups led by Emil Seidel and Hoagy Carmichael. The highlight of this side is the recording of "Star Dust", which is not only the very first recording of the top pop of all time but includes a monumental and imaginative piano solo by composer Hoagy Carmichael. These recordings also include the complete output of Carmichael—cornettist extraordinary.

FJ-109 is presented in a gatefold sleeve and contains full authenticated discographical information on the recordings. The fully packed LP includes no less than 19 titles. The r.r.p. is £2·44 including VAT.

Readers interested in the genuine article can obtain a copy of the latest catalogue of Fountain and Retrieval LPs on request (and enclosing a stamp for return postage) to: *Retrieval Recordings Ltd., 48 Eversley Avenue, Barnehurst, Kent DA7 6RB.*

Who were they?

I have received numerous enquiries from many younger readers who ask questions like, "who were Heinrich Hertz, Popoff, R. A. Fessenden, Nikola Tesla, Sir Oliver Lodge etc, etc.? When did they live and can you describe their contributions to wireless and explain some of their experiments?"

It is for this reason that I hope, from time to time to feature some of the great pioneers of wireless in the Going Back column.

Nikola Tesla

Nikola Tesla was born in the town of Smiljan in Yugoslavia in 1857. He was educated at Prague and Graz Universities and studied "electricity". In 1882 he commenced the study of high frequency currents and developed the "Tesla Coil"—a loose-coupled air-cored high frequency transformer.

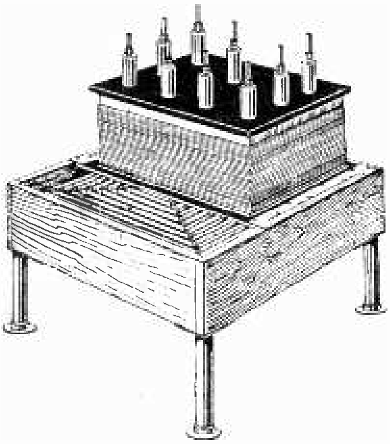
In 1883 he joined the Austrian Telegraphs department and shortly after emigrated to America. He became naturalized and managed to get himself a job as an assistant to Thomas A. Edison.

While working for Edison, Tesla made a special study of high frequency alternating currents and invented an alternator in 1890 which would develop 1kW at 10,000Hz. He patented a synchronous spark discharger in 1896. It was obvious from his patent that he had exhibited an exceedingly clear knowledge of the principle of tuning and a method of adjusting the phase of discharge by varying the position of the stationary electrodes of the spark gap. Like the Tesla Coil, this device was not invented primarily to aid radio telegraphy but was designed to aid Tesla's research into high frequency currents.

A point to bear in mind is that a device similar to that patented by Tesla, was used by Marconi in 1907 when he used the "timed disc" in his spark transmitter.

The Tesla Transformer was used by the Marconi Company in the ½kW transmitting sets. It consisted basically of a primary of a few turns of thick copper wire and a secondary with a large number of turns of a much finer gauge wire. The primary and secondary were separated by an air-space, a glass or ebonite dielectric.

The Marconi version of Tesla's coupling transformer invention was often referred to as a "jigger". The type used for the ½kW spark transmitter had a primary of copper ribbon wound on edge as a sort of "square" spiral. It was mounted on an ebonite support. The secondary was wound outside the primary and a sheet of ebonite was fixed between them. The secondary



Tesla's transformer

winding comprised insulated copper stranded cable wound round a square wooden box. This had an ebonite panel mounted on which were the secondary tappings.

A Clean Sweep

In Germany, the listening tax in 1932 had to be paid monthly. Its collection from the set owners was made by the postman on his rounds. The annual broadcast licence was 24 Marks (then about 30/-).

Germany, at that time possessed roughly four and a quarter million registered listeners and radio pirates were discovered by the municipal chimney sweeps, who, in the course of their daily duties, visited all houses, flats and apartments. It was their duty to notify all wireless receivers to the local authority, thus allowing the latter to make the necessary investigations.

So, if you're naughty and have not paid your TV licence fee yet, keep a wary eye out for chimney sweeps—they may be detector van personnel in disguise.

J.S.T. — O.B.E.

We are very pleased to learn from the New Year's Honours List that Wing Commander John Scott-Taggart, M.C., Italian Order of Merit, has been appointed an officer of the British Empire 'for services to radio engineering'.

Among many other notable achievements 'ST' was the author of the famous ST series of receivers beginning in 1923, designed specifically for the home-constructor.

MODEL CONTROL—*continued from page 1006*

★ components list

ACTUATOR

Clockwork motor (Meccano No. 1 "Magic")
Axle Rod (Meccano No.17 2in.)
Collar with screw (Meccano No. 59)
Rod connector (Meccano No. 213)
Bell electromagnet (see text)
Materials for bracket, escapement etc.

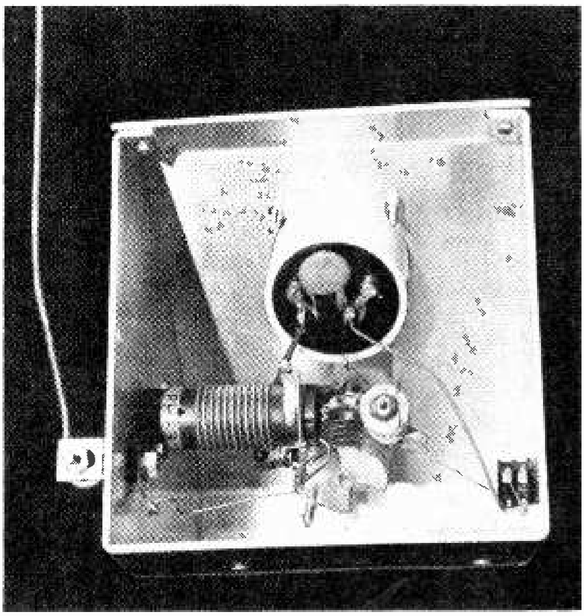
MONITOR

C1, 0·047μF. TC1, trimmer 30pF. VC1, 15pF variable (Jackson C804). D1, OA90. L1/2, coil (Wearite PHF3 or home-made). Case, 4 x 4 x 4in. or similar (H. L. Smith, Type U). Telescopic aerial (see text).

check, especially with a powerful transmitter, take care that the meter is not damaged. Should there be any sign that the reading will exceed full-scale, when tuning VC1, move the monitor to a greater distance or reduce the length of aerial.

USING THE MONITOR

With the transmitter switched on VC1 is rotated for maximum reading on the meter and only needs re-adjustment if the monitor aerial is changed or the transmitter frequency changed. The monitor is placed so that a reading of about a quarter to half scale is obtained. With a low power transmitter, running possibly only a few hundred milliwatts, the monitor will only need to be at a short distance. But if the maximum permitted power is used, the distance will become inconveniently large, so a very short aerial wire should be used with the monitor.



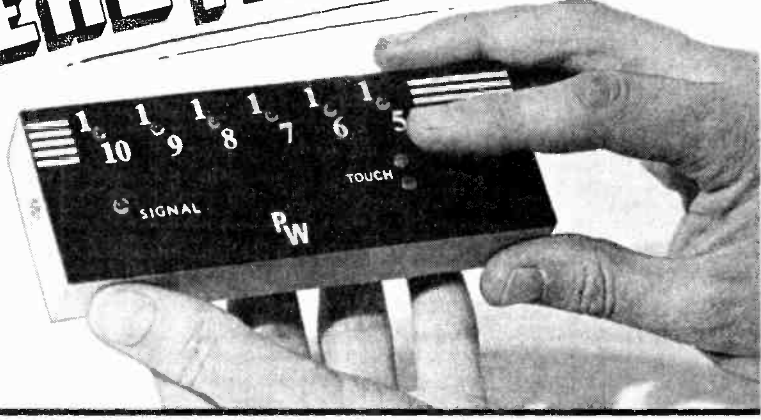
Inside the monitor. Compare with Fig. 5.

Provided transmitter and monitor remain in the same positions and other circumstances which could influence the field strength are also unchanged any modification to the transmitter which increases the power of the radiated signal can be seen. It will be found that quite small adjustments to transmitter tuning can have a considerable effect on radiated power.

SPEED UP YOUR REFLEXES!

IN NEXT MONTH'S PRACTICAL WIRELESS

REACTION TIMER



Here is an amusing device that will enable you and your friends to compare reaction times without any further argument! Full details given for the construction and calibration of the timer.

and

be first to 'hit the button' on our...

QUIZ MONITOR

A 'must' for the quiz master . . . shift the responsibility of decision on to the Quiz Monitor. Sorts out the first contestant to push the button . . . and without fear or favour!

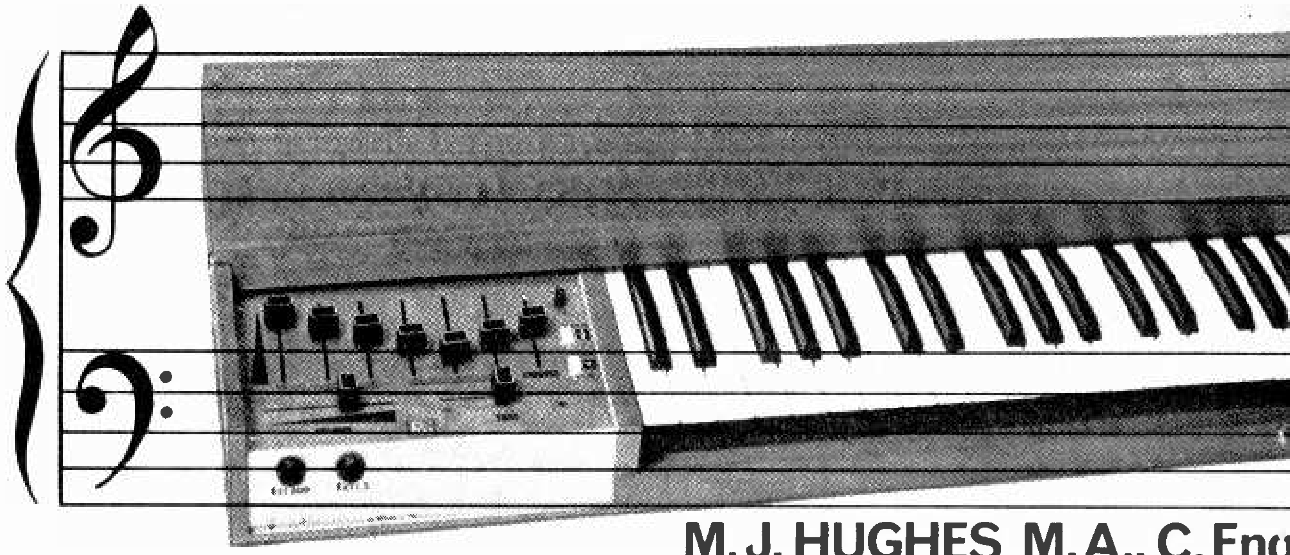
plus

The 'IC+2' RECEIVER

The 'EASYBUILD' ELECTRONIC ORGAN part 2

MANY OTHER CONSTRUCTIONAL ARTICLES, SPECIAL FEATURES AND REGULAR COLUMNS.

ON SALE IN MARCH



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

★ performance

Audio output	1W
Output at external amplifier socket	100-500mV nominal
Output impedance at external LS socket	8—35Ω
Number of octaves	4
Notes available	60
Number of pitches	Two–8ft. and 16ft.
Master oscillator frequency	500kHz nominal.
Three voices each pitch	slider 1—triangular slider 2—square slider 3—spike
Supply voltages from internal power supply	—12V and —27V

IT must be the ambition of thousands of people to own and be able to play an electronic organ, failing to do so only because of the universal hurdle that has to be overcome—the price of a worthwhile instrument. In recent years however, a number of "Reed Organs" have appeared in the shops at more realistic prices but (apart from some near fraudulent claims) none of these, by any stretch of the imagination, can be classed as electronic organs, and of course, none of them get close to emulating the wide range of tone colours and effects that a true electronic organ is capable of producing.

The more adventurous amateur electronics enthusiasts have built their own instruments, but of these courageous people, probably very few have ever been able to complete their project either because time has been against them, or they have run up against the financial barrier. Those who have attempted making their own organ to conventional designs will be very much aware of the tremendous amount of time required to complete the job, caused simply by the number of components, interconnections and complex mechanical structure of the instrument.

The instrument to be described in this article has been designed with all the foregoing problems in mind and the resulting design is neat and extremely simple to make. Four or five evenings of work can complete the electronic assembly, the cabinet is a straightforward carpentry job and the finished organ is small, compact, and light enough to carry around and produces a wide range of tone colours from rich church tones to bright crisp group sounds. It even features a few effects only found on the most expensive of commercial organs. All this is obtained for a comparatively low cost, about £50-£70 at current prices, but it depends, of course, on how one does the shopping and what work one is prepared to do at home.

To keep mechanical problems down to a minimum there are only two printed cricuit boards; one of which houses the tone generating and tone forming circuits, including controls, and the other, a very simple board contains the power supply. Apart from these boards the only other wiring is a loom of wires to the keyboard and input and output lines to an external amplifier, if this is required.

Some sacrifices have had to be made to make it possible to meet the ultimate objective. The main one is the way tone colours are controlled. An organ purist will, no doubt, wince at the way these are generated because we have deliberately avoided the temptation of making a unit that will synthesise a pipe organ. The author feels that if one is making an electronic organ one ought to make the best possible use of electronic techniques to produce acceptable sounds, rather than to make an instrument sound like something it isn't!

INTERNAL AMPLIFIER

It is assumed that the instrument will be used either on the domestic scene, where high powers are not required, or for use with groups which are well catered for with dozens of watts of power from external amplifiers. There is, therefore, a built-in simple one watt audio stage which drives a small internal speaker; this provides ample power for the average room but lacks in bass response (more from the loudspeaker than the amplifier itself). It is for this reason that there are built-in options for headphone output and phono output which will plug into any high power or Hi-Fi amplifier system, for a truly high quality output.

PW 'Easybuild' ELECTRONIC ORGAN

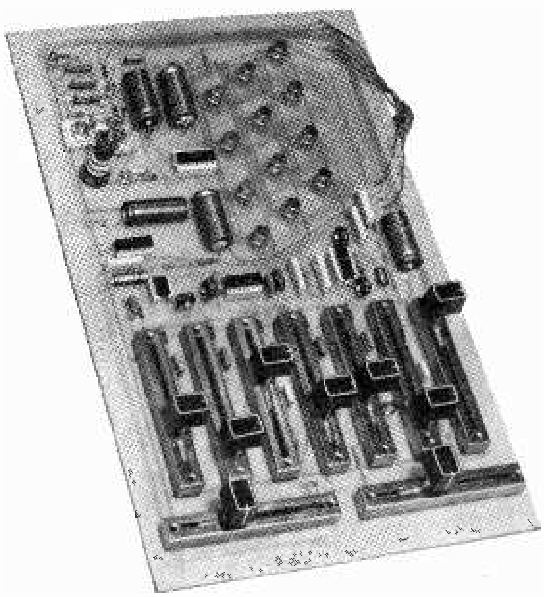
. MIERE

PART 1

Anyone with some experience of soldering should be able to make this organ but, as one might expect, some care and patience is needed to prevent problems. The complexity has been removed from the hands of the constructor and transferred to the main printed circuit board. While assembly is simply a matter of putting the right components into the right place the right way round, the job of "soldering in" has to be done carefully to avoid bridging some of the narrowly separated conductors on the board. The organ also uses a large number of MOS (Metal Oxide Semiconductor) devices which have to be handled correctly to prevent damaging them. This may ring alarm bells in some areas but we shall explain exactly how to handle these devices when the time comes.

It is imperative that before embarking on this project that you obtain a good quality miniature soldering iron. The bit diameter should, ideally, be $\frac{3}{32}$in. but under no circumstances should it exceed $\frac{1}{8}$in. diameter. Apart from this you will need normal tools i.e. side cutters, small pliers, a small screwdriver and resin cored solder. Use 22 gauge solder rather than the heavier 18 gauge to help keep connections neat. We recommend that you also have available a continuity tester (ohmmeter) to check for short circuits, any simple multimeter will suffice.

Armed with this equipment you should experience no problems, and, apart from being very pleased with the sound of the completed instrument, you should obtain great pleasure and satisfaction from the neat way it goes together. The only danger envisaged is that when the neighbours see and play it, you will find yourself embarking on it a second time round! A complete shopping list for all the components and hardware is given in this part together with the names and address of suppliers of the more unusual components.



Main printed board containing tone generating and tone forming circuits, as well as all slider controls.

NOTE GENERATION

Before describing the circuitry in detail we will, for the benefit of those who have not encountered an organ before, go through the system in block form. The complete system is shown in Fig. 1.

A proper organ (unlike simple stylus organs) is a polyphonic device. This means that we can play as many notes as we like, all at the same time. Consequently it is necessary to have a large number of tone generators, each producing a frequency for every note on the keyboard. Using a 49 note keyboard (four 12 note octaves + top "C") we need, on the face of it, 49 separate tone generators. In practice more than these are needed for an organ because we have to provide the facility to play two notes (an octave apart) by depressing a single key which helps to generate the wide range of tone colours. To make this possible and to get the two pitch effect over the whole keyboard it is necessary to provide an extra octave of notes which extend below the bottom end of the normal keyboard. The tone generator in this circuit provides a total of 60 separate signals, each one of which has to have an exact frequency to keep the organ in tune. In the past this in itself has been an awesome task for the home constructor, but by making use of modern technology and integrated circuits this part of the system is now the simplest.

To generate the 60 different notes, we start off by producing 12 tones that give the highest octave required on the keyboard. The notes occuring in octaves beneath this topmost one have an exact two to one relationship with each other. For example, if the frequency for the highest "C" on the keyboard is f, then the "C" an octave lower will be f/2 and for the octave beneath that will be f/4 and so on. The same applies to the other 11 notes in the top octave. To generate notes for sub-octaves it is only necessary to take the frequency of that note for the top octave and subject it to division by two for each successive octave lower. This is easily accomplished using divide-by-two integrated circuits. Operating with a top octave plus four other sub-octaves, for each note four divide-by-two circuits are needed. As it happens there are integrated circuits on the market which contain the four stages we require (for each note) all in the same package, so 12 such integrated circuits are required.

The problem remaining is to generate the 12 original notes for the top octave. In the past this has required 12 separate oscillators each of which needed careful tuning. Apart from the tuning problem these oscillators required a lot of assembly time and proved quite costly. It is now possible to use a single oscillator and a special integrated circuit (which is, admittedly, rather costly) to produce the 12 notes in one operation. This means that there will no longer be any problems with tuning because every note will be precisely locked in an exact frequency relationship with its neighbour, so it is only necessary to set the master oscillator at the right frequency to tune the organ to the international pitch.

Again, the organ purists will wince at this because we are making use of the equal temperament scale which assumes an exact mathematical relationship between the frequencies of adjacent half tones within the musical scale. There is also the apparent drawback that it is virtually impossible to generate this relationship to perfection with simple electronics. Our organ will, intrinsically, be slightly out of tune from the equal temperament scale, but in fact the deviation is so small that it is impossible to discern the difference. It is worth remembering that many

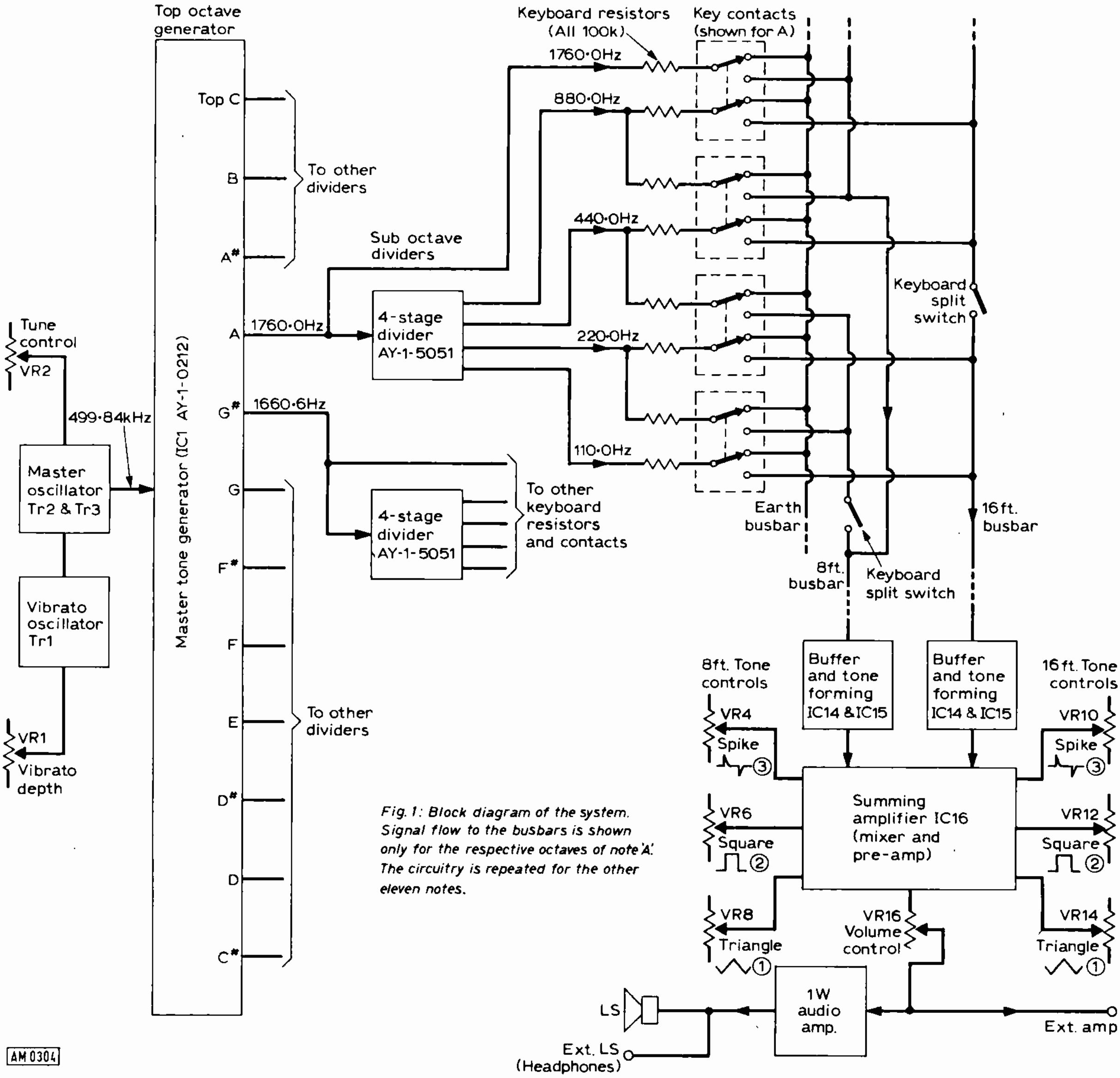


Fig. 1: Block diagram of the system. Signal flow to the busbars is shown only for the respective octaves of note 'A'. The circuitry is repeated for the other eleven notes.

AM0304

highly priced commercial organs are now using exactly the same technique that we are advocating. This master tone generator IC produces the correct musical intervals by dividing down from an input frequency that is considerably higher than any of the notes required. The IC has 12 internal divisors, consequently there are 12 separate notes at the outputs. In our organ a master oscillator producing a nominal 500kHz output signal is used. The table shows the frequencies of the notes generated from the divisors for the top octave and for the subsequent four octaves beneath it. If the organ is to be tuned to Internationl A (440Hz) the input frequency should be 499·840kHz and the figures in the table assume this as being the signal available from the master oscillator.

Even though the master oscillator may not be exactly on the stated frequency the organ will sound in tune with itself throughout its range because the tone intervals are locked. The only problem is that the organ, as a whole, would not necessarily be in tune with other instruments. This immediately presents two advantages in having an organ tuned this way: (1) there are absolutely no problems in setting up the basic tuning and (2) by adjusting one control only the organ can be brought into tune with any other instrument.

By voltage controlling the frequency of the master oscillator at low frequencies (approximately 6Hz) we can introduce frequency modulation of all the tones and this gives a very good vibrato effect. The vibrato is not ideal because all the tones are varying their frequencies in unison and this, to an organ purist, is not desirable, although the result is perfectly acceptable. By applying a DC shift to the voltage controlling the oscillator we can introduce a "tune" control to give Hawaiian guitar type sounds over about $1\frac{1}{2}$ tones.

THE KEYBOARD

The 60 tone lines from the dividers are fed through resistors to contacts on the keyboard. Each key has two contacts which have the true note fed to one contact (we call the genuine notes 8ft pitch) and the corresponding note an octave lower (16ft pitch) to the other contact. When the keys are not pressed the end of each resistor is connected to an earth rail and consequently the signal is shorted to earth. If a key is pressed the signals are fed to a line common to all the keys, called a busbar. There are two busbars in this organ; one for the 8ft pitch notes and the other for the 16ft pitch. The more keys that are pressed the more frequencies are superimposed on each other on each busbar, giving rise to the chords with which we are all familiar. Using the series resistor on each line ensures that the signals superimpose additively which means that the volume will increase somewhat as more keys are pressed.

The signals impressed on the busbars are very much attenuated after the generators but they are in the same form, i.e. they are square waves that have been additively mixed. One could feed the busbar straight into an amplifier and listen to the sound of the square waves but the effect would be most uninteresting, being very much like a clarinet. The next step is to feed the output from each busbar into a circuit that will modify the wave shape of each set of signals. Such a circuit is called a tone forming circuit and there are two sets of these in the organ; one which operates exclusively on 8ft pitch notes while the other operates independently on 16ft pitch.

TONE FORMING

Most organs carry out tone forming by feeding the busbar signals into complex filters, which is called subtractive tone formation because it simply filters out frequencies in various bands to "colour" the sound. The PW organ uses a totally different technique which is a form of additive tone colouration. The technique will be described in more detail later but basically the square wave signal is amplified and in turn forms one of the signals used in the additive process. It is then differentiated to produce a series of fast spikes. Such a signal maintains many of the characteristics of the original sound but becomes extremely "reedy". This signal is easy to produce and forms the second of the additive mixing signals. Finally the original square wave is fed to a two-ramp integrator which converts the square wave into a series of triangular waves. These triangular waves are more mellow in sound quality and closely resemble a flute. Ideally it would have been nice to produce sine waves rather than triangular waves but this would have required far too much circuitry.

These three modifications of the original busbar signals, "square", "spike" and "triangle" are fed via three slider potentiometers to a voltage summer. We can thus mix any proportion of one type of waveform with another and vary the colouration of the sound over a wide range. All the above is repeated for the other pitch (either 8ft or 16ft) and the output from the mixing sliders of the second pitch are also fed to the same summing point. One can therefore mix the spike waveform of, say, the 8ft pitch with the triangle waveform of the 16ft pitch and produce a totally different kind of sound. With the six controls an infinite number of sound patterns can be generated.

NOTE	Divisor	fHz (top octave)	fHz (next octave)	fHz (next octave)	fHz (next octave)	fHz (bot. octave)
Top C	÷239	2091·4	1045·7	522·9	261·4	130·7
B	÷253	1975·7	987·8	493·9	247·0	123·5
A♯	÷268	1865·1	932·5	466·3	233·1	116·6
A	÷284	1760·0	880·0	440·0	220·0	110·0
G♯	÷301	1660·6	830·3	415·2	207·6	103·8
G	÷319	1566·9	783·5	391·7	195·9	97·9
F♯	÷338	1478·8	739·4	369·7	184·9	92·4
F	÷358	1396·2	698·1	349·1	174·5	87·3
E	÷379	1318·8	659·4	329·7	164·9	82·4
D♯	÷402	1243·4	621·7	310·9	155·4	77·7
D	÷426	1173·3	586·7	293·3	146·7	73·3
C♯	÷451	1108·3	554·2	277·1	138·5	69·3

★ components list

Resistors

R1	1MΩ	R17	100kΩ
R2	4·7kΩ	R18	100kΩ
R3	38kΩ	R19	10kΩ
R4	38kΩ	R20	680Ω
R5	2·2kΩ	R21	100kΩ
R6	22kΩ	R22	100kΩ
R7	100kΩ	R23	10kΩ
R8	1kΩ	R24	100kΩ
R9	470kΩ	R25	100Ω
R10	1kΩ	R26	2·2kΩ
R11	100Ω	R27	2·2kΩ
R12	100Ω	R28	22kΩ
R13	10kΩ	R29	4·7kΩ
R14	680Ω	R30	680Ω
R15	10kΩ	R31-R128	100kΩ
R16	100kΩ		

All resistors 10% ¼W

VR1	5kΩ lin slider	VR9	100kΩ min vert preset
VR2	5kΩ lin slider	VR10	10kΩ lin slider
VR3	100kΩ min vert preset	VR11	4·7kΩ min vert preset
VR4	10kΩ lin slider	VR12	10kΩ lin slider
VR5	4·7kΩ min vert preset	VR13	220kΩ min vert preset
VR6	10kΩ lin slider	VR14	10kΩ lin slider
VR7	10kΩ lin slider	VR15	100kΩ min vert preset
VR8	10kΩ lin slider	VR16	10kΩ lin slider

Capacitors

C1	0·22μF	C16	0·33μF
C2	0·22μF	C17	0·047μF
C3	0·22μF	C18	0·1μF
C4	0·1μF	C19	0·33μF
C5	2200μF	C20	0·1μF
C6	1000μF (16V)	C21	0·1μF
C7	500pF (trimmer)	C22	0·1μF
C8	1000μF	C23	10μF (25V)
C9	0·33μF	C24	47μF (10V)
C10	0·033μF	C25	1000μF (16V)
C11	0·1μF	C26	0·33μF
C12	0·33μF	C27	1000μF (16V)
C13	0·1μF	C28	100μF (16V)
C14	0·1μF	C29	3000μF (35V)
C15	0·1μF		

All polyester 240V unless otherwise stated

Semiconductors

Tr1	BCY71	D2	1N4004
Tr2	BCY71	D3	1N4004
Tr3	BCY71	D4	1N4004
Tr4	AD162	D5	1N4004
D1	1N4004	D6	1N4004
		D7	12V 400mW zener

Integrated circuits

IC1	AY-1-0212	IC10	AY-1-5051
IC2	AY-1-5051	IC11	AY-1-5051
IC3	AY-1-5051	IC12	AY-1-5051
IC4	AY-1-5051	IC13	AY-1-5051
IC5	AY-1-5051	IC14	747 dual-in-line
IC6	AY-1-5051	IC15	747 dual-in-line
IC7	AY-1-5051	IC16	741 dual-in-line
IC8	AY-1-5051	IC17	LM380 dual-in-line
IC9	AY-1-5051		

Miscellaneous

T1 240V prim. 18V ½A sec. L1 and L2 Denco Maxi-Q aerial coil (blue) range T2. S1 240V ½A mains slide. S2 single pole rocker. S3 single pole rocker. LS1 8Ω to 35Ω to suit cabinet. Sk1 switched jack. Sk2 switched jack. 49 note (C to C) keyboard. 49 two pole contact assemblies. Main PCB, power supply PCB, 16 circuit board pins, 98 way tag strip (tag separation approx. ¼in.) and approx. 50 yards fine insulated flexible connecting wire.

★ collated component list

Resistors

3 off	100Ω	4 off	10kΩ
3	680Ω	2	22kΩ
2	1kΩ	2	38kΩ
3	2·2kΩ	105	100kΩ
2	4·7kΩ	1	470kΩ
		1	1MΩ

All resistors 10% ¼W

Potentiometers

7 off 10kΩ
2 off 5kΩ
All linear sliders with three terminals (type TTC, PW organ)—from Radio Components Specialists or Henrys Radio

Presets

2 off 4·7kΩ min vertical, 3 off 100kΩ, 2 off 220kΩ

Capacitors

1 off	500pF Compr. trimmer	3 off	0·22μF
		5	0·33μF
1	2200pF (polyester)	1	10μF (25V)
		1	47μF (10V)
1	0·033μF	1	100μF (16V)
1	0·047μF	4	1000μF (16V)
9	0·1μF	1	3000μF (35V)

Transistors

3 off BCY71 and 1 off AD162

Diodes

6 off 1N4004 and 1 off 12V 400mW zener

Integrated circuits

1 off	AY-1-0212	1 off	741 dual-in-line
12	AY-1-5051	1	LM380
2	747 dual-in-line		

Inductor

1 off Denco Maxi-Q aerial coil (blue) range T2

Transformers

1 off 240V prim. 18V ½A sec. type MT50/½

Switches

1 off 240V ½A mains slide, 2 off single pole rockers (miniature)

Loudspeaker

1 off 8Ω to 35Ω to suit enclosure

Miscellaneous

16 printed board pins. 3 x 14 pin DIL sockets. 1 x 16 pin DIL socket. 1 x 8 pin DIL socket. 50 yards fine insulated flexible connecting wire. 93 way tag strip comprising four separate strips holding 24,24,24 and 26 tags each, (these have to be constructed by the builder). Two switched jack sockets (¼in.).

49 note (C to C) keyboard with 49 two pole contact assemblies, paxolin mounting plates and palladium earthing busbars; available as a kit from Maplin Electronic Supplies, PO Box 3, Rayleigh, Essex SS6 8LR priced £29·95 incl. p.p. & VAT.

Main printed circuit board and power supply printed circuit board available from Foresight Electronics, 62 High Street, Croydon CR9 2UT; price of both boards £7·20 incl. p.p. & VAT.

Integrated circuits, Transistors and Diodes available from Chromasonic Electronics, Dept. 1, 56 Fortis Green Rd., London N10; Henry's Radio, 404-406 Edgware Rd., London W2; Marshall's, Dept. PW, 42 Cricklewood Broadway, London NW2 3HD, Tel:01-452 0161 and Foresight Electronics.

NOTE

Practical Wireless is offering a full size paper drawing of the main printed board showing track layout. For those who require one of these, please write, marking the envelope **'Easybuild Organ' to Practical Wireless, Fleetway House, Farringdon St., London, EC4A 4AD.** and enclosing a PO or cheque for 25p and a 10x8in size S.A.E.

The output from the six input summer is fed to an internal integrated circuit power amplifier to give about one watt output from the internal loudspeaker. Alternatively the output from the summer can be taken to an external Hi-Fi amplifier if greater power and/or higher quality is required.

SPLIT KEYBOARD

A drawback with a single manual organ is the lack of ability to emphasise the right hand or the left hand. An option in this system (which is included as standard but can be removed if not desired) is to "split" the keyboard. This allows us to use the 16ft pitch only over the bottom two octaves and the 8ft pitch only over the top two octaves. Thus, by means of a switch, it is possible to have 16ft operating over the whole keyboard but 8ft only over the top two octaves; this would make anything played by the right hand stand out over the accompaniment. Likewise 8ft can be operational over the whole keyboard with 16ft only over the bottom range, giving emphasis to bass notes. There is very little complication introduced to the electronics by doing this, all that is necessary is a series switch in each of the two busbars. The complications arise when trying to play in this mode, and only skilled organists are likely to be able to make the best use of this facility.

Due in part to the lack of pure sinewaves the organ tends to favour reed tones and although there are plenty of mellow tones to be produced, the tone colouration lacks variety. To overcome this drawback and increase the range considerably, it is suggested that the organ be connected to a Hi-Fi amplifier, where the treble and bass controls can be used to the best effect.

CIRCUIT DETAILS

Fig. 2 shows the master oscillator and vibrato oscillator. The nominal 500kHz signal is generated by Tr3 which is a Hartley Oscillator using a standard medium wave tuning coil as the inductor. Making C7 500pF brings its tuning range well down to the frequency required. D1 and D2 are ordinary power rectifier diodes operating as varacter diodes and are, effectively, in shunt across C7. The more negative the potential of Tr2 emitter, the more reverse biased these diodes become, their junction capacitance reduces and the frequency of the oscillator rises.

The quiescent potential at Tr2's emitter is set over a limited range by VR2, the "tune" control already mentioned. On this quiescent potential one can superimpose a low frequency AC signal (about 6Hz) from the phase shift oscillator comprising Tr1. The amplitude of this vibrato signal can be varied from zero to maximum by VR1. There is no built-in preset control to the vibrato frequency but if desired it can be modified by changing the values of R3 and R4 (increasing them to 47kΩ will reduce the frequency and vice-versa). Do not use resistors outside the range of 22kΩ to 47kΩ.

The characteristics of the tuning diodes are by no means linear and it will be found that the vibrato has greater effect when VR2 is set to its earthy end (this corresponds to low frequencies). Values have been chosen to keep the variation to a minimum but in practice this should present no problems because for normal playing VR2 will not be altered once set—unless producing special "tune" effects and even then the "tune" will greatly over-ride the change in vibrato level.

The output from the collector of Tr3 is used to drive the master tone divider integrated circuit (IC1 in Fig. 3). This is an MOS integrated circuit in a 16 lead DIL encapsulation. It requires two negative supply rails of −12V and −27V as well as earth. Because of this, and the fact that other MOS devices having similar power requirements are used, the rest of the circuit is designed to operate from a −12V rail. Provided IC1 sees an input signal of 10V it will carry out its complex division with no problems. Each output is a square wave with unity mark space ratio for even divisions and a slight divergence from unity for odd divisions; this is mentioned purely for information and plays no part in the efficiency of the operation.

The output impedance of the master tone generator is 3·5kΩ. Being comparatively low there are no problems with interfacing it with the subsequent dividers and taking a parallel tapping from it to provide the tones for the topmost octave. Each output is fed to the input of a four stage divider, with 12 such circuits designated IC2 to IC13. These operate from the same supply rails as IC1 and are fully compatible. The only problem with these circuits is that they are in 10 lead TO-5 encapsulations which makes them slightly more difficult to handle. C8 and R12 are for decoupling and to prevent any breakthrough of the

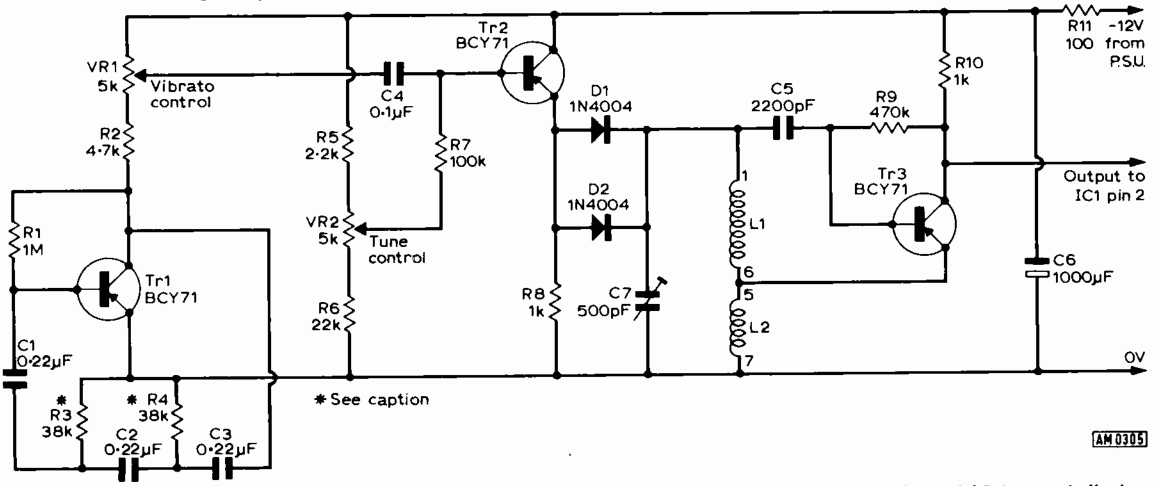


Fig. 2: Circuit diagram of Master oscillator, Vibrato and Tune circuits. R3 and R4 can be varied in the range 22kΩ to 47kΩ to preset vibrato speed to the desired value.

NEW LOW PRICES!

Sinclair Scientific kit

£14.95
(INC. VAT)

(Was £19.95 - save £5!)

Britain's most original calculator now in kit form
The Sinclair Scientific is an altogether remarkable calculator.

It offers logs, trig, and true scientific notation over a 200-decade range – features normally found only on calculators costing around £100 or more.

Yet even ready-built, the Sinclair Scientific costs a mere £21.55 (including VAT).

And as a kit it costs under £15!

Forget slide rules and four-figure tables!
With the functions available on the Scientific keyboard, you can handle *directly*

sin and arcsin,
cos and arccos,
tan and arctan,
automatic squaring and doubling,
$\log_{10}$, antilog$_{10}$, giving quick access to x^y (including square and other roots),
plus, of course, addition, subtraction, multiplication, division, and any calculations based on them.

In fact, virtually all complex scientific or mathematical calculations can be handled with ease.

So is the Scientific difficult to assemble?
No. Powerful though it is, the Sinclair Scientific is a model of tidy engineering.

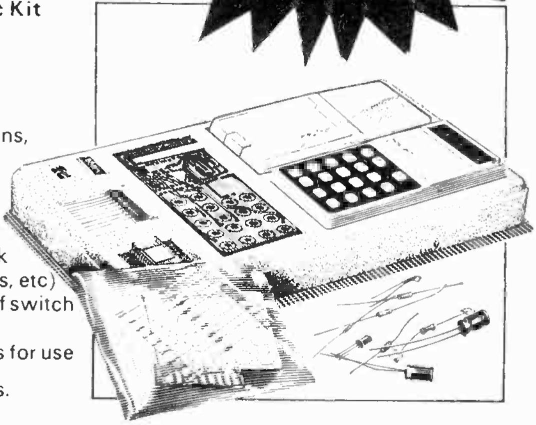
All parts are supplied – all you need provide is a soldering iron and a pair of cutters. Complete step-by-step instructions are provided, and our Service Department will back you throughout if you've any queries or problems.

Of course, we'll happily supply the Scientific or the Cambridge already built, if you prefer – they're still exceptional value. Use the order form.

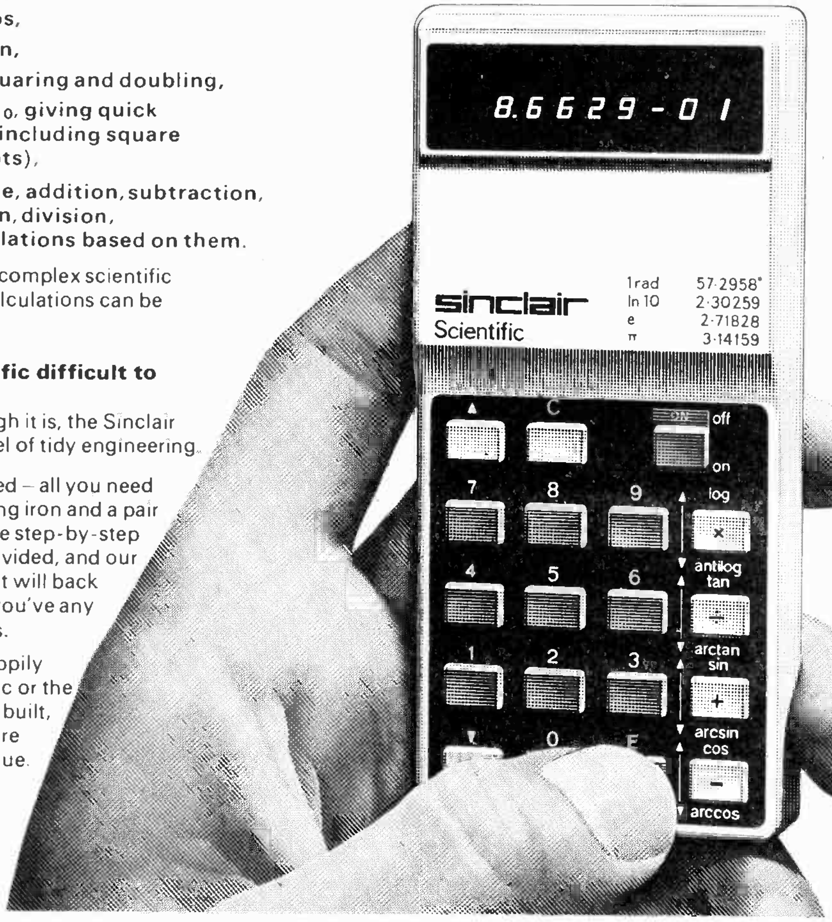
Components for Scientific Kit (illustrated)

1. Coil
2. LSI chip
3. Interface chips
4. Case mouldings, with buttons, windows and light-up display in position
5. Printed circuit board
6. Keyboard panel
7. Electronic components pack (diodes, resistors, capacitors, etc)
8. Battery assembly and on/off switch
9. Soft carrying wallet
10. Comprehensive instructions for use

Assembly time is about 3 hours.



Features of the Sinclair Scientific



● 12 functions on simple keyboard
Basic logs and trig functions (and their inverses), all from a keyboard as simple as a normal arithmetic calculator's. 'Upper and lower case' operation means basic arithmetic keys each have two extra functions.

● Scientific notation
Display shows 5-digit mantissa, 2-digit exponent, both signable.

● 200-decade range
10^{-99} to 10^{99}

● Reverse Polish logic Post-fixed operators allow chain calculations of unlimited length – eliminate need for an button.

● 25-hour battery life
4 AAA manganese alkaline batteries (e.g. MN2400) give 25 hours continuous use. Complete independence from external power.

● Genuinely pocketable
4 1/3″ x 2″ x 11/16″. Weight 4 oz. Attractively styled in grey, blue and white.

NEW LOW PRICES!

Sinclair Cambridge kit

(Was £14.95-save £5!)

Now only £9.95 (INC. VAT)

At its new low price, the original Sinclair Cambridge kit remains unbeatable value.

In less than a year, the Cambridge has become Britain's most popular pocket calculator.

It's not surprising. Check the features below – then ask yourself what other pocket calculator offers such a powerful package at such a reasonable price.

Components for Cambridge Kit

1. Coil
2. LSI chip
3. Interface chip
4. Thick film resistor pack
5. Case mouldings, with buttons, window and light-up display in position
6. Printed circuit board
7. Keyboard panel
8. Electronic components pack (diodes, resistors, capacitors, transistor)
9. Battery clips and on/off switch
10. Soft wallet

Assembly time is about 3 hours.

Take advantage of this money-back, no-risk offer today

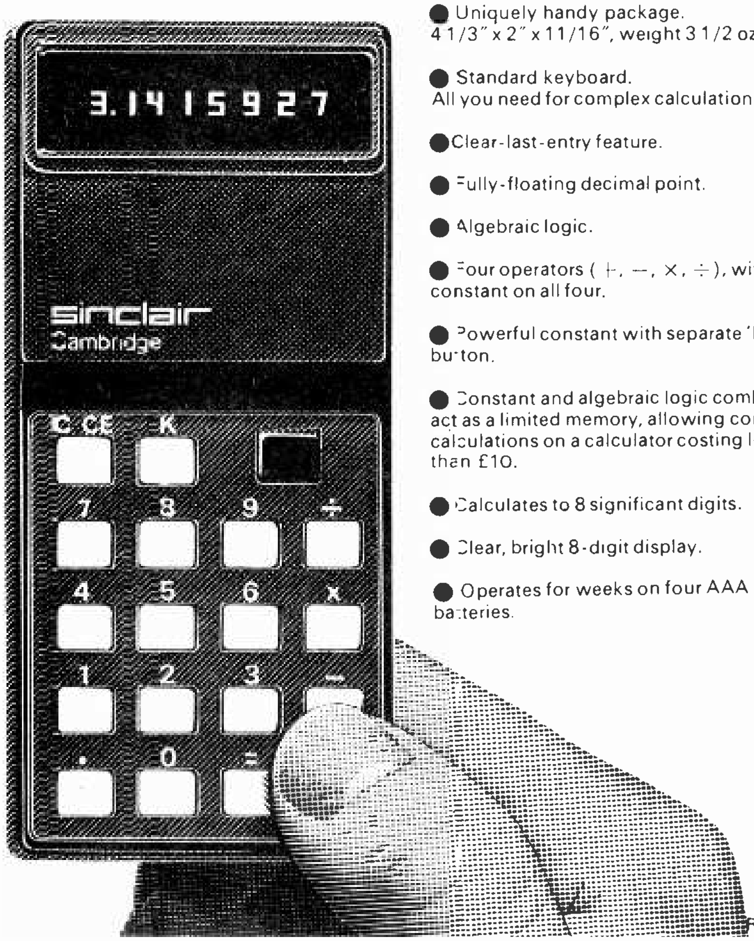
The Sinclair Cambridge and Scientific kits are fully guaranteed. Return either kit within 10 days, and we'll refund your money without question.

All parts are tested and checked before despatch – and we guarantee any correctly-assembled calculator for one year. (This guarantee also applies to calculators supplied in built form.)

Simply fill in the preferential order form below and slip it in the post today.

Scientific
Price in kit form £14.95 inc. VAT
Price built £21.55 inc. VAT.
Cambridge
Price in kit form £9.95 inc. VAT.
Price built £13.99 inc. VAT.

Features of the Sinclair Cambridge



- Uniquely handy package. 4 1/3" x 2" x 11/16", weight 3 1/2 oz.
- Standard keyboard. All you need for complex calculations.
- Clear-last-entry feature.
- Fully-floating decimal point.
- Algebraic logic.
- Four operators (+, –, ×, ÷), with constant on all four.
- Powerful constant with separate 'K' button.
- Constant and algebraic logic combine to act as a limited memory, allowing complex calculations on a calculator costing less than £10.
- Calculates to 8 significant digits.
- Clear, bright 8-digit display.
- Operates for weeks on four AAA batteries.

To: Sinclair Radionics Ltd, FREEPOST St Ives, Huntingdon, Cambs. PE17 4BR

Please send me
☐ Sinclair Scientific kit at £14.95
☐ Sinclair Scientific built at £21.55
☐ Sinclair Cambridge kit at £9.95
☐ Sinclair Cambridge built at £13.99

All prices include 8% VAT.

*I enclose a cheque for £.................., made out to Sinclair Radionics Ltd, and crossed.

*Please debit my *Barclaycard/ Access account. Account number

*Delete as required.

Signed ____________

Name ____________

Address ____________

____

Please print. FREEPOST – no stamp needed.

sinclair

Sinclair Radionics Ltd, FREEPOST St. Ives, Huntingdon, Cambs. PE17 4BR.

Reg. No: 699483 England. VAT Reg. No: 213 8170 88.

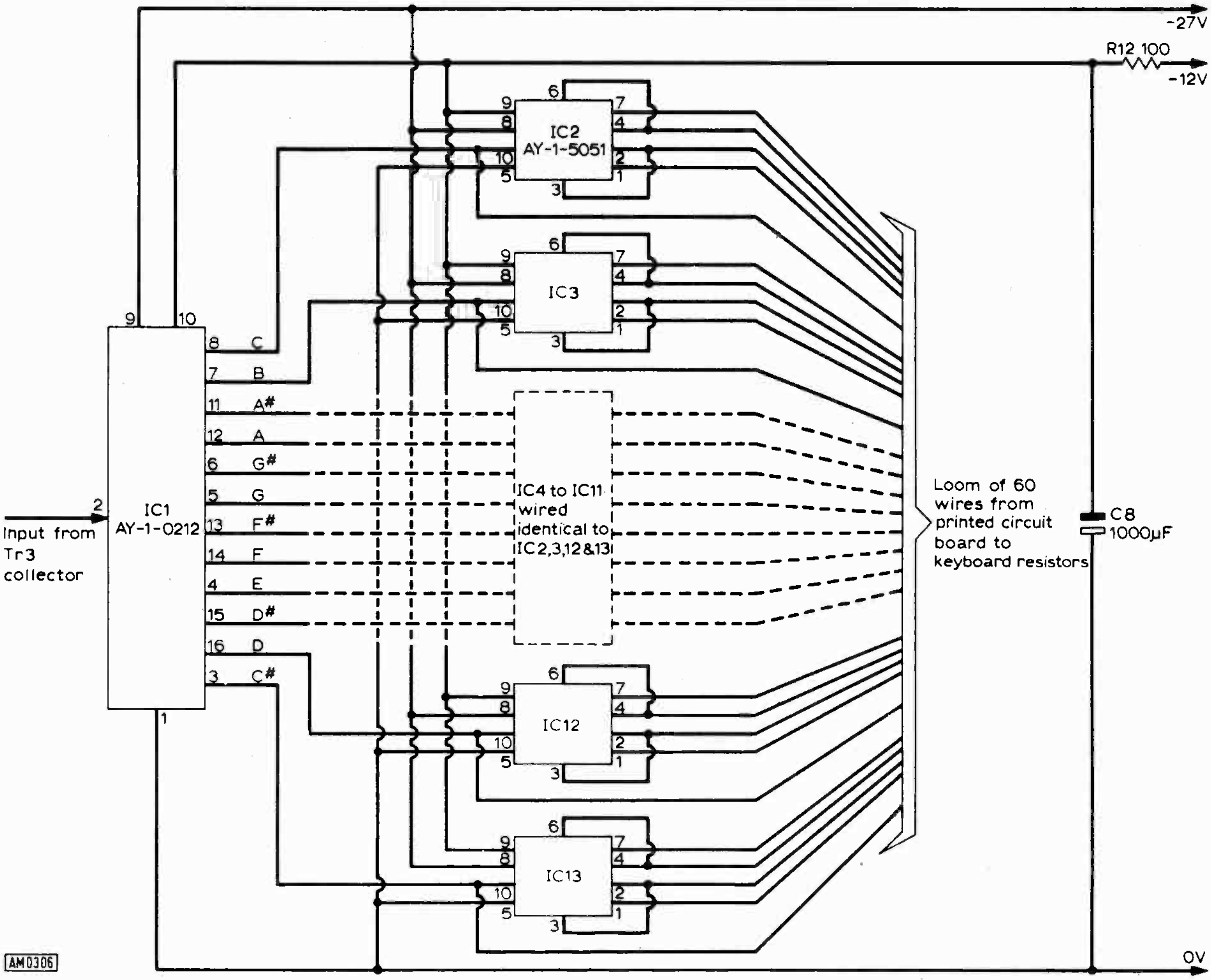


Fig. 3: Master tone generator and divider stages. The note 'C' is 'Top C' for each octave generated. Hence the lowest 'C' for 16ft pitch on the four octave keyboard is not available.

"chorus" from all the notes into the final audio stages of the organ which operates from the same −12V rail.

The four outputs from each divider together with a loop from its input are fed into a 60 wire loom which is routed to the keyboard resistors (mounted immediately adjacent to the key contacts).

CONTROLS

The two wires from the 8ft and 16ft pitch busbars are routed back to the circuit shown in Fig. 4 which embraces the tone forming circuits, mixing stage and summing amplifier. The top portion and bottom section of Fig. 4 are identical apart from the values of C10 and C17. SW2 acts as the keyboard splitting switch at 8ft pitch. When it is closed the organ operates normally over its full range but when opened, only the top two octaves are fed through C9 to the input buffer amplifier ($\frac{1}{2}$ of IC14). VR3 is used to preset the gain of this stage and its function will be explained during the setting up procedure. C10 with R14 differentiate the square wave signal from IC14 to produce the spikey waveform already described. Proportions of this are divided off by the manual control VR4 to be fed through C11 to the summing point of the six input mixer.

The preset VR5 taps off a proportion of the unmodified square wave signal which is fed via the control VR6 to the summing point. The preset is necessary to control, to a sensible level, the balance between the three tone colours. Without it the square wave signal would be grossly overpowering. C12 feeds the square wave signal to half of IC15 which operates as a two-ramp integrator. The rate of ramp is set by C14 with R15. The slope of the ramp remains constant for all input frequencies, resulting in higher frequencies being subjected to attenuation. Over the frequency range of the organ there is approximately a five to one amplitude variation in signals from the integrator but as it is the higher end that is attenuated this just about compensates for the ear's frequency response. In fact, although this ratio of five to one sounds dramatic there is very little difference on the ear!

The integrator by itself causes a very nasty keying "thump" and this is particularly noticeably at higher frequencies. To remove this effect the capacitor C14 is bypassed by VR7. On setting-up this is adjusted to the minimum value possible, consistent with a useful signal. The higher the value of VR7 the higher the gain of the integrating amplifier and hence the higher the overshoot, which causes the "thump". The

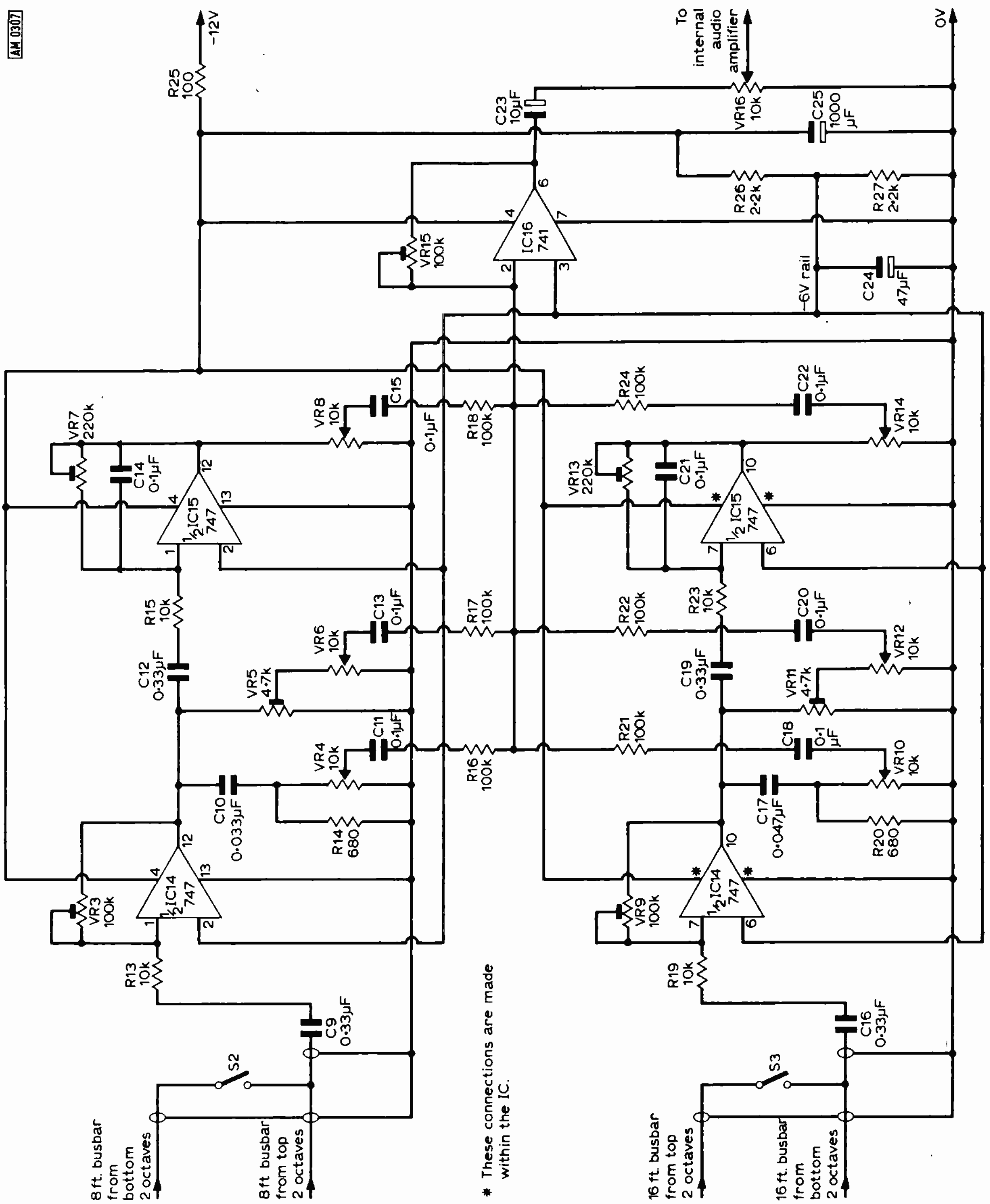


Fig. 4: Circuit diagram of the Tone forming circuits, the mixing stage and preamplifier.

triangular wave output from the integrator is now fed via the control VR8 to the summing point.

The tone forming circuit for 16ft pitch is identical except, of course, that the keyboard splitting switch operates on the bottom two octaves and in order to get a bit more power in the spike waveform, C17 has a slightly higher capacitance.

IC16 acts as a summing amplifier but perhaps ought to be called the pre-amplifier for the output signal. Its gain is set by the preset VR15 so that the output from the wiper of VR16, the volume control, matches the input requirements of the external amplifier (probably in the range of 100 to 500mV). Remember that the output level depends very much on how many notes are being played and how the tone forming sliders are set. It is always better to have less gain than seems necessary in this stage to prevent overloading the other audio stage.

PART 2 NEXT MONTH DEALS WITH BOARD ASSEMBLY, TESTING AND INITIAL SETTING-UP.

PRODUCTION LINES

colin riches

23CM CONVERTER

This SSM 23 converter uses schottky diodes in a balanced hybrid ring mixer. The secrets of its high performance lie in the balance of the mixer circuit, the image suppression stub, accurate matching into the i.f. amplifier and a clean, filtered oscillator injection signal. These features not only aid in the suppression of u.h.f. TV signals but also contribute to the final overall noise figure.

The crystal used in the oscillator chain is a close tolerance, low temperature co-efficient unit oscillating in the region of 100MHz. This is multiplied into the 1,200MHz region and the desired harmonic is selected in a *tuned* 2 pole resonator to provide a high rejection to unwanted harmonics.

In the hybrid ring mixer the signal input, the oscillator chain and the two diodes are each spaced $\lambda/4$ apart, with the oscillator fed in between the two diodes. Therefore, the diodes see an *in phase* injection from the oscillator port and an out of phase signal from the aerial port. The injection is cancelled at the aerial and thus not radiated and the signal is cancelled at the oscillator port and not attenuated in the oscillator filter. Just like the balanced modulator in an SSB transmitter.

The i.f. amplifier employs two stages of amplification designed to have a very low noise figure and carefully matched into the diodes output.

Overall noise figure is 7dB, gain is 27dB and size 4in x $2\frac{1}{2}$in x $1\frac{1}{2}$in. Connectors for Standard converter—BNC co-axial socket input; Belling Lee co-axial output socket; 2mm colour coded supply terminals.

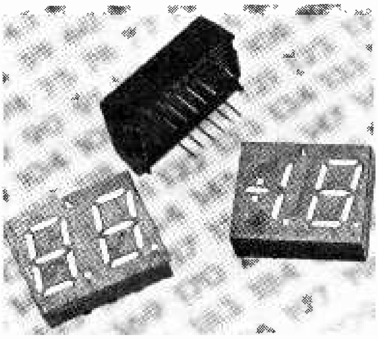
Price is £21·60 (this includes VAT and carriage). Converters are available for other frequencies (including satellite frequencies) or to customers' special requirements—up to the microwave region. Your enquiries are invited. If you would like further details, send a stamped, addressed envelope to: *S.S.M. Solid State Modules, 63 Woodhead Road, Solid, Lockwood, Huddersaeld, HD4 GER.* (*Tel. 0484 23991*).

DUAL-DIGIT DISPLAYS

Litronix announce two new dual-digit red-lit numeric displays, believed to be the only displays of their type currently available. Designated DL-721 and DL-727, they have been created for a broad range of commercial and domestic applications, from digital clocks and t.v. tuner indicators to digital instrumentation and point-of sale systems. DL-721 contains a polarity indicator, and can register from 00 to 19; DL-727 incorporates two 7-segment digits, and can register from 00 to 99.

In both cases, the digits measure 0·5in. in height and have a right-hand decimal point. They are end-stackable on 0·5in. digit centres.

Typical electrical characteristics of these common-anode units include a forward voltage of 2V at 0·5 to 50mA, dynamic resistance of 6-ohm at 10mA, and luminous intensity of 3mcd at 20mA.



Both the -721 and the -727 are priced at £2·44 in quantities of 1,000. For further information and prices, contact *Litronix, European Headquarters—Bevan House, Bancroft Court, Hitchin, Herts SG5 1LW.*

P.C.B.'s

W.K.F. Electronics tell us that they are able to offer any current circuit board published in *Practical Wireless* at 70p each, irrespective of size, complexity, etc.

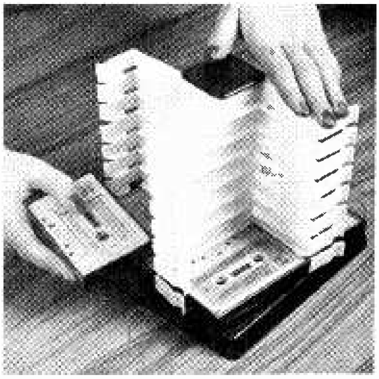
If you would like further information on this service, contact: *W.K.F. Electronics, Welbeck Street, Whitwell, Worksop, Notts.*

CASSETTE STORAGE

This excellent new cassette storage system is being sold direct from the manufacturers, Plastic Engineers Ltd. At a price of £2·50, it represents very good value for money.

The "Tape-Rax" holds 32 cassette cases on eight levels. Extra levels can be added and an extra four levels to hold another 16 cassette cases costs £1 plus 20p post and packing.

"Tape-Rax" may be obtained by sending £2·50 plus 30p postage and packing to *Plastic Engineers Limited, Treforest Industrial Estate, near Pontypridd, Glamorgan.*



THE CHANTICLEER

The "Chanticleer" is a new digital alarm clock from Bywood Electronics. The figures are shown as an orange display 0·7in. high. A brightness control dims the display for bedroom use.

It is very simple to set both time and alarm by two switches. At the time the alarm has been set for, a "beep" is emitted. This can be reset for five minutes simply by tilting the clock. This feature is jolly useful, for if you do doze off the alarm will wake you again in five minutes. The clock is mains operated and if the supply should fail, the display flashes to indicate that it may not be showing the correct time.

Recommended price of the "Chanticleer" is £19·95 plus VAT. It comes complete with case and 2-year guarantee. Further gen from: *Bywood Electronics, 181 Ebberns Road, Hemel Hempstead, Herts, HP3 9RD.*

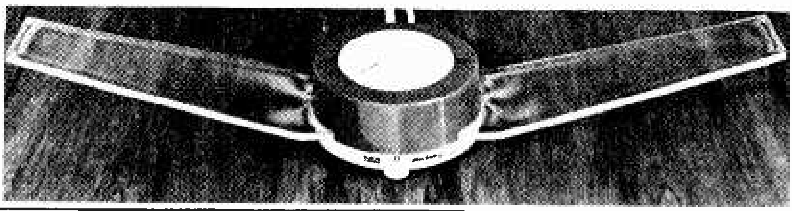
THE SWING S

Audio Workshops Ltd., have introduced a new Swing S indoor f.m. aerial. It has a low profile central body and two clear acrylic plastic "wings" along the edges of which there is an aluminium strip which acts as the aerial's element.

The aerial has a built-in tunable r.f. amplifier which can be tuned by turning the top of the body of the amplifier (white disc in picture) until the chosen optimum frequency is selected.

Audio Workshops tell us that the gain in signal strength is around 3-6dB and good stereo reception is possible under fringe conditions.

The aerial's tuning frequency range is 87-104MHz. It is supplied with two input cables, one for power and one for connection to the tuner. Retail price is £18·09 (including VAT). *Audio Workshops Limited, 29 High Street, Robertsbridge, Sussex.*



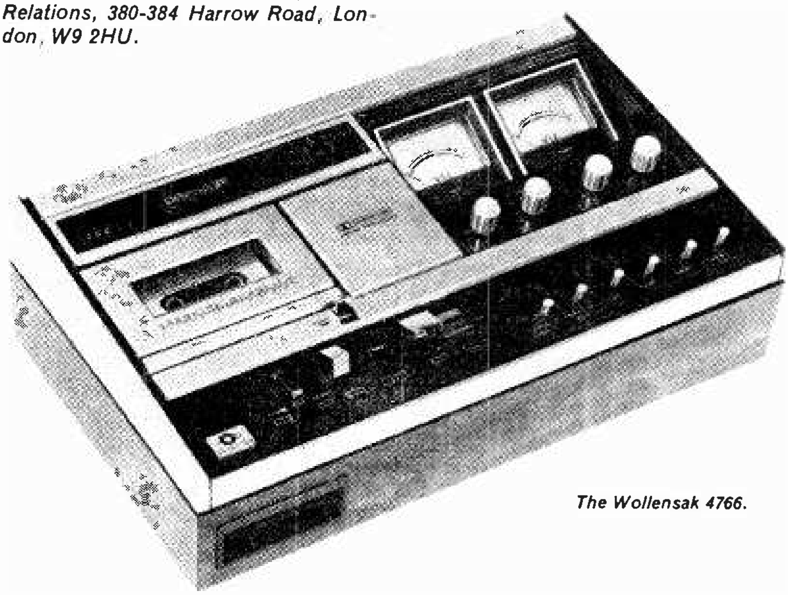
3M CASSETTE DECK

The Wollensak stereo cassette deck type 4766 from 3M employs beltless capstan drive, heavy-duty flywheel and Dolby noise reduction.

Features include sound mixing, peak overload indicators and 3-position bias switching.

Most "Dolbyised" decks have only a service-adjustable calibration system. The 4766 however, has a built-in calibration test tone which the user can adjust himself. Peak level recording indicators flash immediately overmodulation is reached.

Recommended retail price, excluding VAT is £231·48. Further information may be obtained from *3M United Kingdom Limited, Public Relations, 380-384 Harrow Road, London, W9 2HU.*



The Wollensak 4766.

ALPHANUMERIC NIXIE TUBES

Electronic Brokers Ltd., the electronic components and test equipment specialists of London NW1, are importing direct from the USA Alphanumeric Nixie tubes for digital or alphabetical displays.

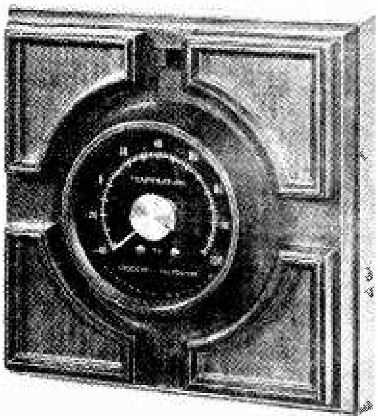
The Nixie tube can display all the letters of the alphabet and the numerals from 0-9 in a single tube.

The tube has 13 or 15 cathode segments, with a common anode. By applying a negative voltage to the proper combination of cathode segments, the alphanumeric characters are formed.

Special features of the Nixie tube include, all DC operation, all characters uniform and of equal height, simple solid-state drive circuits for the memory, and maintenance free operation with long life and no loss of brightness.

Model B-7971 has 2½" character heights and for quantities up to 1,000, the price is 99p each, with special prices beyond this figure. A numeric version—model B-5853 ST is also available with ½" high characters, priced at £1·00 for a single unit, or 80p each for quantities over 100. *Electronic Brokers Ltd. 49/53 Pancras Road London NW1 2QB England Telephone 01-837 7781*

BATTERY-POWERED ELECTRONIC THERMOMETER



All solid-state circuitry provides reliable indoor/outdoor temperature readings in degrees Fahrenheit; from −40°F to +120°F on the same scale. Convenient front-panel selector-switch lets you choose indoor or outdoor scale. Touch the Push-to-Read button and the dial pointer swings up to indicate indoor or outdoor temperature. The thermometer is powered by a 9-volt battery (not included in kit) and housed in a simulated wood-grain plastic cabinet measuring 7"H x 7"W x 2½"D.

Like every Heathkit the GD-1019 kit comes complete with a detailed Assembling and Instruction manual which leads you step-by-step through the construction of this kit.

Kit K/GD-1019 costs £16·20 (including 8% VAT and delivery within United Kingdom). *Heath (Gloucester) Ltd., Gloucester, GL2 6EE.*

TAKE 20

DAVID ANDREWS

No. 69
MORSE CODE OSCILLATOR

A series of simple transistor projects, using not more than twenty components.

The circuit of this easily made Morse practice oscillator is shown in Fig.1 and it requires only two components in addition to the transistors, speaker and pitch control VR1. Current drain will depend somewhat on the transistors but is about 5mA from the 9V battery supply.

The OC42 and BSY95A are inexpensive surplus types but the circuit will operate with almost any small audio or similar type transistors. Tr1 must be PNP and Tr2 NPN transistors. Other suitable transistors are AC128 for Tr1 and BC108 for Tr2 and connections are the same as for Tr2 in Fig.2. Other transistors to hand could easily be tried.

The audio note or pitch obtained depends on the value of C1, speaker impedance and total value of R1 and VR1 in series. It is also influenced by the battery voltage. The exact values shown need not be used, provided the tone is satisfactory. Increasing the value of C1 lowers the frequency.

Fig.2 shows assembly inside a sloping front 4×4×4in. case, but any small box or case which would accommodate the parts would be quite satisfactory. Tr1, Tr2, C1 and R1 are supported on a 5-way tag strip and leads run from here to the speaker and other connecting points. The centre tag of the 5-way strip and negative line is in contact with the metal case, but this is not essential and an insulated box can be used if connections are made as in Fig.2.

A 2-way tag strip holds leads which run to the key. If the key is used with other equipment and is fitted with a jack plug, a suitable socket for this can be fitted to the case. No separate on-off switch is needed as the circuit is off when the key is open. Check that the battery connectors are not able to touch the metal case.

Practicing the code

It is important to form letters and words correctly. A dash should equal three dots in duration and the spaces between dots and dashes forming a letter equal one dot each. Letters are separated by a space of three dots, and words by a space of five dots.

Practice with someone already experienced in the code is probably best. Two beginners, alternately sending and reading, need to take care to avoid habitual errors and is not recommended. This also applies to anyone trying to learn alone. Any learner will find a tape recorder very useful, both for checking sending and for obtaining some code practice for reading purposes. To avoid too much filling in from memory, material recorded to be read later will have to be random letters. These can be obtained by writing A to Y at random in a 5×5 block, to read vertically, horizontally, diagonally and backwards in any combination.

Records and tapes are available and the RSGB slow Morse transmissions on the amateur bands can be heard on a SW receiver, will also provide practice. After the code has been fully memorised, practice eventually brings speed in sending and reading.

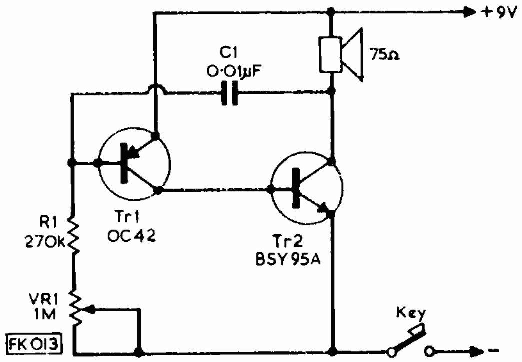
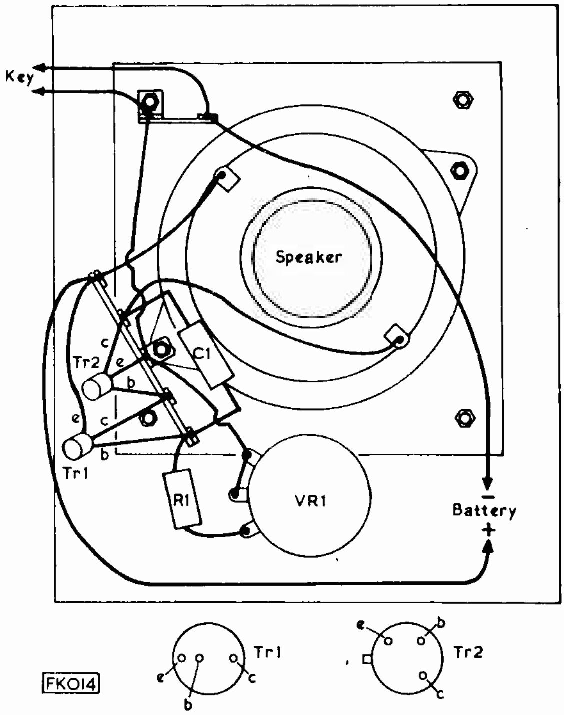


Fig. 1: above, gives circuit of the oscillator. Fig. 2: below, construction using a tag strip to mount components.



★ components list

R1 270kΩ¼W.
VR1 1 MΩ potentiometer.
C1 0·01µF.
Tr1 OC42, AC128 or other audio PNP type.
Tr2 BSY95A, BC108 or other audio NPN type.
75Ω speaker, 2½" or similar.
Tag strips, knob, 4 x 4 x 4in. sloping front case (H. L. Smith & Co. Ltd.)
PP3 or other 9V battery and clips.

STEREO DECODER

When we set about producing a stereo decoder module, we were determined to see that it wasn't just another PLL MPX decoder. And this one isn't. It uses the unique CA3090AQ by RCA. A most sensitive, quiet and most versatile decoder is the result. The built-in TOKO pilot tone filter eliminates pilot tone problems—and the audio amplifier stages ensure enough output to drive your amplifier. The automatic stereo switch will defeat stereo on low level signals when driven from the meter output of the CA3089E

Dynamic characteristics:

Input impedance 50k ohm
Channel separation 40 dB (typ.)
Mono channel balance 0·3dB (typ.)
Minimum signal 40mV (Composite)
Harmonic distortion 0·3% or better
19kHz rejection 55dB
38 kHz rejection 90dB
Audio output 1400mV for 130mV input
Automatic stereo muting with the CA3089E

CA3090AQ	**£3·75**
2mH inductor	**30p**
Module kit	**£5·40**
Module built	**£6·60**

AUDIO AMPLIFIERS

The **LM381** is a dual preamplifier expressly designed to meet the requirements of amplifying low level signals in low noise applications. Total equivalent input noise is typically 0·5μV rms. Each of the two amplifiers is completely independent, with an internal power supply decoupler—regulator, providing 120dB supply rejection and 60 dB channel separation. Other outstanding features include high gain (112 dB), large output voltage swing (Vcc−2V) p-p, and wide power bandwidth (75kHz, 20Vp-p). The LM381 operates from a single supply across the wide range of 9 to 40V. The amplifier is internally compensated and short-circuit protected.

Price with datasheet £1·85

The **LM380** is a two watt audio amplifier intended for low parts count consumer circuits employing a single supply voltage. The output has both short circuit current limiting and thermal overload current limiting to insure safe operation.

Price with data booklet £1·00

FM RADIO

8319 This advanced FM tunerhead contains four tuned circuits—each controlled by a dual varicap diode. The RF and mixer stages employ dual gate depletion MOSFETs, allowing good AGC control and provision is made for simple oscillator only AFC, though the preferred method is to control by means of superimposing the AFC on the main tuning voltage.

Price £7·74

EF5603 A 'no compromise' tunerhead employing top quality techniques and components throughout. The MOSFET RF stage is followed by THREE tuned circuits, giving this head an exceptional immunity to adjacent channel and image interference. Following the mixer, an additional IF gain stage is included, enabling the use of common consumer IC IF amplification stages, such as the CA3089E/TDA 1200 etc **Price £8·40**

FM 1185 Ambit IF module with ceramic filter and CA3089E. Input direct from tunerhead; outputs audio, AFC, AGC, signal strength meter.

CA3089E	**£1·94 (8 page data)**
CFS 10·7	**40p**
22μH inductor	**15p**
KACS K586 Quadrature coil	**30p**
FM 1185 Built and tested	**£4·35**

The unique **LARSEN** FM tunerset, type **7252**, combines a high quality tunerhead and IF, to provide an advanced VHF receiver module, with high gain and low distortion. Also included are features such as mute, AFC on all front end tuned circuits, and audio preamplification.

Sensitivity, Modulation 75 KHz 1μV
S/N ratio 26dB
Total harmonic distortion 0·1%

Price £20·00

CATALOGUE

Contains data and applications on our range of high technology integrated circuits and modules plus full details of the exclusive range of TOKO coils.

Price 25p inc. VAT and postage.

DATA

Photocopied data is available for everything we sell, **6p** per side. Data booklets **free** with ICL 8038, CA3089E, LM380, LM381, EF5603, 8319, 7252.

1 page **free** on request with everything we sell. **VAT** Please add **8%** to all UK orders

Post and Packing 15p.

WAVEFORM GENERATOR

The **8038** Waveform Generator is a monolithic integrated circuit, capable of producing sine, square, triangular, sawtooth and pulse waveforms of high accuracy. The frequency (or repetition rate) can be selected externally over a range from less than 1/1000 Hz to more than 1 MHz and is highly stable over a wide temperature and supply voltage range. Frequency modulation and sweeping can be accomplished with an external voltage and the frequency can be programmed digitally through the use of either resistors or capacitors. The Waveform Generator utilises advanced monolithic technology, such as thin film resistors and Schottky-barrier diodes.

Supply voltage	+10 to + 30V
Frequency range	0·001 Hz to 1 MHz
Sweep FM range	1000 : 1
FM linearity	0·2%
Square wave amplitude	0·9 x Vs
Triangle amplitude	0·33 x Vs
Triangle linearity	0·1%
Sine wave amplitude	0·22 x Vs
Sine wave THD	0·5%

Price with 8 page data and applications booklet £3·10

3 TERMINAL POWER SUPPLY

The **78 series** of three terminal voltage stabilisers have revolutionised all power supply designs over the past year.

Two basic types exist:

78L series up to 100mA output
78 series up to 1A output

Short circuit protection and thermal limiting are built-in.

By the addition of two resistors and a capacitor, the 7805 can give any regulated output voltage between 5 and 20V.

	7805	**78L12**
Output voltage	5V	12V
Tolerance	±0·2V	±0·6V
Regulation	15mV	20mV
Noise voltage	40μV	80μV
Ripple rejection	78dB	42dB

7805 Available in TO3 Metal package **£2·05**
or Plastic package **£1·75**
78L12 Available in TO92 package **45p**

VOLTAGE REGULATOR

NE550/μA 723 Price 80p

INTEGRATED CIRCUITS	
CA3053	40p
CA3088E	£1·24
CA3089E	£1·94
CA3090AQ	£3·75
CA3123E	£1·40
CT7001	£9·80
ICL8038	£3·10
LM309K	£1·90
LM380N	£1·00
LM381N	£1·85
LM1496	£1·02
LM1820	£1·40
LM3900	68p
NE546	£1·40
NE550	80p
NE555V	78p
NE560B	£3·19
NE561B	£3·19
NE562B	£3·19
NE565A	£2·75
NE566V	£2·55
NE567V	£2·75
μA720	£1·40
μA723	80p
μA741	40p
μA753	99p
μA7805UC	£1·75
μA7805KC	£2·05
TBA120A	£1·00
TBA651	£1·81
TBA810S	£1·30
TDA1200	£1·94
SN76660N	£1·00
7400	20p
7401	20p
7402	20p
7404	23p
7413	38p
7446	£1·20
7447	£1·20
7448	£1·25
7473	31p
7474	31p
7490	71p
7493	71p
7496	83p
74121	38p
74192	£1·57
74S00	74p
74S112	£2·30
78L12	45p
9368	£2·20
9582	£2·50
95H90	£9·90
TRANSISTORS	
BC109	12p
BC183L	14p
BC212	14p
BC318	14p
BF256L	34p
BSX20	25p
MEM614/5	38p
MEM616	50p
TIP2955	99p
TIP3055	60p
MJE340	45p
IN4004	10p
IN4143	7p
2N918	42p
2N2369	18p
2N3702	14p
2N3704	14p
2N4427	£1·53
LED DISPLAYS	
DL704	95p
SLA1	£1·75
SLA7	£1·50
SLA9	£1·75
SLA11	£1·75
SLA21	£1·75
TIL209	30p
TOKO FILTERS 455/470KHZ	
CFT455B	45p
CFT455C	45p
CFT470C	45p
CFU050D	50p
MFH41T	£1·35
MFH71T	£1·35
TOKO FILTERS 10·7MHZ	
CFS 10·7	40p
CFK 10·7	60p
TOKO IF COILS 455/470KHZ	
7mm	
LMC4200	27p
LMC4201	27p
LMC4202	27p
SET OF 3	60p
10mm	
YHCS590	27p
YHCS589	27p
YHCS11100	27p
SET OF 3	60p
TOKO IF COILS 10·7MHZ	
KALS4520	30p
KACSK586	30p
TKACS34342/ 34343 (pair)	55p
TOKO INDUCTORS	
22uH	15p
2mH	30p
5·1mH	27p
43mH	27p
MW OSC	
(TBA651)	27p
(CA3123)	27p
TOKO PILOT—TONE FILTERS	
BLR2007	£1·50
BLR2011	£1·75
MODULES	
TOKO	
EF5603	£8·40
ET703	£3·30
LARSEN	
7252	£20·00
8319	£7·74
AMBIT	
CA3090AQ BUILT	£6·60
KIT	£5·40
CA3123E KIT	£3·50
DIGITRONIC III	£46·50
FM1185	£4·35
MC1310 KIT	£5·10
NE561B BASIC KIT	£5·00
TBA810S KIT	£2·75
TTL CLOCK KIT	£5·90
IMHZ XTAL	£3·50
HARDWARE	
TBA810S HEATSINK	15p
IC SOCKETS	
8 PIN	15p
14 PIN	16p
16 PIN	16p
28 PIN	£1·05
PUSHBUTTONS:	
0 to 9	
A to Z	
'C'	
'RUN'	
'STOP'	
'CLEAR'	
'ENTER'	
'AUTO'	
'ON'	
'OFF'	
'SET'	
'RESET'	each 20p

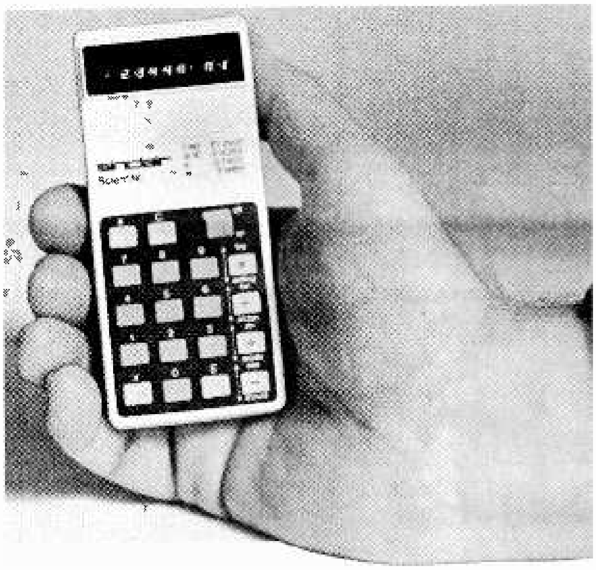
AMBIT INTERNATIONAL 37 HIGH ST., BRENTWOOD, ESSEX, CM14 4RH2 TEL. 0277 216029 TLX.995194

SPECIAL PRODUCT REPORT

sinclair

KIT

'SCIENTIFIC' POCKET CALCULATOR



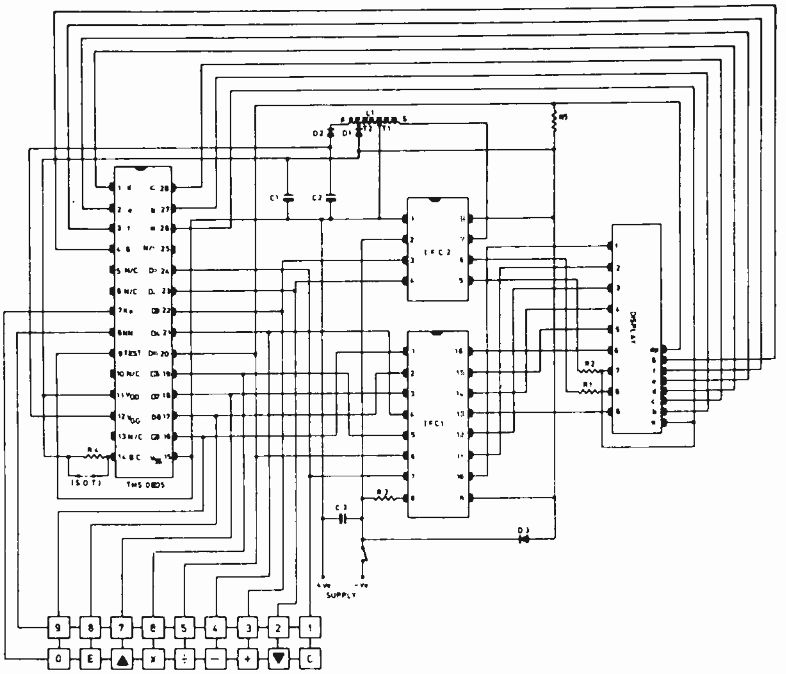
THE kit is supplied in a protective pack of expanded polystyrene, and was complete, even down to two spare buttons for the keyboard. Also included were a small coil of fine gauge solder, a length of desoldering braid and a booklet "Hints on soldering".

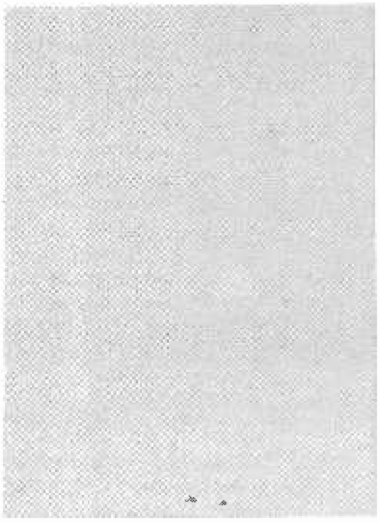
The assembly instructions open with a summary of the construction steps and a components list to help you check and identify the various items in the kit. Then follow tips on soldering and assembly methods, a list of recommended tools and a very important and useful section on avoiding damage to the calculator chip from static electricity buildup.

A series of notes keyed to the list of construction steps give more detailed information on identifying each component and fitting it correctly to the printed circuit board.

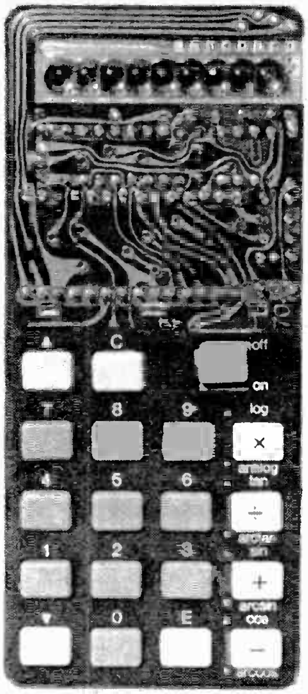
The kit handbook is generally very good though it does contain a number of small inaccuracies. Two of these are very minor and should not cause too much head-scratching except to very inexperienced constructors.

The first occurs in the p.c.b. drawings which show two diodes called D1 and no D3. Since all diodes are the same type it doesn't really matter, of course. The second comes in the assembly instructions for the keyboard and case, where step 13—fitting the on/off switch blade—cannot be accomplished until after the p.c.b. has been located over the keyboard assembly in step 14.





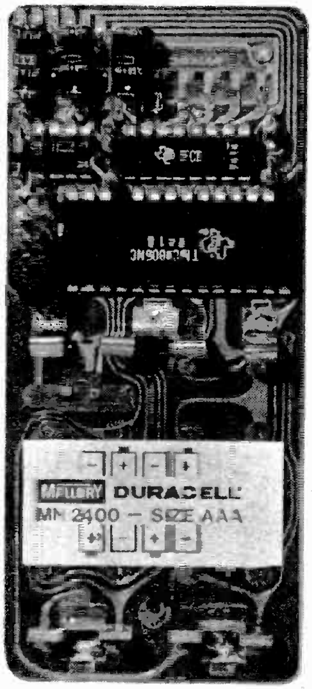
Circuit diagram of the Scientific. The calculator uses three i.c.s plus twelve discrete components and a basic 9-digit l.e.d. display. The value of R4 is selected on test before despatch to match the particular calculator chip supplied. With some i.c.s it may be replaced by a wire link.



Front view of the p.c.b. and keyboard. All soldering, except for the battery clips and display, is done on this side of the board, which is double-sided fibreglass with plated-through holes. These ensure reliable connections between the two sides but also make removing a wrongly fitted component very difficult.

Diode Polarity

The third is not so much an inaccuracy but rather a case of not allowing for all possibilities. In the section on determining diode polarity, the booklet says that the + end or cathode is identified by a band painted on the body of the diode, and this is normally true. In this particular kit the diodes supplied appear to have a black body with a blue band painted around one end. Meter checks revealed that the end with the blue band was the anode. Rather confusing for the uninitiated!



Rear view of the assembled p.c.b. The display drops into a slot in the board and is secured by the soldered connections to its edges.

Apart from these points, the instructions are clear and easily followed, and assembly was completed in under two hours. There are a total of 95 soldered joints to be made, half of them on the pins of the three i.c.s. For these the very small soldering iron (1/16" bit) recommended by Sinclair is really essential.

On fitting a set of batteries (four MN2400) the calculator worked right from switch-on. It has now seen considerable use over a period of three months and has just started on its second set of batteries. During that time one fault developed—a battery clip came adrift from the p.c.b. It seems that for this particular job a larger iron, say 25W, is advisable to get the solder to melt over the whole of the mating surfaces.

Fault-finding

For those who suffer the traumatic experience of their calculator not working correctly when first tested, Sinclair thoughtfully provide a simple faultfinding guide. Since the components in each kit are tested before despatch, it is assumed that the most likely cause of any fault is a poor soldered joint, either open circuit or else shorted to an adjacent connection. In that event, the information provided should help the constructor to pinpoint the trouble.

The two case halves snap together to secure the p.c.b. A door in the back section covers the battery compartment.

In the last resort, you may return your calculator to Sinclair's Service Department for repair. They make a fixed charge of £2·50 unless a major component has been damaged during assembly, in which case the replacement may be charged for.

As a way of buying a truly pocket-sized calculator with more than just the four standard functions of addition, subtraction, multiplication and division, all for under £20, the Sinclair Scientific Kit would seem to take quite a lot of beating. Some prior experience of soldering on p.c.b.s is essential but otherwise you should not encounter any problems in assembly.

Undoubtedly the single most useful extra function on this calculator is log/antilog, which opens the door to a wide range of other functions. On the other hand the most annoying omission is a 'clear last entry' key. Having to repeat a lengthy calculation because you push a wrong button can be very frustrating. The lack of any memory is less of a drawback and can be overcome by using paper and pencil to note down intermediate results in more involved calculations.

The Sinclair Scientific Kit is available from retailers or direct from Sinclair Radionics Ltd., London Road, St. Ives, Huntingdonshire PE17 4HJ. See their current advertisement for recommended retail price.

for PW readers only....

FREE COMPETITION!

£500 to be spent with

FIRST PRIZE £100!

Prizes for the amounts shown here will be in the form of vouchers for the purchase of, or deposit on, Heathkit equipment only. A small selection of Heathkit models is shown below. The vouchers, valid for three months from date of issue by Heathkit, cannot be exchanged by Heathkit for cash.

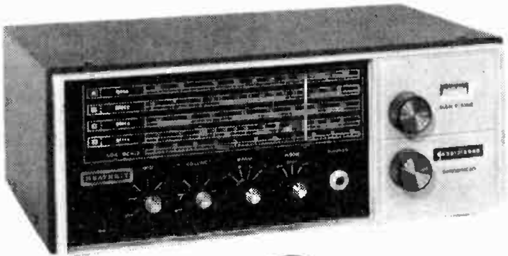
4 PRIZES OF £50! PLUS 8 PRIZES OF £25!

1

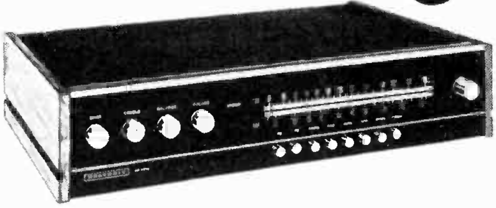
2

HEATHKIT

3



4



5

6

7

FREE ENTRY COUPON

1st	
2nd	
3rd	
4th	
5th	
6th	
7th	
8th	

PRACTICAL WIRELESS
Heathkit Competition

My order of importance for the eight benefits is given on the left. I agree to the rules as final and legally binding.

(Signed)
Mr./Mrs./Miss ....

Full
Address ....

....

....

Post to: PRACTICAL WIRELESS Heathkit Competition, 136 Long Acre, London WC2E 9QP.

Closing date: March 14, 1975

Please send FREE catalogue containing details of the wide range of over 250 electronic kits that may be chosen by winners.

Name ....

Address..

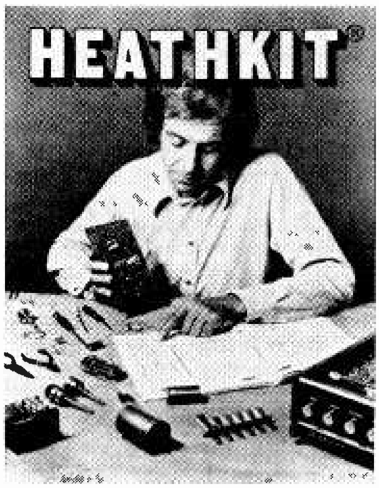
....

....

Practical Wireless Heathkit Competition 1975.

please cut out along this line

Nobody loses with PW! Fill in this coupon too, for a FREE copy of Heathkit's latest catalogue.



A Imparts electronic knowledge and expertise.

B Gives personal control over quality of finished product.

C Gives pride of accomplishment and creative satisfaction.

D Keeps one up to date with the world of electronics.

E More value for money when comparing price and performance.

J Provides an enjoyable and practical hobby.

K Saves time and money by allowing the self-servicing of equipment.

L Range of kits includes products not always available in the shops.

HOW TO ENTER:

By building his own electronic equipment, the home-constructor has many advantages over those who buy ready-made units. Listed above are eight unique benefits which can be enjoyed by the average electronics enthusiast who prefers to "do-it-himself". All you have to do is place them in what you consider to be their order of importance to such an enthusiast. For example, if you think "Provides an enjoyable and practical hobby" is most important of them all, write J in the box marked 1st on your entry coupon. The letter of your next choice goes in the box marked 2nd, and so on for all eight.

Complete the coupon, all in ink (pen or ball-point) with your full name and address, then post in a sealed envelope to:—Practical Wireless Heathkit Competition, 136 Long Acre, London WC2E 9QP, to arrive not later than Friday, March 14th, 1975, the closing date.

If you would like a FREE copy of Heathkit's latest catalogue, also write your full name and address in the right-hand coupon. **DO NOT** detach this from the competition entry coupon.

1 AM/FM DIGITAL ELECTRONIC ALARM CLOCK/RADIO KIT K/GR1075
2 DIGITAL ELECTRONIC CAR CLOCK/TIMER KIT K/GC1093
3 DIGITAL MULTIMETER KIT K/IM1202
4 4-BAND RECEIVER KIT K/SW717
5 AM/FM STEREO TUNER-AMPLIFIER KIT K/AR1214
6 DELUXE METAL LOCATOR KIT K/GD348
7 TUNE-UP METER KIT K/CM1073

RULES

There is no entry fee, but each attempt must be fully completed in ink on the proper printed coupon cut from PRACTICAL WIRELESS, and must bear the entrant's own full name and address.

All accepted entries will be examined, and the first prize, as described, awarded to the entrant who, in the opinion of the judges, has shown the greatest skill and judgement in listing the eight benefits in order of importance. Remaining prizes will be awarded for the next best entries in order of merit. No entrant may be awarded more than one prize. All prizes must be accepted as offered; there can be no alternative awards.

In the event of a tie or ties for any prize(s), a further eliminating test will be conducted by post between the tying competitors to determine such winner(s) or winning order.

Any entry received after the closing date will be disqualified, as will any received mutilated, illegible, incomplete, bearing alterations, with more than one key letter in each space or not complying fully with the instructions and rules. No responsibility can be taken for entries lost or delayed in the post or otherwise; proof of posting will not be accepted as proof of receipt.

The judges' decisions, and those of the Editor of Practical Wireless in all other matters affecting the competition, will be final and legally binding. No correspondence can be entered into.

The competition is open to all readers in Great Britain, Northern Ireland, The Channel Isles and Isle of Man, except employees (and their families) of IPC Magazines Ltd., the printers of Practical Wireless, and of Heath (Gloucester) Ltd.

All winners will be notified and the result published in the earliest possible issue of Practical Wireless.

ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

IT seems strange to be writing this at the end of December for the March issue! I hope that many of you will be poring over the instruction manuals for a shiny new receiver, sent to you from the North Pole. Much more sensible than the eternal socks, shirts and racing cars! The trick is to let the word get around the family quite a few weeks before Christmas, coupled with hints dropped concerning filter bandwidths, sensitivity and desirable modes of operation. This invariably leads to veiled questions as to what you really mean and your prompt reply that the So-and-So receiver will fill the bill!

I managed to get a MFJ Enterprises CW filter this way this year and have since spent a lot of time sorting out signals with the three bandwidths available, down to 80Hz. It can be used at the output socket of a receiver thus avoiding having to dive inside the set! In my case I fitted it after the product detector in my much-modified HRO and coupled with the mechanical filter previously installed I have all the selectivity I need. If interested contact Hockley Audio Centre, Spa Road, Hockley, Essex.

Paul Barker BRS34898 (Sunderland) sent in his usual immaculate log but bemoans the poor conditions on 20m which rather reduced his SSTV loggings. **Tim Charles** (Colchester) is having problems with his Satellite receiver but still managed to log a lot of DX. He comments on the many W stations above 3·8MHz who seem to want to work the DX but never listen below our end of the band at 3·8MHz. Tim's log for 40m shows what can be heard on this much neglected band.

Alan Rae (Glasgow) has been taking advantage of the problems which have beset schools in his part of the country by putting up some more aerials. One is a square loop, 12ft on each side, and tuned with a capacitor for the 15m band. Alan felt a little down-in-the-mouth when he subsequently passed by the Rugby transmitting site with its masses of fantastic aerial arrays. Makes our efforts in the amateur radio field seem a waste of time! **Gary Edge** (Warrington) is also A8740 and he writes to the column for the first time. As one would expect nowadays his best DX has been on 80m using a 9R59DS. More details of his set-up next time, I hope. Another newcomer is **Stephen Budd**, A8713 (Worthing) who has some rather nice things to say about our column coupled with suggestions for more info on DXpeditions, contests etc. Stephen uses old favourite AR88 and preselector, with 150ft of wire.

Regular contributor **Max France** (Warrington) finds that his spare time, such as it is, coincides with best conditions on 80m, which is just as well, I suppose! With catches such as VR1AA and KS6DH he has not been idle. He's been listening to the 10m downlink from Oscar VII but his poor results would seem to suggest that his gear is not yet optimised for that band. Suggest, Max, that you look at a copy of *Radio Communication* each month which covers the Oscar programme very thoroughly.

Alan Doherty BRS34968 (Portrush Co. Antrim) copied plenty on 80m and 20m but found DX sadly lacking on 40m. I think it is a matter of digging below the blanket of Euro QRM, as proved by the log of Tim Charles. **Eric Carling** (Lymington) managed another couple of countries to make it 229 for the year. KC6VE in the Eastern Caroline Is. and YJ8GS were good ones on 20m as were ZL3RB and 8P6ES on the 15m band. **John Porter** (Baslow, Derbys) has been airing his new FR50B (perhaps Christmas comes early in them parts!) and has consequently relegated his 9R59DS to the broadcast bands. You will find that it does a very good job there OM, the IF selectivity of about 4kHz being just right for the QRM and yet not too narrow for listening to a bit of music now and again while working in the shack!

Roger Trett (Norwich) apologises for the lack of reports but he has been busy taking his RAE and we can but wish him every success. He's added another long wire to his collection, mainly to pull in the VK's on his FR50B. **Michael Green** A8088 (Northwich) has been out of commission while getting his receiver's trimmers tickled, as he puts it. Bigger and better logs in future OM? Michael is full of praise for the Mid-Cheshire ARS which meets every Wednesday evening at the Verdin Comprehensive School, Winsford providing instruction for the RAE and Morse practice. I ought to mention that there are many such clubs around the country crying out for more members so make an effort to find your local club and join in the fun if you feel that you are a bit of a loner at the moment. The RSGB can usually help with info or see their callbook.

Crescent Quality Components

BARGAIN CAPACITOR 2,200MFD at 63v. DC wkg.
Size = 2″ × 1¾″ diameter. Tag ended. All new and unused. Our price **35p**.

STEREO/MONO HEADPHONE VOLUME CONTROL BOX
Plug stereo phones into this control box and you then incorporate a right and left hand volume control and a stereo/monoswitch. Complete with stereo jack plug and 2m cable.
A bargain at £1.

TWO WAY STEREO ADAPTOR
Stereo Jack plug to two stereo free sockets, complete with 110mm cable. For connecting two stereo inputs into one.

A bargain at 65p.

LIGHT EMITTING DIODES

Til 209 (Red) With Clip	22p each
Til 209 (Green) With Clip	38p each
Til 209 (Yellow) With Clip	90p each
Mled 500 T092 Type	16p each

LED READOUTS

Litronix

DL707 .3 Character 14 Pin Dil.	£2·00
DL701 as above but ± 1	£2·00
DL747 ·6 Character	£2·62

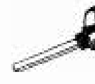
Minitron

3015 7 Segment 16 Pin Dil	£1·18
3015G as above but ± 1	£1·18

Clock Chip

CT7001 MOS/LSI Digital Clock/Calendar Chip Plus full Circuits and Information leaflet	£8·95
Circuits and Information Sheet	15p
Lit 704 Led Display for above	£1·35
Or 4 for	£5·25

WAFER SWITCHES
1 Pole 12 Way
2 Pole 2 Way
2 Pole 3 Way
2 Pole 4 Way
2 Pole 6 Way
3 Pole 4 Way
4 Pole 3 Way
22p each



POTENTIOMETERS
All types 1″ and less diameter

Singles		Dual	
5K	Log or	5K	
10K	Lin Less	10K	
25K	Switch	25K	Less
50K	15p each	50K	Switch
100K		100K	45p each
250K	Double	250K	
500K	Pole	500K	
1M	Switch	1M	
2M	30p each	2M	

PRE SETS
Sub Miniature Skeleton Type 0·1 Watt Horizontal Mounting 100, 250 and 500 ohm, 1k, 2·5k, 5k, 10k 25k, 50k, 100k, 250k, 500k, and 1M ohm **6p each**

MAINS TRANSFORMERS
Open Type Double Wound Continuously Rated, two hole fixing clamp with colour coded flying leads, varnish impregnated. Approx. size: 1¾″ × 1½″ × 1½″ high Fixing centres: $2\frac{5}{32}$″.

TR1	20–0–20v 100 m/a	
TR2	12–0–12 v 100 m/a	All
TR3	9–0–9 v 100 m/a	240 Volt
TR4	6–0–6 v 100 m/a	Primary
TR5	3–0–3 v 100 m/a	

Our Price £1·23 each

200/250v MAINS RELAY
Heavy duty contacts 2·500 ohm coil. All new and unused D.P.D.T. mains relays **50p**, Carr. Free. Special quantity £40 per 100 off.

MINIATURE RELAYS
Brand new range of British made Relays, Size 1¼″ × 1″ × ⅞″. All two changeovers with 250v 1·5A contacts and suitable for fitting on ·1m Veroboard.

Type	Volts	Current	Ohms	
27/A	12v	17M/A	700	All
21/A	12v	28M/A	430	£1·30
12/A	6v	33M/A	185	each

DOUGLAS TRANSFORMERS
All types are standard 240 volt primary.
MT 102 ct. 0 = 19 = 25 = 33 = 40 = 50 at 500M/A £2·00 each

MT237cs 20–0–20 at 150M/A	£1·25
MT241cs 20–0–20 at 30M/A	£1·05
MT240cs 15–0–15 at 30M/A	£1·05
MT239cs 12–0–12 at 50M/A	£1·05
MT238cs 3–0–3 at 200M/A	£1·05

POWER PACKS
PP1 Switched 3 – 6 – 7½ – 9 volt 400M/A Transistor and Zener Stabilised On/Off Switch and Polarity Reversal Switch, in a black metal case £5·25 each.
PP2 Switched 6 – 7½ – 9 volt Battery Eliminator. Approx. size 2¾″ × 2¼″ × 3½″. Ideal for cassette recorders £3·25
PP3 Car converter. From 12v Pos. or Neg. to = 6 – 7½ – 9 volt. Easy to fit and transistor regulated £3·90

VEROBOARD

	·1	·15	Plain ·15
2½ × 3¾	32p	24p	15p
2½ × 5	34p	34p	18p
3¾ × 3¾	34p	34p	
3¾ × 5	39p	45p	
17 × 2½	1·06p	77p	60p
17 × 3¾	1·45p	1·16p	75p
17 × 5	1·85p		1·10p

Pin insertion tool	72p
Spot face cutter	52p
Pkt. 36 pins (state ·1 or ·15)	25p

LOUDSPEAKERS

2½″ 8 ohm	50p
2½″ 40 ohm	50p
2½″ 80 ohm	50p
5″ 8 ohm	ceramic £1·25
6½″ 8 ohm dual cone	ceramic £2·50
10″ 8 ohm dual cone	ceramic £3·75
7″ × 4″ 8 ohm	ceramic £1·60
8″ × 5″ 8 ohm Permanent Magnet	£1·60
*EMI 13″ × 8″ 450 Kit 3 — 8 — 15 ohm	£4·10
*EMI 13″ × 8″ 350 Kit 8 ohm	£7·50

S. G. BROWN "DIPLOMAT" HEADSET
Incorporates ceramic piezo electric transducers.
Specifications:—
Frequency—20-17,500 CPS.
Impedance—Predominantly capacitive, at ·001MFD per earpiece can be regarded as 150K at 1kcs.
Weight—3·5oz. (98 grams).
A Bargain at £1·25 each set

MAINS KEYNECTOR
Keynector connects any Electrical Equipment to the mains supply in seconds. Ideal for beach, garage demonstrations, etc. Multi connections can be made (max. load 13A fused).
£3·25p.

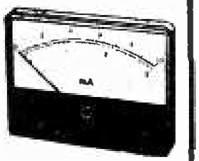
ALUMINIUM BOXES
Metal project boxes give your work a professional finish

	L	W	H	
AB7	2¾	5¼	1½	54p
AB8	4	4	1½	63p
AB9	4	2¾	1½	54p
AB10	4	5¼	1½	63p
AB11	4	2½	2	54p
AB12	3	2	1	45p
AB13	6	4	2	69p
AB14	7	5	2½	84p
AB15	8	6	3	99p
AB16	10	7	3	£1·35
AB17	10	4½	3	£1·02
AB18	12	5	3	£1·20
AB19	12	8	3	£1·50

ABS PLASTIC BOXES
Handy boxes for construction projects. Moulded extrusion rails for P.C. or chassis panels. Fitted with 1mm front panels.
1005 = 105mm × 73mm × 45mm = **51p**
1006 = 150mm × 75mm × 47mm = **66p**
1007 = 184mm × 124mm × 60mm = **96p**
1021 = 106mm × 74mm × 45mm (sloping front) = **50p**

BARGAIN BOARDS
Components galore for the experimenter Ex Computer boards with Resistors, Capacitors and useful Transistors—at least 4 transistors per board. Five boards £1·00.

CLEAR PLASTIC PANEL METERS
Size 59mm × 46mm × 35mm these meters require a 38mm hole for mounting.



ME6	=0 to 50 micro amp Full Scale
ME7	=0 to 100 micro amp Full Scale
ME8	=0 to 500 micro amp Full Scale
ME9	=0 to 1 m/a Full Scale
ME10	=0 to 5 m/a Full Scale
ME11	=0 to 10 m/a Full Scale
ME12	=0 to 50 m/a Full Scale
ME13	=0 to 100 m/a Full Scale
ME14	=0 to 500 m/a Full Scale
ME15	=0 to 1 amp Full Scale
ME16	=0 to 50 volts A.C. Scale
ME17	=0 to 300 volts A.C. Full Scale
ME18	="S" Meter
ME19	="VU" Meter

OUR PRICE £3·00

"CRESCENT" 100 WATT R.M.S. ALL PURPOSE AMPLIFIER U. BUILD . IT

We supply the three modules for you to build this Disco-Group-P.A. amplifier into the cabinet of your choice.

★ **THE POWER AMP MODULE**
170W r.m.s. sq. wave 300W instantaneous peak into 8 ohm (60W into 16 ohm).

★ **THE PRE-AMP MODULE**
Four control pre-amp. Vol. Bass, Treble, Middle controls. Designed to drive most amplifiers using F.E.T first stage.

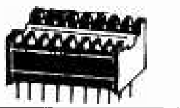
★ **THE POWER SUPPLY**
Is supplied complete with the mains transformer. Complete fixing instructions are supplied and no technical knowledge is required to connect the three ready wired modules. A fantastic bargain. £25. carr. 75p. Send S.A.E. for further details on this or our ready built amplifiers.

DECON DALO 33PC ETCH RESIST PEN
The Decon Dalo 33PC is a unique instrument for the professional and amateur electronics engineer, enabling him to prepare in minutes a perfect printed circuit board
OUR PRICE 80p

ADD LUXURY TO YOUR CAR
with a motor driven car aerial
SPEC:- ★ 5 section
★ extended length 100cm
★ Length under fender 40cm
★ Cable length 120cm
Supplied complete with fixing bracket and control switch £7·50

STOP PRESS

BHA0002	15 watt Amp Module	£3·50
NE555	Timer I.C.	78p
MC1310P	Stereo Decoder I.C.	£2·00
7805	Regulator	£1·49
TIP 29A		55p
TIP 30A		63p
BC107		10p
BC 108		10p
BC109		10p



I.C. SOCKETS
D.I.L.
8 pin
14 pin 14p
16 pin

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.

18 volt 500m/a
240 volt primary transformer bargain.
approx size =60mm x 40mm x 50mm
fixing centres=75mm
Our Price =£1·00.

BARGAIN BOX
Loud buzzer mounted in a metal box complete with two U2 battery size holder.
Designed and can be used as a fire alarm but is ideal as a door or morse code practice buzzer.
Approx. size—2¾″ × 6½″ × 1½″.
OUR PRICE—50p.

U.K. POSTAGE 15p UNLESS OTHERWISE STATED

V.A.T. Please add 8% to all Totals

CRESCENT RADIO LTD. P.W.

All mail to 11 MAYES ROAD, WOOD GREEN, LONDON N22 6TL
Phone: 01-888 3206

Callers Welcome at 15 Mayes Road & 13 South Mall, Edmonton N9.

If you construct You should own one.

CRESCENT CATALOGUE
Price 30p.

ESSENTIAL BOOKS FOR RADIO AMATEURS

NEW BOOK

NBFM MANUAL
by
R. S. Hewes, G3TDR
and
G. R. Jessop, G6JP

The use of frequency modulation by radio amateurs as a communication system has generally been confined to the vhf and uhf bands. When used for this purpose it is essentially a narrow band mode radically different from that used for high fidelity broadcasting. Until now references to narrow band frequency modulation equipment have been confined to articles appearing in various journals, but this manual is intended to present complete coverage of the subject from one source.
It is hoped that it will encourage the home construction of equipment which is truly narrow band, using the frequency or phase methods of modulation and taking full advantage of the mode by the use of the correct demodulator.
The relative freedom from interference to television, radio and audio equipment, and the excellent rejection of impulse noise, makes the mode attractive and economic for both fixed and mobile operation.

60 pages **Price: £1 inc p & p**

NEW EDITIONS

AMATEUR RADIO TECHNIQUES
(5th edition)
by Pat Hawker, G3VA

Basically an ideas and source book, this ever-popular work brings together a large selection of new circuits and devices and many constructional and fault-finding hints.
In this new edition some 50 pages of new material have been included and other sections have been revised and expanded.

304 pages **Price £2·25 inc p & p** **Over 700 diagrams**

RSGB AMATEUR RADIO
CALL BOOK 1975

Incorporates new callsigns and amendments notified between August 1973, when the previous edition closed, and August 1974.
Also includes valuable operating data such as band plans, beacons, amateur radio prefixes in country order, ITU zone list, beam headings and QSL Bureau sub-managers, and a list of RSGB affiliated societies, clubs and groups.

160 pages **Price £1·20 inc. p & p**

These are just three of a complete range of technical publications, log books and maps for the radio amateur. Send a large s.a.e. 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 General Manager and ask for full details.

RSGB

RADIO SOCIETY OF GREAT BRITAIN

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

SPARKRITE Mk II

Electronic Ignition... Better on all points

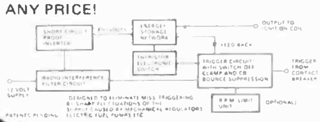
Because you keep your points!

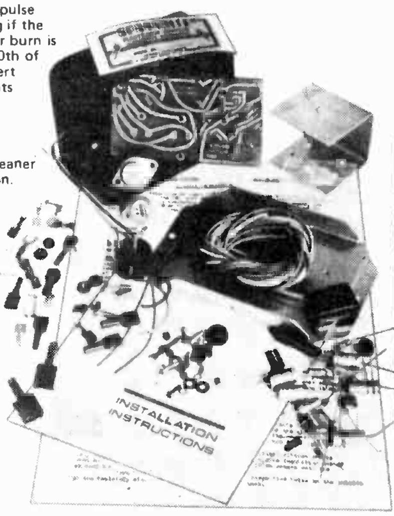
The SPARKRITE MK.2 is a full capacitive discharge electronic system. Specifically designed to retain the points assembly – with all the advantages and none of the disadvantages. No misfire because contact breaker bounce is eliminated electronically by a pulse suppression circuit which prevents the unit firing if the points bounce open at high rpm. Contact breaker burn is eliminated by reducing the current to about 1/50th of norm, thus avoiding arcing. But you can still revert to normal ignition if need be. In seconds. If points go (very unlikely) you can get replacements anywhere. All these advantages.

● Fitted in 15 minutes. ● Up to 20% better fuel consumption. ● Instant all weather starting. ● Cleaner plugs – they last 5 times longer without attention. ● Faster acceleration. ● Faster top speeds. ● Coil and battery last longer. ● Efficient fuel burning with less air pollution.

The kit comprises everything needed

Ready drilled scratch and rust resistant case, metalwork, cables, coil connectors, printed circuit board, top quality 5 year guaranteed transformer and components, full instructions to make positive or negative earth system, and 6 page installation instruction leaflet.
WE SAY IT IS THE BEST SYSTEM AT ANY PRICE!





Sparkrite MK II – full capacitive discharge electronic system – not just a transistorised inductive discharge booster.

PRICES

D I Y Kit only £10.93 incl. VAT and P & P
Ready Built Unit £13.86 incl. VAT and P & P
(Both to fit all cars with coil/distributor ignition up to 8 cylinders)
We can supply units for any petrol-engined vehicle (boat, motorcycle etc) with coil/contact breaker ignition.
Details on request. Call in and see us for a demonstration.

ORDER NOW TO:

ELECTRONICS DESIGN ASSOCIATES
(Dept PW 3) 82 Bath Street,
Walsall WS1 3DE Phone 33652

Please supply:
Sparkrite Mk.2 D.I.Y. Kit(s) at £10.93 each incl. VAT and P & P (Will make pos. or neg. earth). ☐
Sparkrite Ready Built Neg. Earth Unit(s) at £13.86 each incl. VAT and P & P ☐
Sparkrite Ready Built Positive Earth Unit(s) at £13.86 each incl. VAT and P & P ☐

NAME ____________________
ADDRESS ____________________

I enclose cheque/P.O. for £ ________
Send SAE for brochure.

ON THE AIR

Log extracts

Michael Green:—20m DU6BG FP8DH VE3CD/SU **80m** UK1ADZ

Roger Trett:—20m HP9MC HV9VX HZ1TA VP1FF VP2MRA ZB2A **15m** CE6EF VU2DK VK6KG ZS1WA

John Porter:—20m FL8DJ OH0NC VP2SV 5U7AG **15m** VP8NP YS1MAE ZE3JU

Eric Carling:—20m FM7AQ HK0BKX KC6VE P29FV VS6BL YJ8GS 3D2AJ **15m** AP2KS ZL3RB 8P6ES

Alan Doherty:—80m EA8CR KL7HNQ KP4AN VP2DM VS6DL ZL4KF 4S7PB 8R1AG **40m** CT2BN **20m** SV1IE VE6JD ZL2AIL 6W8FN 7X2OA

Max France:—80m AP2KS KZ5JM KS6DH TR8DG VP7NX VP8NP VR1AA VS6FB ZD7FT ZK1DX (Cook Is.) plus 12 ZL's

Stephen Budd:—80m EL7D FP8FU 9M2DQ **20m** VP2MRA ZL1BD ZL2WC **15m** HS4AFD HZ1KE VK6QL VP2SM VP7DF 5N2ESH 9Y4CR

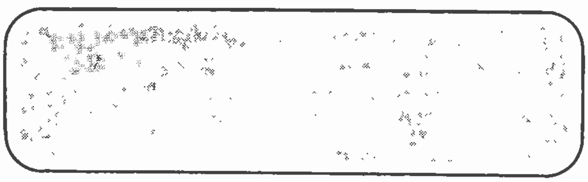
Gary Edge:—80m AP2KS DU1AU PJ2CW ZL2AW **40m** VP2GMB **20m** VK9YR VP8NS ZD7ST

Alan Rae:—80m A4GCV (Oman) A9ZBK (Bahrain) VP2VBU VP8FK **40m** ET3DCO **15m** H18HOG KG4AMI VP2MRA YS1WPE

Paul Barker:—20m (SSTV) I1NKT 12PET OE1SF **20m** 9X5PT **15m** CR7AF KV4AD ZD3R

Tim Charles:—80m CT2BP OJ0MA **40m CO2IP** CT3AR **DU1HKG FW8OR HH9LJ HP1BM KL7TY VK9WT XZ1OT YA1AL YB3CB YS3A ZL1AEA ZL2AKW 3V8AZ**

All stations are SSB except those in bold which are CW.



SHORT WAVE BROADCASTS

by Derek Bell

Glenn Tobin, aged 16, opens our box of goodies this month and he, on his Astrad VEF 204, has pulled in the following:—

7220 Voice of America at 1950 from Tangier
9560 Radio Ghana External service (no time given)

not bad for a simple set with only an added length of wire for an aerial.

Glenn, however, mixes up metres and megahertz because, as he says, his set is only marked in metres and he has to rely on the frequencies announced by the station. The answer to this OM is the following formula, to get the old grey matter stirring! Frequency in metres equals 300,000 over frequency in megahertz. So there! It will make an equation if one knows only one other value either the frequency (MHz) or the wavelength (m). Taking an example:—

$$\text{Wavelength (metres)} = \frac{300{,}000}{6020} = 49{\cdot}23\text{m.}$$

or as the station says "the 49 metre band". The equation also works by dividing metres into 300,000 to give the frequency in megahertz.

Another "crie de-coeur" from Glenn is that he is lacking traffic in the 60 metre band and he wonders if a special aerial is needed. Not at all, says I, try making a centre-fed aerial that is a half wave on 60 metres, using the formula in the P.W. Aerial Data Chart, that is 468/f(MHz) ft. Try cutting a length of copper wire to a quarter wave or about 45ft. which will also match a low input impedance.

One of the regular sounds on the 60 metre band is the atomic clock broadcast from Turin. There are many countries that put out these fixed standard frequency signals and the DXer will find them very handy for checking the calibration of his set since they are usually on a precise frequency, in this case 5MHz. Turin also will QSL if asked nicely.

A "first time" letter comes from **Michael Bridgewaters** of Shifnal, in Shropshire and he would like a feature on propagation popped in. Well, Michael, the fact is that printing and editorial deadlines would make the news stale, if not useless, by the time you got your copy of PW if you are referring to current conditions.

Twelve-year-old **Timothy James** from Basset has written in reporting Radio Australia at 0715 on 9570. He has not given a date for this but he must have heard it at the latter end of the summer season since Australia is now on from 0815 to 0915 on 9570 and they have registered 11760 with the ITU from 1845 to 2000 for this winter.

Someone who seems to have winkled out a few good signals is another youngster **Christopher Rowson** of Tittensor, Staffs., reporting as follows:—

11955 Voice of the Gospel (Ethiopia) at 1545
15483 Radio Tanzania at 1930.

This thirteen-year-old pilots his Grundig Elite Boy and its long wire aerial and reports that he has pulled in the so-called "Paris calling Africa" programmes of ORTF. These are the "Afrique Inter" relays normally intended for French-speaking parts of Africa. By the way, these programmes are very good for French language practice, for those dreaded exams!

One of the many "giveaways" that stations are prone to send out is the pennant. News has been given to me of at least three more countries that have jumped on the bandwagon, namely Poland, Norway and Spain. Radio Nigeria sent out copper necklaces last year, but that did not last very long. Pennants, if you can get them, are fine to hang on the shack wall and those I have seen range from the large red, white and blue plastic of Radio Nederland to the exquisite pale-blue silky textured example from Adventist World Radio.

Paul Heath of Wednesfield informs us that HCJB Quito is at present sending out a form with its QSL card asking about the religion of their correspondent and how many times the said correspondent goes to church. This I think must rank, for sheer impertinence, alongside the penetrating questions that Radio Pekin asks. For instance, they want to know one's occupation and how long one has held it. While touching on the subject of Gospel stations, **Rex**

Cooper of Foulden, Norfolk reports having heard 15120 ETLF Addis Ababa at 1415, one of the more difficult loggings. To his Marconi CR150 Rex has added a preselector and a 33 foot vertical aerial. All I can say is, may the winds stay calm! Rex says that he bought the set in the local market and after "breathing on it" is getting reasonable results. One of his favourite stations was FEBA in the Seychelles and Rex would like anyone who knows what has become of it, to shout up.

From the horse racing scene round Yorkshire, Doncaster to be exact, **Jack Hanson** says that he has a couple of questions. The first is "who puts out the fixed-frequency signals on 2·5, 5, 10 and 15 MHz. If it is a beat at one second intervals it is probably one of the standard frequency stations mentioned earlier. The way to check is to listen for a speech or morse announcement. His second query concerns the BBC World Service on 17700, broadcast on 8th Dec. at 1100. Jack reports that it had "a booming echo rather like two path propagation". Almost certainly it was a combination of sky and ground waves.

We must welcome a new station on the air. From Antarctica comes news that the American Forces Antarctic Network opened in December on 6012 using one kilowatt pumped into a vertical aerial. On that happy note comes time for me to close the shop and say "best 73s" to you and yours.

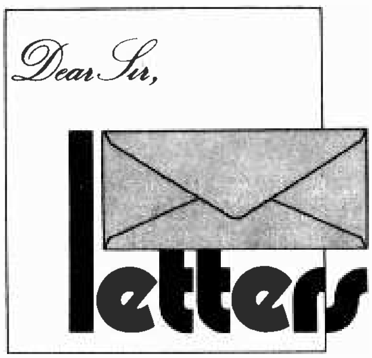
BROADCAST BANDS

Short Wave reports by the 15th of the month to Derek Bell c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

Medium Wave Logs to Charles Molloy, 132 Segars Lane, Southport, PR8 3JG.

AMATEUR BANDS

Logs covering any amateur band/s in band/ alphabetical order by the middle of the month to Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashtead, Surrey, KT21 2TW.



Thank you P.W.

Eighteen years ago a school friend showed me his home made one valve short wave receiver and introduced me to *Practical Wireless*, from then on I was hooked. Over the years I built numerous receivers and items of test gear from the pages of your magazine. In recent years with the aid of *Television* magazine I have progressed through the deeper mysteries of television and gained practical experience by repairing friends' equipment and with the 'five bobs' gained thereby have furnished a small workshop and acquired a supply of spares.

I must confess that in spite of the fascination of television I cannot resist constructional articles on pocket transistor radios. I recently made the "Mini Pop" two I.C. radio (*P.W.* May '74) which I fitted into the 'Boots Soapdish Lid' case as described for the "Mite" radio (*P.W.* April '69) without undue cramping. The quality of performance of this set is unbelievable and I'm sure puts the majority of commercial built pocket superhets to shame.

I would like to offer my humble thanks for all your efforts in making this possible, and providing so many hours of enjoyment for, I am sure, a great number of people. Thank you.—**John Bloxham** (Warwickshire).

Planespotters beware

On the 7th January this year a BAC One-Eleven was hijacked from Heathrow, and subsequently flown to Stansted. This you are all probably well aware of. What perhaps is news to a number of your readers is the fact that listening-in on the v.h.f. communications link between plane and control tower is illegal; as is listening to the Police, Fire Service and any other public service organisation.

Although the manufacturers are well aware of this fact, they persist in equipping their domestic v.h.f. receivers with full coverage of the 96-110 MHz band. It's possible to buy a receiver in any market place for £5, go to Heathrow, and eavesdrop on highly confidential communications between the aeroplane and ground stations

The result of this latest hijack drama has finally brought home to those in high places the danger of allowing receiving equipment ot this type to get into the hands of the general public. It was disclosed recently, that during the drama, talks were going on between the plane's Captain, the Home Office and Scotland Yard, nearby 'plane spotters' heard the lot, apparently to the amazement of 'Security Chiefs'!!

The danger here of course, is in the definition of the word 'plane spotter'. If they are genuine enthusiasts, the dangers are not too great, but what's to stop would-be hijackers listening-in, or other undesirables? The complete procedure that Scotland Yard and the Home Office has worked out together with regards hijacks, could very soon become common knowledge, and as such a serious security risk.

The answers are many. Either put the public service communications on another frequency, scramble or code the messages, or stop making receivers capable of tuning over the present frequencies. The problem with the latter is the million or so radios already in public hands. What do we do?, tell those owners to report to their local friendly security centre to have their radios doctored?!

Maybe we ought to enforce the law already in existance, and punish anyone found listening to the Police, aeroplanes etc. You may well ask how does one do this? The answer is again simple——put microphones and cameras in everyones' homes, in the streets and the countryside,—ah well, 1984 here we come!—**Andrew Auger** (South London).

AUTOMATIC EMERGENCY LIGHTING

Power cut days will soon be upon us. Our simple kit makes any light a fail-safe light. Kit containing relay and rectifiers and data, only **65p** each. 10 or more **60p** each. Suitable case **40p** extra.

PORTABLE CABINET OFFER

A nicely made portable cabinet, soft padded black finish intended for portable stereo system. Dimensions as sketch. With motor board cut out for Garrard SP 25. This was obviously a very costly cabinet originally made for a de-luxe record player. Offered at **£1·95** plus **£1** carriage, free if bought with the Garrard or BSR record decks

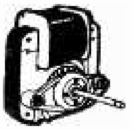
LIGHT DIMMER KIT

For dimming up to 250w without heat sink or 750w with heat sink. This comprises, quadrac. variable control potentiometer, condenser, resistors, tag strip for mounting and data. Price **£1·50.** **5 amp Industrial Model £3·30.**

RELAY BARGAIN

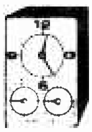
Type 600 relay, 2 changeover one open and one closed contact. Twin 500 ohm coils make this suitable for closing off DC 6v, DC 12v, DC 24v or AC mains using resistor and rectifier, **33p** each. Resistor and rectifier **20p** extra.

MAINS MOTOR



Precision made—as used in record decks and tape recorders—ideal also for extractor fans, blower, heaters, etc. New and perfect. Snip at **75p.** Postage 20p for first one then 10p for each one ordered.
1″ stackmotor **£1·04.**
$1\frac{1}{2}$″ stackmotor **£1·20.**

TIME SWITCH



Smith's mains driven clock with 15 amp switch, also notes showing how you can wake up with music playing, kettle boiling or come home to a warm house, warn off burglars, keep pets warm, halve your heating bills, etc. **£2·45.**

MACLAREN THERMOSTAT

Make and break 20A a.c. with the sensor probe coupled by a 2 feet capillary covering range of 10-100°C—complete with large engraved control knob. Price **88p.**

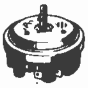
WINDSCREEN WIPER CONTROL

Vary speed of your wiper to suit conditions. All parts and instructions to make. **£2·75.**

6 DIGIT COUNTER

Resettable. 440 ohm coil up to 25 impulses per second. Ex-equipment but guaranteed perfect, **£2·85** each.
4 digit counter as specified for telephone charge calculator **93p.**

PRESSURE SWITCH



Containing a 15 amp change over switch operated by a diaphragm which in turn is operated by air pressure through a small metal tube. The operating pressure is adjustable but is set to operate in approx. 10 in. of water. These are quite low pressure devices and can in fact be operated simply by blowing into the inlet tube. Original use was for washing machines to turn off water when tub has reached correct level but no doubt has many other applications **£1·72**, each.

NUMICATOR TUBES

For digital instruments, counters, timers clocks, etc. Hi-vac XN.3. Price **99p** each. 10 for **£9.**

MULLARD AUDIO AMPLIFIERS

All in module form, each ready built complete with heat sinks and connection tags, data supplied.
Model 1153 500mW power output **90p**
Model 1172 750mW power output **£1·07**
Model EP9000 4 watt power output **£2·00**
EP 9001 twin channel or stereo pre amp **£1·41**

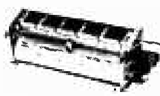
EXTRACTOR FAN

Cleans the air at the rate of 10,000 cubic ft. per hour. Suitable for kitchens, bathrooms, factories, changing rooms, etc., it's so quiet it can hardly be heard. Compact. $5\frac{1}{2}$″ casing with $5\frac{1}{2}$″ fan blades. Kit comprises motor, fan blades, sheet steel casing, pull switch, mains connector, and fixing brackets. **£2·75** + 20p P. & P.

CENTRIFUGAL BLOWER

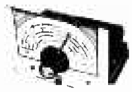
Miniature mains driven blower centrifugal type blower unit by Woods. Powerful but specially built for quick running—driven by cushioned induction motor with specially built low noise bearings. Overall size $4\frac{1}{2}$″ × $4\frac{1}{2}$″ × 4″. When mounted by flange, air is blown into the equipment but to suck air out, mount it 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. etc. A real bargain at **£2·50p.**

TANGENTIAL HEATER UNIT



This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters. Comprises motor, impeller, 2kW element allowing switching 1, 2kW, and with thermal safety cut-out. Can be fitted into any metal lined case or cabinet. Only needs control switch, **£2·75.** Don't miss this. Control Switch, **55p.** P. & P. 50p.

SHORTWAVE CRYSTAL SET



Although this uses no battery it gives really amazing results. You will receive an amazing assortment of stations over the 19.25.31.39 metre bands—Kit contains chassis front panel and all the parts. **£1·25**—crystal earphone **50p.**

DRILL CONTROLLER

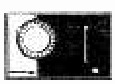
NEW IKW MODEL

Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. **£2·25** plus 25p post and insurance. Made up model also available. **£3·25** plus 30p post & p.

THIS MONTH'S SNIP

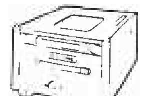
High compliance 8″ round speakers suitable for 8–12 ohm outputs, these speakers have rubber mounted diaphragms and will handle up to 12·5 watts. Made originally for an expensive Decca hi-fi outfit, we offer at **£3·75** each or **£7·00** a pair plus 40p each postage.

SMITHS CENTRAL HEATING CONTROLLER



Push button gives 10 variations as follows:- (1) continuous hot water and continuous central heating (2) continuous hot water but central heating off at night (3) continuous hot water but central heating on only for 2 periods during the day (4) hot water and central heating both on but day time only (5) hot water all day but central heating only for 2 periods during the day (6) hot water and central heating on for 2 periods during the day time only—then for summer time use with central heating off (7) hot water continuous (8) hot water day time only (9) hot water twice daily (10) everything off. A handsome looking unit with 24 hour movement and the switches and other parts necessary to select the desired programme of heating. Supplied complete with wiring diagram. Originally sold, we believe, at over £15—we offer these, while stocks last, at **£5·95** each, post 30p.

TAPE DECK



In metal case with carrying handle, heavy fly wheel and capstan drive. Tape speed $3\frac{3}{4}$. Mains operated on metal platform with tape head and guide. Not new but guaranteed good working order. Price **£1·95** plus £1 post and insurance.

GENERAL PURPOSE SWITCH

Responds to moisture, heat, light, touch, time delays, etc. etc. Basic kit comprising relay, transistors, diodes, condensers, resistors, etc. and data—only **£1·50** + 30p post.

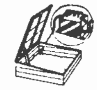
AMMETERS

—moving iron so AC/DC—ideal for chargers etc. 2″ sq. full vision 0-8 amp **95p.** $1\frac{1}{2}$″ *round* 0-2 amp **55p,** 0-3 amp **65p,** 0-4 amp **75p.**

DISTRIBUTION PANELS

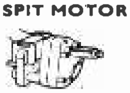
Just what you need for work bench or lab. 4 × 13 amp sockets in metal box to take standard 13 amp fused plugs and on/off switch with neon warning light. Supplied complete with 6 feet of flex cable. Wired up ready to work. **£2·75** plus 25p P. & P.

SOIL HEATER



Or could be used on bench for seed trays. Comprising mains transformer to reduce to safe voltage also heater wire. **£2·00** plus 20p p. & p.

SPIT MOTOR



200-250V induction motor, driving a Carter gearbox with a $1\frac{1}{2}$″ output drive shaft running at 5 revs p.m. Intended for roasting chickens, also for driving models—windmills, coloured disc lighting effects, etc. **£2·50** plus 20p post and ins.

TERMS:—
ADD 8% V.A.T.
Send postage where quoted—other items, post free if order for these items is £6·00, otherwise add 30p.

J. BULL (ELECTRICAL) LTD.

(Dept. PW), 102/103 TAMWORTH RD.
CROYDON CRO IXX

NEW ITEMS THIS MONTH

The bargains in this column are just some of the items which appeared in the December supplement to our catalogue. You can receive this catalogue and the next 12 supplements by sending **£1.**

Room Thermostat. Mercury Switch type with thermometer for low voltage gas central heating systems etc. Made by a famous American Company, these are of very neat appearance, in plastic case, easily mounted but the most important feature is that they cut in and out quickly, thus maintaining a very steady temperature. Price **£1·85**

12v Sealed Plug-in Relay with two sets changeover contacts 10 amp rating. Fit into a standard octal valve base. Limited quantity. **£1** each.

Constant voltage step down transformer. American made 500w loading. Input voltage can be either 115 + or −20% or 220 + or −20%. For 50 c.p.s. mains output 115v 50 c.p.s. A real quality transformer, probably cost well over £100. Not new but guaranteed perfect. Our price **£45.** Ditto 750w **£60.** Carriage paid.

Mercury Batteries. Bank of 7 mercury cells Type No. 625 which measure approx. $\frac{3}{4}$″ diameter by 1″ thick in plastic tube with positive and negative ends marked giving a total of 10·7v. Only **5p** per bank or **£1** per carton of 25. With simple holder these will replace the PP3 and similar, or can be quite easily separated for operating simple pocket radios and instruments, deaf aids, etc.

Two circuit micro-switch. Famous American Licon, maker's ref. 16-40411. Size approx. 1″ long $\frac{1}{2}$″ wide $\frac{1}{4}$″ thick. Two electrically separate circuits, one makes, the other breaks when nylon push rod is depressed. Circuit rating we estimate at 5 amps 250v. **12p** each.

Sound to light unit for enhancing your audio either with the addition of coloured lighting or white light responding to the music. Our unit, which will work up to three 150w lamps, is available as a kit of parts at **£6·95** or made up ready to work **£7·95.**

Emergency lighting. It would seem that once again there is a possibility of power cuts and black-outs. We hope it won't be as bad as last year, but the possibility of having to work off batteries is definitely with us. We can still offer 12v battery fluorescents. 24″ uses the standard 24w tube and gives an excellent light, price **£4·50** + 50p post and insurance. Also the 40″, which uses the 40w tube, is now available, price **£7** + 75p post and insurance. We also still have stocks of big inverters, ref. YB. This is a 500w 24v operated inverter, unfortunately not 50 c.p.s. Its frequency, we believe, is 400 c.p.s. which means that whilst fluorescent lighting could be worked off it, special chokes would have to be used. Normal incandescent lamps can of course be used without any bother. The price of this unit is **£19·50** + carriage at cost.

Luminous rocker switch, suitable for 13 amps at mains voltage, these are illuminated with neon through amber panel, snap-in fixing into hole size $1\frac{1}{8}$″ × $1\frac{1}{8}$″. Special bargain, **22p** each.

Chrome plated metal legs, heavy duty, really good quality, made originally for an expensive Decca outfit, height 12″, **£1·50** per set of 4 plus post 30p.

Experimenters Relay Parcel. 10 type 600 relays all different coil values covering most experimenters needs. Also one mounting bracket. Total retail value £3·50—yours for **£3** plus 30p post.

Motor with fan blade—if you want something to cool a cabinet or if you are making a cooker hood or a blower heater, this may be the answer. 1″ stack induction motor with a set of Smith's fan blades, approx. 5″ diameter. **£1·50** + 30p post.

Microswitch bargain—Honeywell, brand new 10 amp 250v gold on silver contacts, standard fixing, normal operation. Price **10p** each.

Cooling fins—heavy duty for TO6 type semi-conductors, extruded aluminium, size $4\frac{1}{2}$″ × 3″. Price **50p** each.

Full wave rectifiers 4 × 1N3208 which we understand are rated at 25 amps mounted on cooling fins, these were intended for computers but were never installed. Price **£3** each.

Insulated terminals. These are the popular type which will take a wire under the head or a 4mm plug in the top, fully insulated for mounting with metal panels, available in several popular colours—price **12p** each.

Delay Switch. Depending on the amount of voltage applied, so this switch will delay making the circuit (of up to 15 amps at normal mains voltage) for up to 10 seconds, delay may be fixed or made variable with a suitable potentiometer. These can also be used as thermal relays as suitably connected a low current relay can switch up to 100 amps or more—these are glass tubes plus in 4 pin base—with base **75p** each.

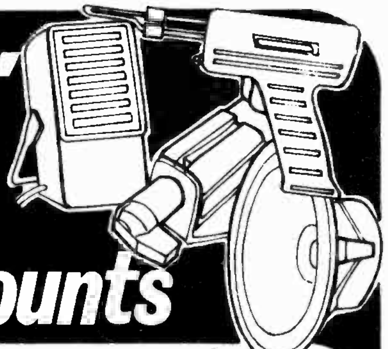
Smiths 24 hr. timer heart, really the "Autoset" without its plastic case. This is a 24 hr. twice on, twice off, clock switch which will repeat until re-programmed. Switches rated at 15 amps. Limited supplies—**£3·75** each.

Smiths colour stat. Customers will remember that we had a supply of these wall mounting thermostats last year. We were able to supply these at £1·65. A new batch has just arrived but like most other things these days they have gone up in price and we must now charge **£2·25** each. However, this is still a very low price for such a thoroughly reliable wall thermostat.

Panel meter with trip. American made. These are flush mounting, full vision, moving coil meters, face size $2\frac{1}{4}$″ × $2\frac{1}{4}$″ with two front settings which enable an external circuit to be tripped, a light lit or an alarm sounded, at pre-set voltages within the range of the meter. We have meters covering the following DC voltages:- 0 to 6: 0 to −15: 0 to −25; 0 to +25: 0 to +150. All **£4·75** each.

p. 470 974 1000

'BIG' Discounts



ALL PRICES INCLUDE V.A.T.

SPEAKER BARGAINS

	£
EMI 13" x 8" 3, 8 or 15 ohm Plain	2·05
With Co-Axial Tweeter 8 ohms only	2·20
Twin Tweeter	4·10
Type 350 8 or 15 ohm, 20 watt	7·95
6½" 8 ohm, 10 watt	2·40
8" 8 ohm, 10 watt	3·75
12" 8 ohm, 20 watt	6·70
8" x 5" C/Mag. 5 watt	1·25
8" x 5" Dualcone 8 ohm, 10 watt	2·55
GOODMANS 6½" 8 ohm Dualcone	2·15
ELAC 6½" 8 ohm Dualcone	2·15
ELAC 8" 8 ohm Dualcone	2·30
ELAC 8 ohm Dualcone 10 watt	3·50
FANE 7" x 4" 3 or 8 ohm	1·00
ADASTRA 10" 8 or 15 ohm, 10 watt	3·55
BAKER GROUP 25 12" 8 or 15 ohm, 25 watt	7·65
P. & P.	·30
5" 8 ohm, C/Mag.	·85
2½" 8 ohm or 64 ohm	·50
P. & P.	·15

TWEETER & CROSSOVER

EMI 3½" 3 or 8 ohm C/Mag	1·25
Cone Tweeter 8 or 15 ohm, 10 watt	2·60
Cone Tweeter 8 ohm, 3 watt	1·45
Horn Tweeter 8 ohm, 20 watt	6·40
Dome Tweeter 8 ohm, 30 watt	5·40
Crossovers CN23 (3 ohm), CN28 (8 ohm), CN216 (16 ohm)	1·20
P. & P.	·10

KIT FORM CABINETS TEAK VENEER

12 x 12 x 6 with 8" 8" x 5" or 6½" and 3½" cut out	3·30
17 x 10 x 9 with 8" or 13" x 8" cutout	3·80
18 x 11 x 9 with 13" x 8" cutout for EMI 350	4·25
P. & P. ea.	·45

MICROPHONES

CM70 Planet stick metal, switch crystal	1·55
DM160 Dynamic omni-dir. ball metal	4·75
UD130 50K/600 ohm, uni-dir ball metal	6·40
TW209	5·75
CONDENSER MIKE 600 ohm, uni-dir	9·35
Cassette Stick Mike with R. Control on/off switch (2·5 & 3·5mm J/Ply)	1·45
P. & P.	·20

SOLDERING IRONS

ANTEX CN240 15 watt	2·15
SK 1 Kit (15 watt iron 2 spare Bib etc.)	3·50
X25 25 watt (low leakage)	2·15
P. & P.	·10

CARTRIDGES & STYLII

ACOS GP91/2SC or 3SC ster. comp.	1·00
GP93/1 or 95/1 ster. cryst.	1·35
GP94/1 or 96/1 ster. ceram.	1·75
GP101 cryst. comp.	0·80
GP104 ster. ceram.	1·65
BSR X5M or X5H cryst. comp.	1·70
SX6M or SX6H cryst. comp.	1·90
SC5M ster. ceram.	2·60
SONOTONE 9TAHC or 9TAHC/G Diam.	1·80
3509 Ster. ceram. Diam.	1·90
GOLDRING G850	2·95
G800	3·95
G800E	6·90
P. & P.	·10
D. Diamond Stylii for above	1·25
G800/G850	1·95
G800E	3·95
P. & P.	·05

CALCULATORS SINCLAIR

Cambridge	19·95
Scientific	29·95

BATTERY ELIMINATORS

240v input 6, 7·5 or 9 12v d.c. input (specify output)	2·95
6, 7·5 or 9 d.c. output at 300mA	2·30
P. & P.	·15

TAPES	Stnd.	LP	DP
5"	50p	65p	1·00p
5¾"	65p	80p	1·40p
7"	80p	1·10p	1·80p

PLASTIC LIBRARY CASES

For 5" Reels	18p
5¾" Reels	22p
7" Reels	25p

P. & P. 1–3, 9p ea. 4 or more, lot 30p

LOW NOISE CASSETTES

	1–5	6–10	11–20
C60	35p	33p	30p
C90	45p	43p	40p
C120	55p	52p	50p

Cassette Cases	10p
Cassette Head Cleaner	40p

P. & P. 1–5, 3p ea. 6–10, 15p lot. 11–20, Post Free.

BIB ACCESSORIES

Tape Editing Kit	Ref. 23	1·35
Recording Tape Splicer	Ref. 20	1·15
Cassette Tape, editing	Ref. 24	1·50
Cassette Salvage Kit	Ref. 29	·45
12's Cassette Case	Ref. 34	£1·50
Stylus Balance	Ref. 32A	1·20
Spirit Lever	Ref. 46	·50
Hi-Fi Stereo Test Cassette		2·10
Groove-Kleen Record Cleaner		1·90
P. & P.		·10

WHARFEDALE SPEAKER BARGAINS

	£	P&P
Linton 2 Kit (pr)	19·95	1·00
Glendale 3 Kit (pr)	33·50	1·50
Dovedale 3 Kit (pr)	52·00	1·50
Denton 2 Speaker (pr)	30·00	2·00
Linton 2 Speaker (pr)	39·50	2·00
Dovedale 3 Speaker (each)	42·00	2·00
Glendale 3 Speaker (pr)	57·00	3·00
Kingsdale 3 Speaker (each)	59·95	3·00

Send 25p for COMPLETE CATALOGUE, refundable upon first order. ALL OUR MERCHANDISE IS FULLY GUARANTEED.
Subject to manfacturer increase and availability.

Riversdale Electronics

Mail Order Department PW3
P.O. Box 470, Manchester M60 4BU.

TECHNOMATIC LTD. 54 SANDHURST ROAD, LONDON NW9

Tel: 01-204 4333

AC126/7/8	11p	TIS43	26p	**DIODES**		**SCR-THYRISTORS**	
AC176	12p	2N2646	35p	1N4001	5p	1A/50V	42p
AC187/8	11p	2N2926	8p	1N4007	7p	1A/400V	60p
AD161/2	36p	2N3053	18p	1N914	4p	3A/400V	75p
AF114/5/7	12p	2N3055	40p	OA200	6p	C106D	45p
BC107/8	9p	2N3442	140p	AEY11	50p	2N3525	91p
BC109C	10p	2N3702/3/4	11p	ZIJ	65p	**TRIAC**	
BC182/3	10p	2N3705/6	10p	TIL209	16p	3A/400V	95p
BC184	11p	2N3773	220p			6A/400V	120p
BC212/3	11p	2N3819	20p	**ZENERS**		16A/500V	180p
BC214	13p	2N3823	60p	400mW	9p	DIAC	20p
BFY50/1/2	15p	2N4871	31p	1·3W	20p	**DIL SOCKETS** (Low Profile Texas)	
MPF102	31p	2N5457	31p	1·5W	27p	8 Pin	12p
MPF103/5	31p	2N5458	31p	**BR. RECT.**		14 Pin	13p
OC28	55p	2N5459	31p	1A/50V	20p	16 Pin	14p
OC35	48p	3N128	79p	1A/600V	25p		
TIP41A	65p	3N140/1	86p	2A/100V	35p		
TIP42A	70p	40673	56p				
TIP2955	70p						

TTL SERIES				**Linear IC's**		**1 AMP REG (TO220)**			**CMOS LOGIC ICs by RCA**	
7400	14p	7473	36p	536	192p	5V, 12V	140p	MFC4000 40p	Gates (CD4001AE, CD4011AE etc)	37p
7401/2	15p	7474	34p	555	50p	CA3046	55p	TBA800 100p	CD4013	67p
7403	22p	7475	52p	556	100p	ICL8038	290p	TBA810 125p	CD4017	183p
7404	18p	7476	37p	566	220p	MC1310	240p	TBA820 80p	CD4027	108p
7408	20p	7486	41p	567	2 0p	MC1312	220p	ZN414 110p	CD4029	325p
7410	15p	7489	340p	709	28p			LM380 100p	CD4024	148p
7413	30p	7490	45p	723	55p				CD4030	82p
7420	15p	7491	94p	741	25p				CD4046	220p
7430	15p	7492	68p	747	70p				CD4047	154p
7441	75p	7493	48p	748	38p				(SAE for full list please)	
7442	70p	74107	45p	DIL 8 or 14						
7447	95p	74121	34p							
7448	90p	74141	85p							

OPTO-ELECTRONICS 7 SEGMENT READ OUTS					
3015F	120p	LIT747	250p	5001 12 Digit Calculator Chip	485p
MAN3M	100p	3 DIGIT READ OUTS "BLISDOR" LENS	250p	5314 Clock chip	650p
MAN4	180p	RED LENS	185p	Clock chip with Alarm (Similar MM5316)	750p
LIT704	135p	LEDS TIL209 (Red)	16p	PC Keyboard 2·36" x 3·76" x 0·45"	400p
LIT707	135p	Green/Yellow	35p		
		LDR ORP12	50p		

FOR FULL LIST SEND SAE OR REFER OUR ADVERT IN P.E. OR W.W.
Complete semiconductor kit for PW ASCOT STEREO CASSETTE DECK £4·85 + VAT.

MAIL ORDER ONLY
MINIMUM ORDER £2.

P & P 15p.
Add 8% VAT on total.

ENGINEERS FREE YOURSELF FOR A BETTER JOB WITH MORE PAY!

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

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

CUT OUT THIS COUPON

POST NOW

CHOOSE A BRAND NEW FUTURE HERE!

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

- Build-As-You-Learn PRACTICAL RADIO AND ELECTRONICS (with kit) ☐
- Electrical Engineering ☐
- Electrical Installations and wiring ☐
- Electrical Draughtsmanship ☐
- Electrical Mathematics ☐
- Electronic Engineering ☐
- Computer Electronics ☐
- Computer Programming ☐
- General Radio and TV Engineering ☐
- Radio Servicing, Maintenance and Repairs ☐
- Transistor Technology ☐
- CITY AND GUILDS Installations and Wiring ☐
- CITY AND GUILDS Electrical Technicians ☐
- CITY AND GUILDS Telecommunications ☐
- Radio Amateurs' Exam etc. etc. ☐

To ALDERMASTON COLLEGE Dept. EPW-01 Reading RG7 4PF EPW-01

NAME (Block Capitals Please)

ADDRESS

Other subjects

Age

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

HOME OF BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

HOTLINES ON RECENT DEVELOPMENTS

TIME HAS COME

Timers are an evergreen idea in electronics and many ingenious circuits have been published using a variety of techniques. One of the latest ideas on the market isn't just an integrated circuit requiring a "few external components" to make an electronic timer unit. The latest is just a component and, apparently doesn't require any assistance at all, other than power.

It comprises a two-terminal cylindrical case measuring 0·75in. in diameter and 2in. long. With a wire from each end it looks rather like a capacitor.

Series connected, the module provides fixed delay times of 1, 5, 10, 30 and 60 seconds. It is accurate over its temperature range to within ±10%. The temperature range is given as 32 to 125°F. The device comes in three input voltages; 12, 24 or 48V. The inductive output is rated at 500mA and the equivalent British price is about £3. Not available in the UK yet, as far as I know.

REALLY WIRE-LESS!

One of the interesting events on the hi-fi market was the launch of a headset which isn't attached to the equipment by any wires of any sort. Just put these headphones on and out comes your stereo hi-fi. But it's not done by magic—just infra red. The system utilises photodiodes which emit a modulated IR beam. This in turn is detected by photo-sensitive diodes on the headset itself. It's thought that this system is almost ideal for the average hi-fi enthusiasts room since the type of emission is unaffected by surfaces and colours etc. The modulated light source itself is diffused throughout the room so it isn't necessary to wander round with the top of your head always pointing towards the IR transmitting diodes. The power output of the IR diodes is only 60mW to cover the average room so the system does not waste precious watts.

As a point of interest, Ginsberg confesses to remembering a similar system being shown at the SRDE (Signals Research and Development Establishment) near Bournemouth some 6–7 years ago. The idea then was that a whole class could be fed with instructions from a single IR source located in the ceiling. Wonder what happened to that idea or if anyone ever took it up?

FIBRE OPTICS

The coaxial cable has been with us for many years, and will doubtless be around for some time to come. But already there are serious rivals stirring. Fibre optics is one which has been quietly developing for some time. Thinking of the price of copper is one good reason for trying fibres for communications purposes. Pilkington Brothers is well known in the field of glass and this company has been carrying out a considerable amount of work on fibres. However the first demonstration given on short cables was given recently.

The company calls its cable Hytran and it can replace copper cable for short range applications. A most significant feature is that Hytran is said to cost only one tenth the price asked for low-loss fibres which were previously thought to be the "real McCoy" if one wanted to communicate. The current suggestion is that Hytran is eminently suitable for cables up to around 180 metres in length. Pilkington are also recorded as saying that the demand for short range cables of this kind is on the increase although long distance usage of fibres is still another decade away.

NUCLEAR MAGNETICS

The Air Force Weapons Laboratory in the US is concerned about the effects that a huge electromagnetic pulse from a nuclear blast might have on the electronics systems in aircraft. So it's built a "little" gadget which simulates the effect—quite safely I'm told. The aircraft under test is held in a huge trestle structure made of wood and nylon. And just when it least suspects it, the US Airforce fires an 8MV pulse at it via a nearby antenna. The 8MV pulse is triggered in only 10nS. The electronics to accomplish all this is quite horrendous and, just for interest, the entire complex should be completed by 1976—and each of the trestles can accommodate an aircraft the size of a jumbo jet.

ALL BRITISH

Have you heard the name Godfrey Hounsfield? If you haven't, then you've missed something. He's British and a pioneer. His work, or rather the results of it have been described as the most significant thing in its field since Rontgen discovered X-rays. Hounsfield's work led to the EMI-Scanner manufactured by British company EMI Limited (Now you must of heard of His Masters Voice!).

The EMI-Scanner is a computerised brain examination system. It employs a computer to calculate the many thousands of readings which have been taken through various cross sections of the patients brain. The readings are obtained by using a narrow beam of X-rays which are rotated around the head for a short time while examination is in progress. The results of this are reproduced as detailed and very accurate pictures of brain tissue. These are projected onto a television screen. It is claimed that the system produces 100 times the amount of information on brain tissue compared to that obtained from normal skull Xray techniques.

Perhaps the most important question is, "Has it caught on or is it one of those laboratory wonders which has problems in practice?". Well, EMI introduced it just two short years ago and orders to date have amounted to £22 million (that's twenty two million pounds sterling) with £21 million being exports.

Can you think of anything that's gone from nothing to £22 million in two years. I think its a super achievement by a British man and exploited by a British company.

Ginsberg

IC OF THE MONTH

—continued from page 998

Miniature 3 gang tuning capacitors VC1, VC2 and VC3 in Fig. 1 are not readily available at the present time. The constructor can therefore either use a larger three gang type or make a simpler receiver using a miniature two gang type. In the simpler receiver, the RF stage of the μA720 is not used and the signal from the aerial coupling coil is fed directly to pin 1 (i.e. to the mixer input). The performance of such a simple receiver will not be so good as when an RF stage is employed, but will be perfectly adequate for the reception of normal broadcasting stations which provide a reasonable signal strength at the location concerned.

In car radio receivers, one may wish to replace the variable tuning capacitor with a permeability tuning system in which iron dust cores move along the centre of the coils concerned. A circuit for this purpose is shown in Fig. 3.

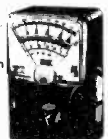
AVAILABILITY

The μA720 is available from advertisers. At the time of writing the price is about £1·25 plus VAT, but this should be checked before ordering. PW

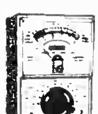
Europe's Largest Hi-Fi Retailers

LASKYS

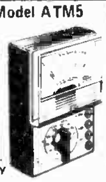
give you the greatest choice

TMK 200 MULTIMETER KIT

Build yourself a quality 20000 opv. multimeter and save money. Complete kit with meter scale, movement and rotary range selector ready mounted in cabinet. All parts, batteries, test prods and instructions. Ranges: 0/0.6/6/30/120/600/1200V D.C. 0/6/30/120/600/1200V A.C. Current: 0/0.6/6/60/600mA. Resistance: 0/10/100K/1/10 Meg ohms. Decibels: −20 to +63db. Size: 90 x 150 x 35mm.

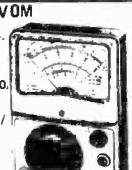
OUR PRICE £7.95 P&P 30p

AUDIOTRONIC Model ATM1

Top value 1,000 opv pocket multimeter. Ranges:– 0/10/50/250/1,000 volt AC and DC. DC current 0-1mA/100mA. Resistence: 0/150k ohms. Decibels: −10 to +22dB. Size 90 x 60 x 28mm. Complete with test leads.

OUR PRICE £3.25 P&P 15p

AUDIOTRONIC Model ATM5

Jewel movement, attractively moulded case with edgwise ohms adjustment. Ranges: 0-3/15/150/300/1200V AC, (2500 opv). 0-6/30/300/600V DC, (5000 opv). 0-300 uA/0-300mA DC. Resistance: x 10 & x 100, −10 to +16dB. Supplied with battery test leads and data booklet. Size: 121 x 73 x 29mm.

OUR PRICE £3.95 P & P 20p

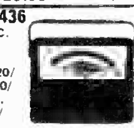
HIOKI 720X VOM

A versatile, accurate measuring instrument. 20,000 opv. 0/5/25/100/500/1000V DC. 0/10, 50/250/1000V AC. 0–50uA/250mA. 0–20k/2 Megohms.

OUR PRICE £5.97 P&P 30p

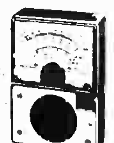
MODEL C7202EN

20,000 o.p.v. DC. 10,000 o.p.v. AC. Mirror Scale. 5/25/50/250/500/1000/2500 V. DC. 10/50/100/500/1000 V. AC. DC Resistance x 10, x 1000 (30Ω centre scale) DC Current 50uA, 2.5mA/250mA. −20 to +68 dB.

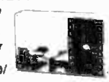
OUR PRICE £6.95 P & P 30p

MODEL PL436

20,000 opv DC. 8000 opv AC. Mirror scale. 6/3/12/30/120/600V DC. 3/30/120/600V DC. 50/600μA/60/600mA. 10/100K/1 Meg/10 Meg Ohm. −20 to 46 dB.

OUR PRICE £6.97 P&P 30p

HIOKI 730X

30,000 opv. Overload protection. 6/30/60/300/600/1200V DC. 12/60/120/600/1200V AC. 60/μA/30mA/300mA. 2K/200K/2 Meg Ohm. −10 to 63 dB.

OUR PRICE £7.50 P&P 30p

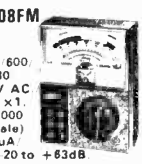
U4323 MULTIMETER

20,000opv. Simple unit with audio/IF oscillator. Suitable for general receiver tuning. Ranges: 0.5/2.5/10/50/250/500/1000V DC. 2.5/10/15/250/500/1000V AC. 0.05/0.5/5/50/500mA DC. Resistance: x 10, x 100, x 1,000, x 10,000 (50Ω, 500Ω, 5kΩ, 50kΩ centre scale) Battery operated. Size: 160 x 97 x 40mm. Supplied in carrying case complete with test leads.

OUR PRICE £7.70 P&P 30p

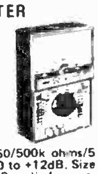
U435 MULTIMETER

20,000opv. Ranges: 75mV/2.5/10/25/100/250/500/1000V DC. 2.5/10/25/100/250/500/1000V AC. Current: 50uA/1/5/25/100mA/0.5/2.5A DC. 5/25/100mA/0.5/2.5A AC. Resistance: 0.3/3/30/300k ohms. Size: 205 x 110 x 84mm. Supplied complete with leads, crocodile clips and steel carrying case.

OUR PRICE £8.75 P&P 30p

MODEL C7208FM

30,000 opv DC. 15,000 opv AC. 6/3/15/60/300/600/1200 V. DC 6/30/120/600/1200 V AC. DC Resistance x 1, x 10, x 100, x 1000 (50Ω centre scale) DC Current 30uA/3/30/600mA. −20 to +63dB.

OUR PRICE £8.95 P & P 30p

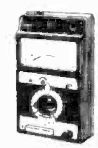
U4324 MULTIMETER

High sensitivity, overload protected. 20,000opv. Ranges: 0.6/1.2/3/12/30/60/120/600/1200V DC. 3/6/15/60/150/300/600/900V AC. Current: 0.06/0.6/6/60/600mA/3A DC. 0.3/3/30/300mA/3A AC. Resistence: 25/500 ohms/0.5/5/50/500k ohms/5 Mohms. Decibels: −10 to +12dB. Size 167 x 98 x 63mm. Supplied complete with test leads, spare diode and instructions.

OUR PRICE £9.25 P&P 30p

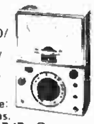
U91 Clamp VOLT AMMETER

For measuring AC voltage and current without breaking circuit. Ranges: 300/600V AC. Current: 10/25/100/250/500A. Accuracy 4%. Size 283 x 94 x 36mm. Complete with carrying case, leads and fuses.

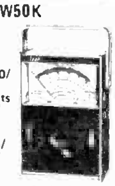
OUR PRICE £13.50 P&P 30p

U4312 MULTIMETER

extremely sturdy instrument for general electrical use. 667opv. 0/0.3/1.5/7.5/30/60/150/300/600/900V DC & 75mV. 0/0.3/1.5/7.5/30/60/150/300/600/900V AC. 0/300uA/1.5/6/15/150/60/600mA/1/1.5/6A DC. 0/1.5/6/15/60/150/600mA/1.5/6A AC. 0/200/3k/30k ohms. DC accuracy 1%. AC 1.5%. Knife edge pointer, mirror scale. Complete with sturdy metal carrying case, leads and instructions.

OUR PRICE £10.25 P&P 50p

HIOKI 750X VOLT-OHM-MILLIAMETER

43 ranges: 0–0.3/0.6/1.5/3/6/12/30/60/150/300/600/1,200V DC. 0–3/6/15/30/60/120/300/600/1,200V AC. Current: 0–30/60uA/1.5/3/15/30/150/300 mA/6/12A. Resistence: 0–3/300k/3/30Mohms. Decibels: −10 to +17dB. Output:– 0–3/6/15/30/60/120/300V. Accuracy ± 3% DC, ± 4% AC. Sensitivity: 50,000 opv DC, 5,000 opv AC. 4 inch meter. Built in protection. Size: 57 x 102 x 153mm.

OUR PRICE £11.95 P&P 40p

TMK MODEL TW50K

46 ranges, mirror scale. 50k/V DC 50k/V AC. DC Volts: 0.125/0.25/1.25/2.5/5/10/25/50/125/250/500/1000. AC Volts 1.5/3/5/10/25/50/125/250/500/1000. DC current 25/50uA/2.5/5/25/50/250/500mA/5/10A. Resistence: 10k/100k/1 Meg/10 Meg ohms. −20 to +81.5dB.

OUR PRICE £12.50 P&P 20p

MODEL C7080EN

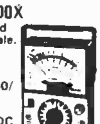
Giant 6" mirror scale. 20,000 opv. 0/0.25/1/2.5/10/50/250/1000/5000V DC. 0/2.5/10/50/250/1000/5000V AC. 0/50uA/1/10/100/500mA/10A DC. 0/2k/200k/20 Meg. −20 to +50dB.

OUR PRICE £19.95 P&P 35p

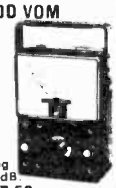
MODEL 500

30,000 opv with overload protection. Mirror scale. 0/0.5/2.5/10/25/100/250/500/1000V DC. 0/2.5/10/25/100/250/500/1000V AC. 0/50uA/5/50/500mA. 12A DC. 0/60k/6 meg/60 megohms.

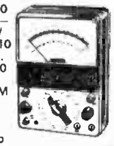
OUR PRICE £13.95 Carr. paid

HIOKI MODEL 700X

100,000opv. Overload protection. Mirror scale. 0.3/0.6/1.2/1.5/3/6/12/30/60/120/300/600/1200V DC. 1.5/3/6/12/30/60/150/300/600/1200V AC. 15/30uA/3/6/30/60/150/500mA/6/12A DC. 2k/200k/2M/20MOhms. −20 to +63dB.

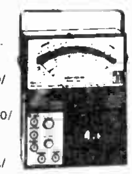
OUR PRICE £14.95 P&P 30p

MODEL AS.100D VOM

100,000 opv. Mirror scale. Built-in meter protection. 0/3/12/60/120/300/600/1200V DC. 0/6/30/120/300/600V AC. 0/10μA/6/60/300mA/12 Amp. 0/2K/200K/2 M/200 Meg Ohm. −20 to 17 dB.

OUR PRICE £17.50 P&P 30p

KAMODEN HM7208 FET VOM

Input impedence 10 Megohms. Ranges:– 0/.25/1/2.5/10/50/1000V DC. 0/2.5/10/50/250/1000V AC. 0/25uA/2.5/25/250 mA DC. 0/5k/50k/500k/5 M 500 Megohms

OUR PRICE £21.00 P & P 40p

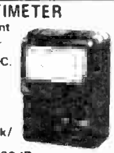
KAMODEN 360 MULTIMETER

High sensitivity DC 100kohm/V AC 10kohm/V 5" mirror scale, overload protected. Ranges: 0.5/2.5/10/50/250/1000V DC. 5/10/50/250/1000V AC. Current: 0.01mA/0.5/5/50/500mA/10A. Resistance: 0.1/1/10/100 ohms/1/10/100k ohms/10/100M ohms. Decibels −20 to +62dB. Battery operated. Size: 180 x 140 x 80mm. Supplied complete with test leads etc.

OUR PRICE £17.50 P & P 40p

Model HT100B4 MULTIMETER

Overload protected, shock proof circuits. 9.5uA Meter with mirror scale. Sensitivity 100kV. Polarity change switch. Ranges: 0.5/2.5/1-/50/250/500/1,000 Volts DC. 2.5/10/50/250/1,000 Volts AC. DC resistence' 0–20/200k/2/20 Meg. ohms. DC current:– 10/250uA/2.5/25/250 mA/10A. AC current:–0–10A. −20 to +62dB. Operates from 2 x 1.5V batteries. Size: 180 x 134 x 79mm.

OUR PRICE £17.50 P&P 40p

370WTR MULTIMETER

Features AC current ranges. 20,000opv. 0/0.5/2.5/10/50/250/500/1000V DC. 0/2.5/10/50/250/500/1000V AC. 0/50uA/1/10/100 mA/1/10A DC. 0/100mA/1/10A AC. 0/5k/50k/500k/5 Meg/50 Meg. Decibels: −20 to +62dB.

OUR PRICE £19.95 P&P 30p

U4317 MULTIMETER

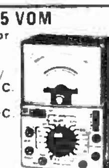
High sensitivity instrument for field and laboratory work. Knife edge pointer, 86mm mirror scale. Overload protection Ranges: 100mV/0.5/2.5/10/25/50/100/250/500/1000 V DC. 0.5/2.5/10/25/50/100/250/500/1000V AC. Current: 50uA/0.5/1/5/10/50/250mA/1/5A DC. 0.25/0.5/1/5/10/50/250mA/1/5A AC. Resistance: 0.5/10/100/200 ohms/1/3/30/300k ohms. Decibels: −5 to +10dB. Battery operated. Size: 210 x 115 x 90mm. Supplied in carrying case complete with leads.

OUR PRICE £16.50 P&P 40p

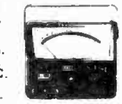
KAMODEN 72.200 Multitester

High sensitivity tester. 200,000 opv. Overload protected. Mirror scale. Ranges:–0/.06/.3/3/30/120/600/1200V DC. 0/3/12/60/300/1200 V AC. 0/6uA/1.2mA/120mA/600mA/12A DC. 0/12A AC. −20 to +63dB. 0/2k/200k/2 Meg/200 Megohms.

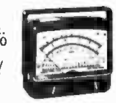
OUR PRICE £22.50 P&P 30p

MODEL AF.105 VOM

50,000 opv. Mirror scale. Meter protection. 0/3/3/12/60/120/300/600/1200V DC. 0/6/30/120/300/600/1200V DC. 0/30μA/6/60/300 mA/12 Amp. 0/10K/1m/10m/100 Meg Ohms. −20 to 17 dB.

OUR PRICE £12.50 P&P 30p

TMK MODEL 117 FET ELECTRONIC VOLTMETER

Battery operated. 11 Meg input, 26 ranges. Large 4¼" mirror scale. Size: 149 x 117 x 60mm. 0.3–1200V DC. 3–300V RMS AC. 8–800V P-P. DC current 0.12–12mA. Resistence up to 2000MOhms. Decibels: −20 to +51dB. Supplied complete with leads and instructions.

OUR PRICE £18.50 P&P 20p

TMK 100K LAB TESTER

100,000opv. 6½" scale. Buzzer short circuit check. Sensitivity 100,000 opv DC. 5k/V AC DC Volts: 0.5/2.5/10/50/250/1000V AC. 3/10/50/250/500/1000V DC. current 10/100uA/10/100/2.5/10A. Resistence: 1k/10k/100k/10 Meg/100 Meg ohms. Decibels: −10 to +49dB. Plastic case with carrying handle. Size: 190 x 172 x 99mm.

OUR PRICE £19.95 P&P 30p

LB4 TRANSISTOR TESTER

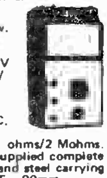
Tests PNP or NPN transistors. Audio indication. Operates on two 1.5V batteries. Complete with instructions etc.

OUR PRICE £4.50 P&P 20p

KAMODEN TT35 TRANSISTOR TESTER

High quality instrument to test reverse leak current and DC current. Amplification factor of NPN, PNP, diodes, transistors, SCR's etc. 4" square clear scale meter. Operates from internal batteries. Complete with instructions, leads carrying handle.

OUR PRICE £17.50 P & P 40p

U4341 Multimeter & Transistor Tester

27 ranges. 16,700opv. Overload protected. Ranges: 0.3/1.5/6/30/60/150/300/900V DC. 1.5/7.5/30/150/300/750V AC. Current: 0.06/0.6/6/60/600mA DC. 0.3/3/30/300mA AC. Resistance: 0.06/0.6/2/6/20/60/200k ohms/2 Mohms. Battery operated. Supplied complete with probes, leads and steel carrying case. Size: 115 x 215 x 90mm.

OUR PRICE £10.50 P&P 30p

S100TR MULTIMETER TRANSISTOR TESTER

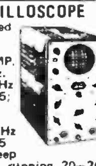
100,000opv. Mirror scale. Overload protection. 0/0.12/0.6/3/12/30/120/600V DC. 0/6/30/120/600V AC. 0/12/600uA/12/300mA/6/12A DC. 0/10k/1 Meg/100 Meg. −20 to +50dB. 0.01–0.2 MFD Transistor tester measures Alpha, Beta and ICO. Complete with instructions, batteries and leads.

OUR PRICE £19.95 P&P 25p

SWR METER Model SWR3

Handy SWR meter for transmitter antenna alignment, with built-in field strength meter. Accuracy 5%. Impedence 52' Indicator 100uA DC. Full scala 5 section collapsible antenna. Size 145 x 50 x 60mm.

OUR PRICE £4.25 P&P 30p

C15 PULSE OSCILLOSCOPE

For display of pulsed and periodic waveforms in electronic circuits. VERT. AMP. Bandwidth: 10MHz. Sensitivity at 100kHz VRMS/mm: 0.1–25; HOR. AMP. Bandwidth: 500kHz. Sensitivity ay 100kHz VRMS/mm: 0.3–25 Preset triggered sweep 1–3000usec. Free running 20–200 kHz in nine ranges. Calibrator pips. 220 x 360 x 430mm. 115–230V AC.

OUR PRICE £43.00 Carr. paid

ALL PRICES EXCLUDE VAT

Also see following pages

SINCLAIR DM2 DIGITAL MULTIMETER

Will measure AC and DC volts, AC and DC current, and resistance in a total of 20 ranges. The large light emitting diode display will read up to 1999 and automatically indicate polarity. Indication of positive and negative overload is also provided. The instrument is fitted with a combined carrying handle and bench stand and sockets are provided for the connection of an external power supply.
RANGES:
DC VOLTS: 1v, 10, 100v, 1000v
AC VOLTS: 1v, 10v, 100v, 1000v
DC CURRENT: 1mA, 10mA, 100mA, 1000mA
AC CURRENT: 1mA, 10mA, 100mA, 1000mA
RESISTANCE: 1k, 10k, 100k, 1000k

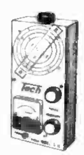
OUR PRICE £59.95 P & P 50p

RUSSIAN C116 Double Beam OSCILLOSCOPE

5 MHz pass band. Separate Y1 and Y2 amplifiers. Rectangular 5" x 4" CRT. Calibrated triggered sweep from 0.2usec. to 100 milli-sec/cm. Free running time base, 50Hz–1MHz. Built-in time base Calibrator and amplitude Calibrator. Supplied complete with all accessories and instruction manual.

OUR PRICE £87.00 Carr. paid

MODEL TE15 GRID DIP METER



Transistorised. Operates as Grid Dip, Oscillator, Absorbtion Wave Meter and Oscillating Detector. Frequency range 440kHz–280MHz in six coils. 500uA meter. 9V battery operation. Size: 180 x 80 x 40mm.

OUR PRICE £17.50 P&P 30p

TRANSISTORISED L.C.R. A.C. BR/8 MEASURING BRIDGE

A new portable bridge offering excellent range and accuracy at low cost. Resistance: 6 ranges: 0.1 ohm-11.1 megohm ± 1% Inductance: 6 ranges: 1 microhenry-111 henries ± 2% Capacity: 6 ranges: 10pf-1110 mfd ± 2% Turns Ratio: 6 ranges: 1:1/1000-1:11100 ± 1% Bridge Voltage at 1,000cps. Operated from 9-volt battery. 100 micro-amp meter indication. Size 7¾" x 5" x 2".

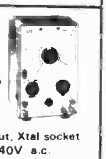
OUR PRICE £27.50 P&P 30p

TE16A TRANSISTORISED SIGNAL GENERATOR

5 ranges, 400kHz to 30 MHz. An inexpensive instrument for the handy-man. Operates on 9V battery. Wide easy to read scale. 800kHz modulation. Size: 149 x 149 x 92mm. Complete with instructions and leads.

OUR PRICE £8.97 P&P 30p

TE-20D RF SIGNAL GENERATOR



Accurate wide range signal generator covering 120 kHz-500 MHz on 6 bands. Directly calibrated. Variable R F attenuator audio output. Xtal socket for calibration. 220/240V a.c. Brand new with instructions. Size 140mm x 215mm x 170mm.

OUR PRICE £19.95 P&P 50p

MODEL TE20 RF SIGNAL GENERATOR

Six bands. 120kHz–260MHz. Dual output RF terminals. Separate variable audio output. Accuracy ± 2%. Audio output to 8V. Power requirements: 105–125V, 220–240V AC. Size: 193 x 265 x 150mm. Complete with test leads etc.

OUR PRICE £18.95 P&P 50p

ARF 300 AF/RF SIGNAL GENERATOR

All transistorised compact fully portable. AF sine-wave 18Hz to 220 kHz. AF square wave 18Hz to 100k Hz. Output Square/Sine wave 10V. P-P RF 100kHz to 200MHz. Output 1V maximum. 220/240V AC operation. Complete with instructions and leads.

OUR PRICE £37.50 P&P 50p

MODEL MG100 SINE SQUARE WAVE AUDIO GENERATOR

Range 19 – 220,000Hz Sine Wave 19–100,000 Hz Square Wave. Output Sine or Square wave 10v P. to P. Size 180 x 90 x 90mm. Operation 220/240v. A.C.

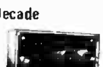
OUR PRICE £19.95 P&P 50p

TE22 SINE SQUARE WAVE AUDIO GENERATOR

Sine 20cps to 200kHz on 4 bands. Square 20 cps to 30 kHz. Output impedence 5000 Ohms. 200/250V AC operation. Supplied brand new guaranteed, with instruction manual and leads.

OUR PRICE £24.95 P&P 50p

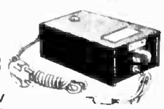
BELCO AT201 Decade ATTENUATOR



Frequency range 0–200kHz. Attenuator 0–111dB, 0.1dB steps. Impedence 600 ohms. Input power maximum 30dBm. Size: 180 x 90 x 55mm.

OUR PRICE £12.50 P&P 50p

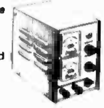
DT 124 POWER UNIT



220 240V AC Input. Output 6, 7.5 or 9V DC 400mA.

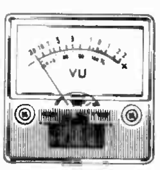
OUR PRICE £2.20 P&P 50p

PS200 Regulated POWER SUPPLY UNIT



Solid state. Variable output 5–20V DC up to 2 Amp. Independent meters to monitor voltage and current. Output 220/240V AC. Size: 190 x 136 x 98mm.

OUR PRICE £19.95 P&P 50p



VU METER TYPE 3

Size: 33mm 20mm

£1.25 P&P 15p

SDH8V MONO/STEREO HEADPHONES

Volume control for each channel, 4/16 ohms impedence. Frequency response 20Hz–18kHz. Complete with 10ft. coiled lead and jack plug.

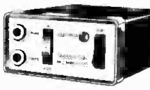
OUR PRICE £4.97 P&P 30p

BH001 HEADSET and Boom Microphone

Moving coil. Ideal for language teaching, communications etc. Headphone impedence 16 ohms. Microphone impedence 200 ohms.

OUR PRICE £5.95 P&P 30p

UNIPEX NT 100A



The unipex NT100A is a compact portable transistorised PA amplifier. This versatile unit has a maximum output of 10 watts RMS and operates on any 10-16V DC source, negative or positive ground and uses only 1.5A at rated output. Supplied complete with mounting brackets etc, plus full installation and operating instructions.

OUR PRICE £21.75 P&P 50p

EA41 REVERBERATION AMPLIFIER

Self contained, transistorised, battery operated. Simply plug in microphone, guitar etc. and output to your amplifier. Volume control and depth of reverberation control. Beau-walnut cabinet. 184 x 77 x 108mm.

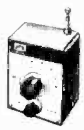
OUR PRICE £7.50 P&P 30p

RANK AUDIO RA 210T STEREO AMPLIFIER

7½ + 7½ watts rms. Inputs for magnetic phono, tuner, tape and aux. Separate base, treble, balance and volume controls. Headphone socket. Teak case. Unrepeatable offer.

OUR PRICE £17.50 P&P 50p

VHF 105



This unit will give instant reception of the ground-to-air, air-to-ground waveband. Simply place beside any AM or FM Radio covering 535–1605 kHz, 88–108 MHz – no conversion or connection required. This converter is self powered by one 9-volt (PP3 Type) battery and comes complete with a full set of instructions and battery.

OUR PRICE £3.50 P&P 50p

Just arrived – the sensational WIEN ET1008 CASSETTE! RECORDER

A highly recommended cassette recorder at this really low Laskys price.

ONLY £8.95 P&P 50p

FANTASTIC VALUE!

SPECIAL OFFER! CONVERT YOUR STEREO SYSTEM TO 4D SOUND

This clever unit enables you to add 4D sound to your existing system. Complete with simple connection details. Use this converter (together with 2 extra speakers) to achieve the fantastic 4D quadrophonic sound! The effect of being immersed within the music becomes a thrilling new experience (2 year guarantee).

OUR PRICE £3.95 P&P 50p

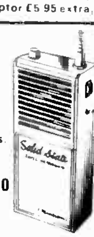
FM TUNER CHASSIS

6 transistor high quality tuner. Size only 153 x 101 x 63mm. 3 IF stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9V battery. Covers 88–108MHz. Ready built, ready for use. Fantastic value for money.

OUR PRICE £8.95 P&P 20p

Stereo Multiplex Adaptor £5.95 extra.

WALKIE TALKIES



SKYFON NV7
Super low cost transmitter/receivers. 100MW with call buzzer and on/off volume control. 7 transistors. Telescopic rod antenna.

OUR PRICE £31.50 per PAIR P.&P. 50p

NOT LICENSABLE IN THE U.K.

ELECTRONIC CALCULATORS

We carry a tremendous range of both pocket and desk calculators from as little as **£8.90**. Owing to the demand it is not possible to include them in this advertisement, so send for our latest price list or call into any branch.

MINIATURE ORGAN MUSIC MASTER AM100

Spanning nearly two octaves, including semi-tones. This instrument will give hours of enjoyment to all the family. Beautifully finished. The Keyboard range can be adjusted to be in tune with any instrument. Operates from internal 9V battery. Fitted with on/off switch, vibrato switch, earphone socket and external 9V D.C. socket.

OUR PRICE £7.95 P&P 50p

BINATONE DIGITAL CLOCK

Attractive ivory case. Large clear numbers for hours, minutes and seconds. A.C. 240V operation. Size approx. 6½ x 3 x 3½ inches.

OUR PRICE £4.50 P&P 50p

SINCLAIR IC12 INTEGRATED CIRCUIT AMPLIFIER

complete with printed circuit mounting board.

OUR PRICE £1.50 P & P 15p

SINCLAIR Project 80 Modules

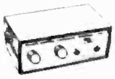
Z40 Power Amp.	£5.95	P & P 15p
Z60 Power Amp.	£7.45	P & P 15p
Stereo 80 Pre-Amp.	£13.95	P & P 15p
Active Filter Unit	£7.45	P & P 15p
FM Tuner	£13.95	P & P 15p
Stereo Decoder	£8.95	P & P 15p
PZ5 Power Supply	£5.95	P & P 30p
PZ6 Power Supply	£8.95	P & P 30p
PZ8 Power Supply	£8.45	P & P 30p
Transformer for PZ8	£4.05	P & P 50p

SINCLAIR Project 80 Packages

2xZ40/Stereo 80/PZ5	£25.44
2xZ40/Stereo 80/PZ6	£27.84
2xZ60/Stereo 80/PZ8	£29.84

P & P 35p each

TE1021 Stereo Listening Station



For balancing and gain selection of loudspeakers with additional facility for stereo headphone switching. Two gain controls, speakers on–off slide switch, stereo headphone socket.

OUR PRICE £2.25 P&P 15p

AUDIOTRONIC LOW NOISE CASSETTES

TYPE	5	10	25
C60	£1.57	£3.00	£7.08
C90	£2.24	£4.25	£10.00
C120	£2.73	£5.17	£12.24

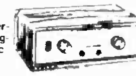
P&P 3p each. 10 and over Post Free

MP7 MIXER-PREAMPLIFIER

5 Microphone inputs each with individual gain controls enabling complete mixing facilities. Battery operated. Size: 235 x 127 x 76mm. Inputs: Mics. 3 x 3mV 50k; 2 x 3mV 600 ohms. Phono. Mag. 4mV 50k; Phono Ceramic 100mV 1 Meg. Output 250mV 100k.

OUR PRICE £8.97 P&P 20p

AUDIOTRONIC AHA101 Stereo Headphone Amplifier



All silicon, transistor amplifier operates from magnetic, ceramic or tuner inputs with twin stereo headphone outputs and separate volume controls for each channel. Operates from 9V battery. INPUTS: 5mV and 100mV. OUTPUT: 50mV per channel.

OUR PRICE £8.50 P&P 30p

HIGH QUALITY CONSTRUCTION KITS

JOSTY KIT

WE ARE APPOINTED STOCKISTS AT Oxford Street, 42 & 257 Tottenham Court Road, 34 Lisle Street, 152, Fleet Street, 311 Edgware Road, CROYDON BIRMINGHAM KINGSTON LEICESTER NORTHAMPTON SOUTHEND TUNBRIDGE WELLS WOLVERHAMPTON branches, or by Mail Order

All kits are complete with comprehensive easy to follow instructions and covered by full guarantee.

Post and Packing 15p per kit.

AF20 Mono amplifier	£5.61
AF25 Mixer	£3.29
AF30 Mono pre-amplifier	£3.20
AF35 Emitter amplifier	£2.42
AF80 0.5W mic. amplifier	£4.86
AF305 Intercom	£7.67
AF310 2 Mono Amplifier	£7.55
M160 Multi-vibrator	£2.18
M1302 Transistor tester	£8.33
M191 VU Meter	£5.37
M192 Stereo balance meter	£5.93
LF380 Quadraphonic device	£8.42
AT5 Automatic light control	£3.75
AT30 Photo cell switch unit	£6.68
AT50 400W triac light dimmer/speed control	£5.18
AT56 2,200W triac light dimmer/speed control	£6.75
AT60 1 channel light control	£10.82
AT65 3 channel light control	£16.52
GU330 Tremolo unit	£8.10
HF61 Diode detector	£3.87
HF65 FM transmitter	£3.21
HF75 FM receiver	£3.66
HF310 FM tuner	£16.32
HF325 Deluxe FM tuner	£26.33
HF330 Decoder (HF310/325)	£10.55
GP310 Stereo pre-amplifier for use with 2 x AF310	£22.98
GP312 Circuit board	£10.02
GP304 Circuit board	£5.33
HF380 lw/vhf aerial amplifier	£6.02
HF395 broadband aerial amp.	£2.10
NT10 Stabilised power supply 100mA, 9V	£6.27
NT300 Stabilised p. supply	£13.16
NT310 Power Supply 240 V AC or 2 x 18 V D C at 2 amps	£5.64
NT306 Voltage converter	£5.64
NT315 Power supply 240V AC to 4.5/15V DC, 500mA	£12.06

Amateur Electronics by Josty-Kit, the professional book for the amateur – covers the subject from basic principals to advanced electronic techniques. Complete with circuit board for AE1 to AE10 listed below.

OUR PRICE £3.30 (No VAT)
P&P 25p plus VAT.

AE1 100mW output stage	£1.55
AE2 Pre-amplifier	£1.32
AE3 Diode receiver	£2.05
AE4 Flasher	£1.26
AE5 Astable multi-vibrator	£1.14
AE6 Monostable multi-vibrator	£1.11
AE7 RC generator	£1.08
AE8 Bass filter	£1.05
AE9 Treble filter	£1.05
AE10 CCIR filter	£1.05

Also see previous page

ALL PRICES EXCLUDE VAT

(SEW) PANEL METERS

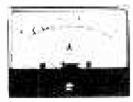
SEW PANEL METERS ARE STOCKED AT OUR 3 LISLE ST., 311 EDGWARE RD., & 152 FLEET ST., BRANCHES or order by post.

USED EXTENSIVELY BY INDUSTRY, GOVERNMENT DEPARTMENTS, EDUCATIONAL AUTHORITIES ETC.

Over 200 ranges in stock—other ranges to order. Quantity discounts available. Send for fully illustrated brochure.

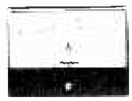
*Items with asterisk are Moving Iron type, all others are Moving Coil

CLEAR PLASTIC MODEL SD640
Size: 85 x 64mm



50uA	£3 90	10V DC	£3 75
100uA	£3 85	20V DC	£3 75
200uA	£3.80	50V DC	£3 75
500uA	£3 75	300V DC	£3 75
50-0-50uA	£3 85	15V AC	£3 85
100-0-100uA	£3 80	300V AC	£3 85
1mA	£3 75	VU Meter	£4 00
5mA	£3 75		
10mA	£3 75		
50mA	£3 75		
100mA	£3 75		
500mA	£3 75		
1A DC	£3 75		
5A DC	£3 75		
10A DC	£3 75		
5V DC	£3 75		

CLEAR PLASTIC MODEL SW100
Size: 100 x 80mm



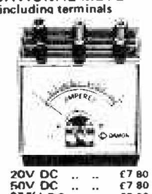
50uA	£4 70	150V AC	£4 55
100uA	£4 60	300V AC	£4 55
500uA	£4 40	VU Meter	£5 00
50-0-50uA	£4.60		
100-0-100uA	£4 55		
1mA	£4.40		
1A DC	£4 40		
5A DC	£4 40		
20V DC	£4 40		
50V DC	£4 40		
300V DC	£4 40		

EDGWISE MODEL PE70
Size: 90 x 34mm

50uA	£4 25
100uA	£4 20
200uA	£4.16
500uA	£4 00
50-0-50uA	£4 20
100-0-100uA	£4.15
1mA	£3 95
300V AC	£4 05
VU Meter	£4 40

MODEL E0107 EDUCATIONAL METER
Size: 100 x 90 x 150mm including terminals

A range of high quality moving coil instruments ideal for school experiments and other bench applications. 3" mirror scale. The meter movement is easily accessible to demonstrate internal working.

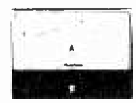


50uA	£8.70	20V DC	£7 80
100uA	£8 10	50V DC	£7 80
50-0-50uA	£8 10	300V DC	£7 80
1mA	£7 80	500mA/5A DC	£8 80
1-0-1mA	£7.80	5V/50V DC	£8 80
1A DC	£7 80	5V/15V DC	£8 80
5A DC	£7 80	1/5A DC	£8 80
5V DC	£7 80		
10V DC	£7 80		
15V DC	£7 80		

CLEAR PLASTIC MODEL MR 85P
Size: 120 x 110mm

50uA	£5 60	300V DC	£5 40
100uA	£5.55	15V AC	£5 45
200uA	£5 50	300V AC	£5 45
500uA	£5 40	S Meter 1mA	£5 35
50-0-50uA	£5 55	VU Meter	£5 70
100-0-100uA	£5 50	1A AC	* £5 35 *
500-0-500uA	£5 35	5A AC	* £5 35 *
1mA	£5 35	10A AC	* £5 35 *
1-0-1mA	£5 35	20A AC	* £5 35 *
5mA	£5 35	30A AC	* £5 35 *
10mA	£5 35		
50mA	£5 35		
100mA	£5 35		
500mA	£5 35		
1A DC	£5 35		
5A DC	£5 35		
15A DC	£5 35		
30A DC	£5 55		
10V DC	£5 35		
20V DC	£5 35		
50V DC	£5 35		
150V DC	£5 35		

CLEAR PLASTIC MODEL SD830
Size: 110 x 83mm



50uA	£4.40	10V DC	£4 20
100uA	£4 35	20V DC	£4 20
200uA	£4 30	50V DC	£4 20
500uA	£4 25	300V DC	£4 20
50-0-50uA	£4 35	15V AC	£4 30
100-0-100uA	£4.30	300V AC	£4 30
1mA	£4 20	VU Meter	£4 50
5mA	£4 20		
10mA	£4 20		
50mA	£4 20		
100mA	£4 20		
500mA	£4 20		
1A DC	£4 20		
5A DC	£4 20		
10A DC	£4 20		
5V DC	£4 20		

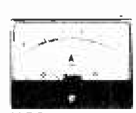
CLEAR PLASTIC MODEL MR 45P
Size: 50 x 50mm

50uA	£3 30	300V AC	£3 15
100uA	£3 25	S Meter 1mA	£3 05
200uA	£3 20	VU Meter	£3 50
500uA	£3 10	1A AC	* £3 05 *
50-0-50uA	£3 25	5A AC	* £3 05 *
100-0-100uA	£3 20	10A AC	* £3 05 *
500-0-500uA	£3 05	20A AC	* £3 05 *
1mA	£3 05	30A AC	* £3 05 *
5mA	£3 05		
10mA	£3 05		
50mA	£3 05		
100mA	£3 05		
500mA	£3 05		
1A DC	£3 05		
5A DC	£3 05		
10V DC	£3 05		
20V DC	£3.05		
50V DC	£3 05		
300V DC	£3 05		
15V AC	£3 15		

CLEAR PLASTIC MODEL MR 38P
Size: 42 x 42mm

50uA	£3.20	20V DC	£2 85
100uA	£3 15	50V DC	£2 85
200uA	£3 10	100V DC	£2 85
500uA	£2 90	150V DC	£2 90
50-0-50uA	£3 15	300V DC	£2 90
100-0-100uA	£3 10	500V DC	£2 95
500-0-500uA	£2 85	750V DC	£2 95
1mA	£2 85	15V AC	£2 95
1-0-1mA	£2 85	50V AC	£2 95
2mA	£2 85	150V AC	£2 95
5mA	£2 85	300V AC	£2 95
10mA	£2 85	500V AC	£3 10
20mA	£2 85	S Meter 1mA	£2 85
50mA	£2 85	VU Meter	£3 30
100mA	£2 85		
150mA	£2.85		
200mA	£2 85		
300mA	£2 85		
500mA	£2 85		
750mA	£2 85		
1A DC	£2 85		
2A DC	£2 85		
5A DC	£2 85		
10A DC	£2 85		
3V DC	£2.85		
10V DC	£2 85		
15V DC	£2 85		

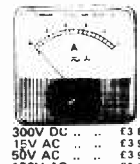
CLEAR PLASTIC MODEL SD460
Size: 59 x 46mm



50uA	£3 60	10V DC	£3 40
100uA	£3 55	20V DC	£3 40
200uA	£3 50	50V DC	£3 40
500uA	£3 45	300V DC	£3 40
50-0-50uA	£3.55	15V AC	£3 55
100-0-100uA	£3 50	300V AC	£3 55
1mA	£3 40	VU Meter	£3 75
5mA	£3 40		
10mA	£3 40		
50mA	£3 40		
100mA	£3 40		
500mA	£3 40		
1A DC	£3 40		
5A DC	£3 40		
10A DC	£3 40		
5V DC	£3 40		

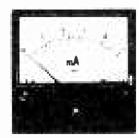
POSTAGE & PACKING 15p

CLEAR PLASTIC MODEL MR 65P
Size: 86 x 78mm



50uA	£4 05	300V DC	£3 80
100uA	£3 95	15V AC	£3 90
200uA	£3 90	50V AC	£3 90
500uA	£3 85	150V AC	£3 90
50-0-50uA	£3 95	300V AC	£3 90
100-0-100uA	£3 90	500V AC	£4 00
500-0-500uA	£3 80	S Meter 1mA	£3 90
1mA	£3 80	VU Meter	£4 20
1-0-1mA	£3 80	1A AC	* £3 80 *
5mA	£3 80	5A AC	* £3 80 *
10mA	£3 80	10A AC	* £3 80 *
50mA	£3 80	20A AC	* £3 80 *
100mA	£3 80	30A AC	* £3 80 *
500mA	£3 80	50mA AC	* £3 80 *
1A DC	£3 80	100mA AC	* £3 80 *
5A DC	£3 80	200mA AC	* £3 80 *
10A DC	£3 80	500mA AC	* £3 80 *
15A DC	£3 80		
20A DC	£3 90		
30A DC	£3 95		
50A DC	£4 15		
5V DC	£3 80		
10V DC	£3 80		
15V DC	£3 80		
20V DC	£3 80		
50V DC	£3 80		
150V DC	£3 80		

BAKELITE MODEL S80 Enlarged Window
Size: 80 x 80mm

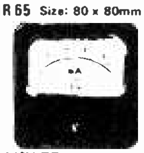


50uA	£4 60
100uA	£4 55
500uA	£4 30
50-0-50uA	£4 55
100-0-100uA	£4 50
1mA	£4 30
1A DC	£4 30
5A DC	£4 30
20V DC	£4 30
50V DC	£4 30
300V DC	£4 30
300V AC	£4 40
VU Meter	£4 80

CLEAR PLASTIC MODEL MR 52P
Size: 60 x 60mm

50uA	£3 80	S Meter 1mA	£3 40
100uA	£3 60	VU Meter	£3 90
500uA	£3 45	1A AC	* £3 40 *
50-0-50uA	£3 60	5A AC	* £3 40 *
100-0-100uA	£3 45	10A AC	* £3 40 *
1mA	£3 40	20A AC	* £3 40 *
5mA	£3 40	30A AC	* £3 40 *
10mA	£3 40		
50mA	£3 40		
100mA	£3 40		
500mA	£3 40		
1A DC	£3 40		
5A DC	£3 40		
10V DC	£3 40		
20V DC	£3 40		
50V DC	£3 40		
300V DC	£3 40		
15V AC	£3 50		
300V AC	£3 50		

BAKELITE MODEL MR 65 Size: 80 x 80mm



25uA	£5 40	300V DC	£3 90
50uA	£4 10	30V AC	* £3 70 *
100uA	£4 05	50V AC	* £3.70 *
500uA	£3 75	150V AC	* £3 70 *
50-0-50uA	£4 05	300V AC	* £3 70 *
100-0-100uA	£4 00	500V AC	* £3 70 *
500-0-500uA	£3 70	VU Meter	£4 20
1mA	£3 70	1A AC	* £3 70 *
1-0-1mA	£3 70	5A AC	* £3 70 *
5mA	£3 70	10A AC	* £3 70 *
10mA	£3 70	20A AC	* £3 70 *
50mA	£3 70	30A AC	* £3 70 *
100mA	£3 70	50A AC	* £3 70 *
500mA	£3 70	500mA AC	* £3 70
1A DC	£3 70	50mV DC	£3 85
2A DC	£3 70	100mV DC	£3.85
5A DC	£3 70		
10A DC	£3 70		
15A DC	£3 70		
30A DC	£3 70		
50A DC	£3 90		
5V DC	£3 70		
10V DC	£3 70		
15V DC	£3 70		
20V DC	£3 70		
50V DC	£3 70		
150V DC	£3 70		

240° Wide Angle 1mA METERS

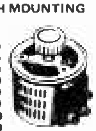
MW1-6 60 x 60 mm £6.50 P & P 15p

MW1-8,80 x 80 mm £6·90 P&P 15p

YAMABISHI VARIABLE VOLTAGE TRANSFORMERS

Excellent quality at low cost. Input: 230V 50/60Hz. Output 0–260V.

MODEL S260 BENCH MOUNTING



		P&P
1A	£10.50	50p
2.5A	£12.00	50p
5A	£17.50	50p
8A	£30.35	£1.00
10A	£33.75	£1.00
12A	£36.40	£1.00
20A	£85.00	£1.50
25A	£95.00	£1.50
40A	£120.00	£1.50

ALL PRICES EXCLUDE VAT

ASK LASKYS about Hi fi

CALL INTO YOUR NEAREST LASKYS BRANCH OR SEND COUPON BELOW FOR NEW 32 PAGE HI-FI PRICE LIST

CENTRAL LONDON

481 OXFORD ST	01-493 8641
3 LISLE ST. WC2	01-437 8204
34 LISLE ST. WC2	01-437 9155
118 EDGWARE RD. W2	01-723 9789
193 EDGWARE RD. W2	01-723 6211
207 EDGWARE RD. W2	01-723 3271
311 EDGWARE RD. W2	01-262 0387
346 EDGWARE RD. W2	01-723 4453
382 EDGWARE RD. W2	01-723 4194
109 FLEET ST. EC4	01-353 5812
152/3 FLEET ST. EC4	01-353 2833
10 TOTTENHAM CT. RD.	01-637 2232
27 TOTTENHAM CT. RD.	01-636 3715
33 TOTTENHAM CT. RD.	01-636 2605
42/45 TOTTENHAM CT. RD.	01-636 0845
257/8 TOTTENHAM CT. RD.	01-580 0670

ESSEX
86 SOUTH ST. ROMFORD 20218

205/206 CHURCHILL WEST, VICTORIA CIRCUS, SOUTHEND 0702 612241

GLOUCESTERSHIRE
16/20, PENN ST. BRISTOL 0272-20421

KENT
53/57 CAMDEN RD., TUNBRIDGE WELLS 0892-23242

LEICESTERSHIRE
45 MARKET PLACE, LEICESTER 0533-537678

NORTHAMPTONSHIRE
73 ABINGTON STREET, NORTHAMPTON 0604-35753

STAFFORDSHIRE
30 WULFRUM WAY, WOLVERHAMPTON 0902-23384

SURREY
1046 WHITGIFT CENTRE, CROYDON 01-681 3027

38/40 EDEN ST., KINGSTON 01-546 1271

32 HILL ST. RICHMOND 01-948 1441

WARWICKSHIRE
116 CORPORATION ST., BIRMINGHAM 021-236 3503

ALL BRANCHES OPEN FROM 9am to 6pm MON TO SAT

OUR CUSTOMER SERVICES DIVISION at head office will answer all your enquiries – just ring 01-200 1321

EXPORT Personal exports arranged for overseas visitors. Goods specially packed, insured and despatched to all parts of the world at minimum cost exclusive of VAT. Payment by bank transfer, certified cheque, postal order or money order in any currency.

BARCLAYCARD & ACCESS Phone your order to 01-200 0037 or call into any branch

NO DEPOSIT TERMS available on most goods for personal callers

CHEQUES TO THE VALUE OF £30. ACCEPTED FROM PERSONAL SHOPPERS WITH BANKERS CARD. IN OTHER CASES AND FOR AMOUNTS IN EXCESS OF £30. PLEASE ALLOW TIME FOR CLEARANCE. BANKERS DRAFTS ACCEPTED.

All prices correct at 13/1/75 subject to change without notice E.&O.E.

A member of the Audiotronic Group of Companies

FOR MAIL ORDER

We offer a speedy and efficient service by mail order. Remember to add 8% VAT to total value of goods including post and packing.

TO LASKYS CUSTOMER SERVICES DIVISION
Audiotronic House, The Hyde, London NW9 6JJ Tel 01-200 1321

Please send me the following items

TOTAL PURCHASE PRICE (inc P&P and VAT)

32 Page HI FI PRICE LIST — TICK HERE

I enclose cheque postal order money order

I wish to pay by Barclaycard/Access and my number is

NAME

ADDRESS

Signature

Registered in England No 347947 at 12 Lower Grosvenor Place London SW1 OEX PW3

CHROMASONIC electronics

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

RESISTORS

The standard ranges of Resistors stocked are either E12 or E24 and the values are all in multiples of ten times the decade shown below. The E12 items are only those in bold type. The E24 items are both those in bold and light type.

10	**18**	**33**	**56**
11	20	36	62
12	**22**	**39**	**68**
13	24	43	75
15	**27**	**47**	**82**
16	30	51	91

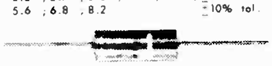
CARBON FILM 1/4 watt ± 5% tol. 2p ea.
E12 Series 10Ω to 330KΩ

CARBON FILM ½ watt ± 5% tol. 1½p ea.
E24 Series 10Ω to 10MΩ

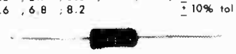
'CERMET' THICK FILM ½ watt ± 2% tol. 8p ea.
E12 series 56Ω to 150KΩ

METAL OXIDE FILM ½ watt ± 2% tol. 4½p ea.
E12 series 10Ω to 1MΩ

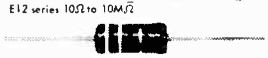
CARBON COMPOSITION ½ watt 4½p ea.
2.2 ; 2.7 ; 3.3 ; 3.9 ; 4.7 ; ±0.5 tol.
5.6 ; 6.8 ; 8.2 ±10% tol.



CARBON COMPOSITION 1 watt 5½p ea.
2.2 ; 2.7 ; 3.3 ; 3.9 ; 4.7 ; ±0.5 tol.
5.6 ; 6.8 ; 8.2 ±10% tol.

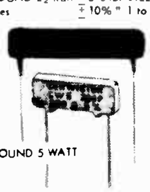


CARBON FILM 1 watt ± 5% tol. 3½p ea.
E12 series 10Ω to 10MΩ



CARBON FILM 2 watt ± 5% tol. 6½p ea.
E12 series 10Ω to 10MΩ

WIREWOUND 2½ watt ± 5% tol 0.22 to 0.47Ω 15½p
E12 series ± 10% " 1 to 270Ω 13p



WIRE WOUND 5 WATT 13p ea.

1	**25**	**250**	**1.5K**
1	30	270	1.8K
1.8	39	**300**	**2K**
2.2	**50**	330	2.2K
2.7	60	350	**2.5K**
3.3	**68**	400	2.7K
3.9	75	470	3K
4.7	82	**500**	3.3K
5	**100**	560	**3.5K**
5.6	125	600	3.9K
6.8	133	**680**	4.7K
8.2	**150**	**750**	**5K**
10	180	820	5.6K
15	**200**	1K	**6.8K**
21	220	1.2K	8.2K

WIRE WOUND 10 watt 14p ea.
All the values shown in bold in the 5 watt range

WIRE WOUND 10 watt ± 5% tol. 20p ea.
10K ; 15K ; 20K ; 25K

WIRE WOUND 15 watt 13½p ea.
All the values from 10Ω upward shown in bold in the 5 watt range.

POTENTIOMETERS

5K	250K	Log or Lin Less Switch (and 1K Lin)	14p
10K	500K	Log or Lin with Switch	26p
25K	1 Meg	Dual Less Switch	46p
50K	2 Meg	1 Meg Log only	57p
100K		10K Log + 10K Antilog Less Switch	

Sliders

10K	Single	33p
25K		
50K	DUAL	55p
100K		

Presets

Vertical or Horizontal

.1 Watt 5½p .25 Watt 7p

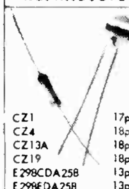
100	1K	10K	100K	1Meg
250	2.5	25K	250K	2.5 Meg
500	5K	50K	500K	5Meg

Cermets

100	2.5K	25K	250K
500	5K	50K	500K
1K	10K	100K	1Meg

40p

VDR's & Thermistors



CZ1	17p
CZ4	18p
CZ13A	18p
CZ19	18p
E298CDA258	13p
E298EDA258	13p
E298EDA260	13p
E298EDA262	13p
E298EDA265	13p
E298EDP268	13p
E298ZZ05	13p
E298ZZ06	13p
E299DDP336	14p
E299DDP338	14p
E299DDP342	14p
E299DDP348	14p
GL16	£1.21
GL23	£1.21
R53	£1.49
R54	£1.61
VA1005	16p
VA1026	16p
VA1033	16p
VA1034	16p
VA1039	16p
VA1040	16p
VA1053	16p
VA1055S	16p
VA1056S	16p
VA1066S	17p
VA1057S	19p
VA1067S	19p
VA1077	19p
VA1098	21p
VA1104	31p
VA1107	29p

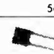
CAPACITORS

Ceramic Plate

Mullard C333 Series 63 Volts Wkg.

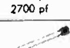
all at 5½p each

±0.25pf	1.8 pf	±2%	12 pf	±2%	68 pf
	2.2 pf		15 pf		82 pf
	3.3 pf		18 pf		100 pf
	3.9 pf		22 pf		120 pf
	4.7 pf		27 pf		150 pf
	5.6 pf		33 pf		180 pf
	6.8 pf		39 pf		220 pf
	8.2 pf		47 pf		270 pf
	10 pf		56 pf		330 pf



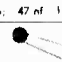
Mullard 630 series 40 volts ± 10% tol.
* 629 series 100 volts
all at 5½p each

390 pf	1000 pf	3300 pf
470 pf	1200 pf	3900 pf
560 pf	1500 pf	4700 pf
680 pf	1800 pf	* 10 nf
820 pf	2200 pf	* 22 nf
	2700 pf	



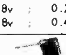
Erie Monolithic Ceramic 30 Volts Wkg.

27 nf 11p; 47 nf 13p; 100 nf 17p



Low Voltage Disc Ceramics
all at 5½p each

0.01 uF	18v	0.1 uF	30v
0.022 uF	18v	0.22 uF	6v
0.047 uF	18v	0.47 uF	3v

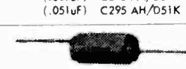


Mylar Film 100 Volts Wkg.

1000 pf	2½p	0.05 uF	3½p
2000 pf	2½p	0.068uF	5p
5000 pf	2½p	0.1 uF	5p
0.01 uF	3½p	0.2 uF	6½p
0.02 uF	3½p	0.47 uF	7p
0.04 uF	3½p		

MULLARD C295 Series 63 volts

Tolerance ± 1%		Polystyrene	
6,800pf	(6.8nf)	C295 AH/D6K8	11p
8,200pf	(8.2nf)	C295 AH/D8K2	11p
13,000pf	(13nf)	C295 AH/D13K	15p
18,000pf	(18nf)	C295 AH/D18K	15p
20nF	(.02uF)	C295 AH/D20K	15p
30nF	(.03uF)	C295 AH/D30K	18p
39nF	(.039uF)	C295 AH/D39K	18p
51nF	(.051uF)	C295 AH/D51K	25p



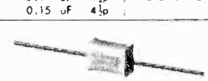
Polystyrene 160 volts Wkg.
Tolerance ±1pf up to 33pf; ± 5% 47pf up.

10 pf to 10,000 pf (0.01 uF) in multiples of.
10 ; 15 ; 22 ; 33 ; 47 ; 68.

Wima MKS 0.22uF ± 5% 100v 11p

Mullard C280 Series. 250 Volts Wkg.
Metallised Polyester Film

0.01 uF	3½p	0.22 uF	5½p
0.015 uF	3½p	0.33 uF	7p
0.022 uF	3½p	0.47 uF	9p
0.033 uF	3½p	0.68 uF	12p
0.047 uF	3½p	1.0 uF	14½p
0.068 uF	4 p	1.5 uF	22p
0.1 uF	4½p	2.2 uF	26½p
0.15 uF	4½p		



Mullard C281 series 400 Volts Wkg.
Metallised Polycarbonate Film ±10%

0.01 uF	5p	0.1 uF	8p
0.015 uF	5p	0.15 uF	9p
0.022 uF	5p	0.22 uF	11p
0.033 uF	6p	0.33 uF	15½p
0.047 uF	6½p	0.47 uF	16½p
0.068 uF	6½p		

CAPACITORS

Silvered Mica 350V.

Tol. ± 0.5pf 11p each

2.2 pf	18pf	30pf
3.3 pf	20pf	33pf
5 pf	22pf	39pf
10 pf	25pf	47pf

Tol. ± 1% 11p each

50pf		150pf
56pf	82pf	180pf
68pf	100pf	200pf
75pf	120pf	220pf

12p each

250pf	330pf	560pf
270pf	390pf	680pf
300pf	470pf	820pf
	[illegible]00pf	

17p each

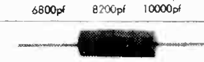
1000 pf	1500pf	220pf
	1800pf	

26p each

2700pf	3600pf	5000pf
	4700pf	

33p each

6800pf	8200pf	10000pf



Mixed Dielectric 600 Volts Wkg.

0.01 uF	8p	0.1 uF	9 p
0.022 uF	8p	0.22 uF	17½p
0.033 uF	8p	0.47 uF	26½p
0.047 uF	8p	1 uF	36½p
0.068 uF	9p		

Mixed Dielectric 1000 Volts Wkg.

1000 pf	6½p	0.022uF	11p
2200 pf	6½p	0.047uF	13p
3300 pf	7p	0.1 uF	13p
4700 pf	7p	0.22 uF	24½p
0.01 uF	10p	0.47	33p

Solid Tantalum Beads
all at 16½p

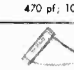
0.1 uF	35v	10 uF	6.3v
0.22 uF	35v	10 uF	16v
0.47 uF	35v	10 uF	25v
1.0 uF	35v	22 uF	16v
2.2 uF	35v	47 uF	6.3v
4.7 uF	35v	100 uF	3v

Feed-through Ceramics

1000 pf 350v 6p

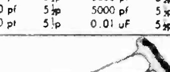
Disc Ceramics 750 Volt Wkg.
all at 5½p each

470 pf; 1000 pf, 5000 pf; 0.01 uF



Tubular H1-K Ceramics 750 Volts Wkg.

1000 pf	5½p	3000 pf	5½p
1500 pf	5½p	5000 pf	5½p
2000 pf	5½p	0.01 uF	5½p



Pulse Ceramics all at 10p each

12 kv D.C. Wkg		8kv D.C.
10pf	120pf	200pf
22pf	140pf	220pf
68pf	150pf	250pf
82pf	180pf	270pf
100pf	200pf	300pf

VAT INCLUSIVE PRICES AT 8%

OVERSEAS CUSTOMERS DEDUCT 2/27
VAT INVOICES ON REQUEST
P&P On U.K Orders 15p Overseas Orders at Cost

SAXON

Money saving high performance audio equipment
DIRECT FROM OUR OWN FACTORIES

GUARANTEED TESTED HIGH PERFORMANCE MODULES—now better value than ever

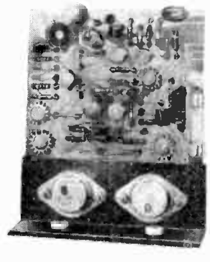
SA35 £5·45 Carriage free
35W RMS 25–50V
7 transistors, 7 diodes

SA50 £6·90 Carriage free
50W RMS 25–65V
7 transistors, 7 diodes

SA100 £12·50 Carriage free
100W RMS 45–70V
10 transistors, 7 diodes

- ★ 25Hz–25kHz
- ★ 0·2% distortion
- ★ Noise—80dB
- ★ 500mV into 20K
- ★ 4–16 ohms
- ★ Simple wiring
- ★ Short and open circuit proof
- ★ Continuously rated
- ★ Top-grade components

120 watt module complete with built-in supply—extra heavy duty £22·50 Carr. 60p



THE SA100 MODULE

POWER SUPPLIES

UNSTABILISED—READY WIRED

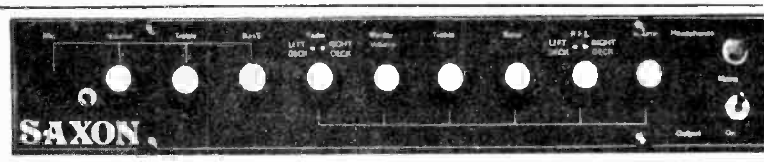
PU45	Suits 2 SA35 or 1 SA50 (4 ohm)	£5·45	Carriage 30p
PU70	Suits 2 SA50 (8 ohm) or 2 SA100	£8·45	Carriage 40p
STABILISED			
PS45	Suits 2 SA35 or 2 SA50 (4 ohm)	£4·45	Carriage free
MT45	Transformer for above	£3·50	Carriage 30p
PS70	Suits 2 SA100	£5·45	Carriage free
MT70	Transformer for above	£4·90	Carriage 40p

N.B. PS70 is not suitable for the SA50

Mk II STEREO DISCO MIXER £22·50

Carr. 30p

This well tried unit mixes two decks, handles any ceramic cartridge, and features mic over-ride plus separate full range bass and treble controls on both mic and deck inputs. Ample headphone power is available for P.F.L. May be used for mono and is mains operated. Fitted with sturdy screening case. Controls: Mic vol, base, treble. Left/Right fade, deck volume, bass, treble, h/phone select. vol, Mains. Size 17½in × 3in × 4in deep.



DISCO MODULE £9·50 Carr. 20p

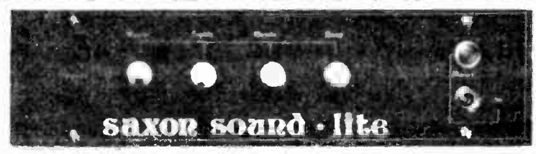
Thousands sold of this extremely popular mono version. A mic input may be fitted using the VA30 (see below). Low consumption from a 9V battery. Features the same high standards of reproduction as the Stereo version. Controls: H/phone select, vol, Left deck vol, Right deck vol, bass, treble, master vol. Size 12¾in × 3in × 2in deep.

3-CHANNEL SOUND-LITE £22·50 Carr. 30p

Only SAXON can supply such incredible value for money. This unit features 3kW power handling, full-wave control, bass, middle, treble AND master controls. Twin loudspeaker jacks for "through" connections. It may be used free standing or will panel mount next to either of the above. Also features unique CUT-BACK circuitry for extra wide range response. Size 12in × 3in × 2½in deep. Professional standards at a price you can afford!

SINGLE CHANNEL VERSION £7·50 Carr. free — Recently reduced in price due to increasing sales, handles 1kW. Full wave operation.

ADD 8% VAT TO ALL ORDERS



MULTI-PURPOSE MIXERS

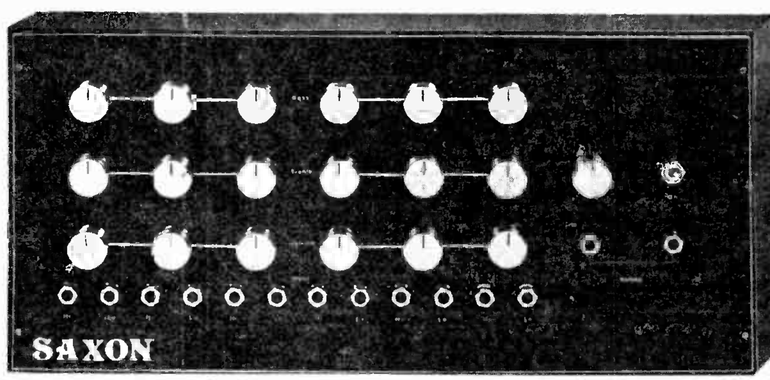
M4HL £19·50 Carr. 50p

M6HL £29·50 Carr. 50p

Featuring multiples of our VA30 module, the M4HL and M6HL fulfil the requirements of all clubs, groups, etc. where a high quality mixer is required. Each channel has one high and one low impedance input, plus volume, treble and bass controls. Input impedances may, if required, be easily changed. The M4HL has four channels, and one output, and the M6HL six channels (12 inputs) and a master control and two outputs. Either unit may be used free-standing or panel mounted. These mixers will feed all types of amplifier. Recommended for their versatility and high performance, and excellent value for money.

VA30 CHANNEL MODULE £3·50 Carr. free

This is the basic channel module in the above mixers and may also be used for extra imputs on either the mono or stereo mixers. Fitted with volume, bass and treble controls, requires just a jack and supply (9–100V)

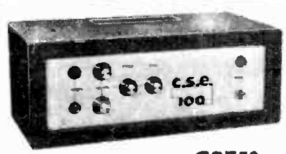


SAXON CSE 100

COMPLETE AMPLIFIER

£39·90
Carr. free

100W of speech and music—Two separately controlled inputs. Wide range bass and treble controls. Sturdy and attractive vynide case. Twin outputs. Ideal for groups, discos, etc. Fully tested and guaranteed. 50W version identical in appearance.



CSE50
£29·50 Carr. free

NEW ! !

SAXON MULTIMIX 100 £57-00 carr. free

100W rms four inputs *slider* controls *plus* master slider. Wide range bass and treble controls. Fantastic value, ideal for complete disco's, groups, clubs etc.

SAXON MULTIMIX 50—Exactly as above but 50W rms. £45·00

CALLERS AND MAIL ORDER

SAXON ENTERTAINMENTS LIMITED

327–333 WHITEHORSE ROAD · CROYDON CR0 2HS

(Please quote magazine when ordering)

SHOP HOURS: 9 a.m.–5 p.m. — LUNCH 12.30–1.30 p.m. MAIL ORDER DESK: 10 a.m.–3 p.m.
24-HOUR ANSWER SERVICE. TEL. 01-684 6385. TECHNICAL ENQUIRIES: 01-684 0098.

SEND 10p FOR OUR 26 PAGE MANUAL—full circuits & details.

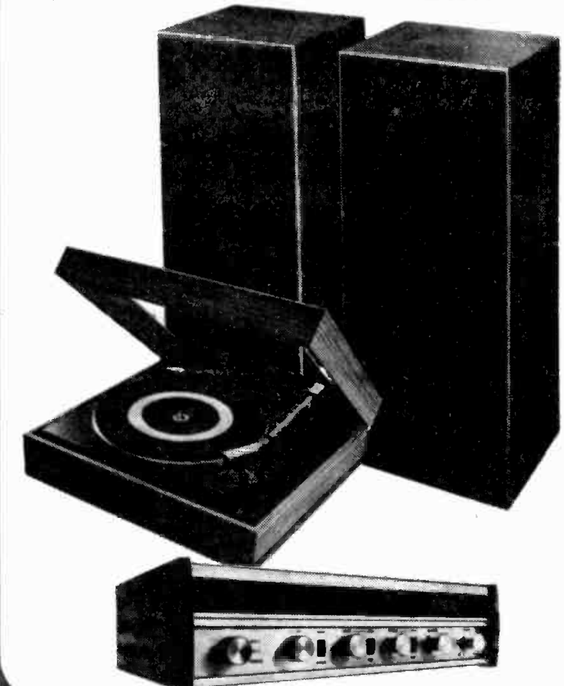
TERMS OF BUSINESS: C.W.O. C.O.D. or ACCESS (just send in card number). Send 50p for C.O.D.

Please send S.A.E. with all enquiries.

VAT @ 8% must be added to all orders including carr. charges.

RTVC FOR AUDIO AT A BUDGET

COMPLETE STEREO SYSTEM *



System 1. £51·00

40 Watt Amplifier. Viscount III – R102 now 20 watts per channel.
System I includes:
Viscount III amplifier – volume, bass, treble and balance controls, plus switches for mono/stereo on/off function and bass and treble filters. Plus headphone socket.
Specification
20 watts per channel into 8 ohms. Total distortion @ 10W @ 1kHz 0·1%. *P.U.1* (for ceramic cartridges) 150mV into 3 Meg. *P.U.2* (for magnetic cartridges) 4mV @ 1kHz into 47K. equalised within ±1dB R.I.A.A. *Radio* 150mV into 220K. (Sensitivities given at full power). Tape out facilities: headphone socket. power out 250mW per channel. *Tone controls and filter characteristics.* Bass: +12dB to −17dB @ 60Hz. Bass filter: 6dB per octave cut. Treble control: treble +12dB to −12dB @ 15kHz. Treble filter: 12dB per octave. *Signal to noise ratio:* (all controls at max.) – 58dB. Crosstalk better than 35dB on all inputs. Overload characteristics better than 26dB on all inputs. Size approx. 13¾″ × 9″ × 3¾″.
Garrard SP 25 Mk III deck with magnetic cartridge, de luxe plinth and hinged cover.
Two Duo Type II matched speakers – Enclosure size approx. 17½″ × 10¾″ × 6″ in simulated teak. Drive unit 13″ × 8″ with parasitic tweeter. 10 watts handling.

Complete System £51·00

System 2. £69·00

Viscount III amplifier (As System I)
Garrard SP 25 Mk III deck (As System I)
Two Duo Type III matched speakers – Enclosure size approx. 27″ x 13″ x 11½″
Finished in teak veneer. Drive units 13″ x 8″ bass driver, and two 3″ (approx.) tweeters. 20 watts R.M.S., 8 ohms frequency range — 20 Hz to 18,000 Hz.

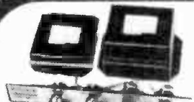
Complete System £69·00

PRICES: SYSTEM 1	
Viscount III R102 amplifier	£24.20 + £1 p & p
2 Duo Type II speakers	£14.00 + £2.20 p & p
Garrard SP 25 with Mag. cartridge de luxe plinth and hinged cover	£21.00 + £1.75 p & p
total: £59.20	
Available complete for only:	**£51·00** + £3.50 p & p

PRICES: SYSTEM 2	
Viscount III R102 amplifier	£24.20 + £1 p & p
2 Duo Type III speakers	£39.00 + £4.00 p & p
Garrard SP 25 with Mag. cartridge de luxe plinth and hinged cover	£21.00 + £1.75 p & p
total: £84.20	
Available complete for only:	**£69·00** + £4.00 p & p

STEREO 21 * QUALITY SOUND FOR LESS THAN £20·00

Stereo 21, easy to assemble audio system kit. No soldering required.
The unit is finished in white P.V.C. and the acrylic top presents an unusually interesting variation on the modern deck plinth.
Includes:– **BSR 3 speed deck**, automatic, manual facilities together with stereo cartridge.
Two speakers with cabinets.
Amplifier module. Ready built with control panel, speaker leads and full, easy to follow assembly instructions.
Specifications: For the technically minded:—
Input sensitivity 600mV. Aux. input sensitivity 120mV. Power output 2.7 watts per channel. Output impedance 8–15 ohms. Stereo headphone socket with automatic speaker cutout. Provision for auxiliary inputs – radio, tape, etc., and outputs for taping discs. **Overall Dimensions.** Speakers approx. 15½″ × 8″ × 4″. Complete deck and cover in closed position approx. 15½″ × 12″ × 6″.
Complete only **£19.55** + £1.60 p & p. **Extras if required.** Optional Diamond Styli **£1.37.**
Specially selected pair of stereo headphones with individual level controls and padded earpieces to give optimum performance, **£3.85.**



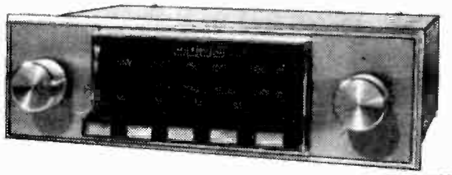
BUILD YOUR OWN * STEREO AMPLIFIER

For the man who wants to design his own stereo — here's your chance to start, with Unisound — pre-amp, power amplifier and control panel. No soldering — just simply screw together. 4 watts per channel into 8 ohms. Inputs: 120mV (for ceramic cartridge). The heart of Unisound is high efficiency I.C. monolithic power chips which ensure very low distortion over the audio spectrum.
240V. AC only. **£7·64 + 55p. p & p**

8 TRACK HOME CARTRIDGE PLAYER *

Elegant self selector push button player for use with your stereo system. Compatible with Viscount III system, Unisound module and the Stereo 21. Technical specification Mains input, 240V, Output sensitivity 125mV Comparable unit sold eleswhere at £24.00 approx. **Yours for only**
£11.95 + 90p p & p.

PUSH BUTTON CAR RADIO KIT * ~ The Tourist II



NO SOLDERING REQUIRED!

NOW BUILD YOUR OWN PUSH BUTTON CAR RADIO

Easy to assemble construction kit comprising fully completed and tested printed circuit board on which no soldering is required. All connections are simple push fit type making for easy assembly. Fine tuning push button mechanism is fully built and tested to mate with printed circuit board.

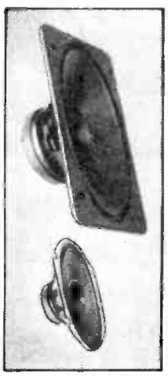
Technical specification: (1) **Output** 4 watts R.M.S. output. For 12 volt operation on negative or positive earth. (2) **Integrated circuit** output stage, pre-built three stage IF Module. **Controls volume** manual tuning and five push buttons for station selection, illuminated tuning scale covering full, medium and long wave bands.
Size chassis 7″ wide, 2″ high and 4¾″ deep approx **£7.70**+55p p & p

Speaker including baffle and fixing strip **£1.65+23p. p&p.**

Car Aerial Recommended — fully retractable **£1.37+20p. p & p**

The Tourist I Kit For the experienced constructor If you can solder on a printed circuit board you can build this model.
Same technical specification as Tourist II **Price £6.60 + 55p p & p.**

EMI SPEAKERS AT FANTASTIC REDUCTIONS

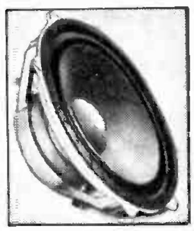


20 WATT SPEAKER SYSTEM *

System consists of a 13″ × 8″ (approx) eliptical woofer unit with a 8″ × 5″ (approx.) mid range unit incorporating parasitic tweeter and crossover components. Circuit Diagram

Technical Specification:
Bass Unit
Flux density—100 K, speech coil—1½″, Cone, Triple laminated paper with P.V.C. surround.
Mid Range Unit
Flux density-33K, speech coil-1″ with parasitic tweeter.
Power Handling
20 watts R.M.S., impedance – 8 ohms, frequency response – 20 Hz to 18,000 Hz.

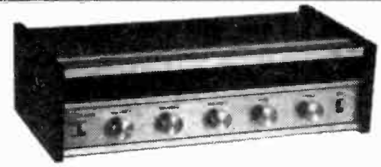
OUR PRICE £6.60. Complete + 90p p & p.



15″ 14A/780 BASS UNIT

Bass unit on a rigid diecast chassis. Superior cone material handles up to 50 watts RMS, and is treated to give a smooth frequency response. Resonance 30 Hz flux density 360,000 Maxwells. Impedance at 1 kHz is 8 ohms. 3″ voice coil.

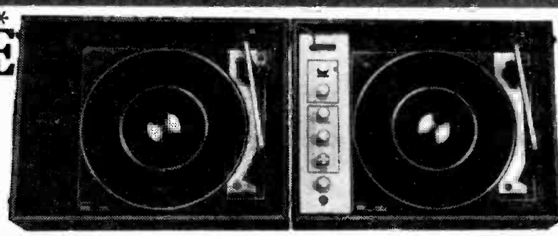
Recommended retail price £40·80.
OUR PRICE £18·70 + £1·50 p & p



DISCO AMPLIFIER*

Reliant Mk IV Mono Amplifier, ideal for the small disco or house parties.
Outputs 20 watts R.M.S. into 8 ohms (suitable for 15 ohms).
Inputs *4 electrically mixed inputs. *3 individual mixing controls.
*Separate bass and treble controls common to all 4 inputs.
*Mixer employing F.E.T. (Field Effect Transistors) *Solid State circuitry.
*Attractive styling.
INPUT SENSITIVITIES –Input – 1.) Crystal mic. guitar or moving coil mic, 2 and 10mV. (Selector switch for desired sensitivity).
–Inputs – 2), 3), 4). Medium output equipment – ceramic cartridge, tuner, tape recorder, organs, etc. – all 250mV sensitivity. AC Mains, 240V operation. Size approx: 12½″ × 6″ × 3½″. **£15.00 + 60p. p & p**

PORTABLE* DISCO CONSOLE



INCORPORATES: Pre-Amp with full mixing facilities, including switched input for mic with volume control, switched input for auxiliary with volume control, bass and treble controls, volume control and blend control for turntables.

Two B.S.R. single play professional series decks, fitted with crystal cartridges.
The turntables are designed and precision engineered. They combine clean modern styling with superb reproduction. Their many special features include square section aluminium tonearms, (high precision low mass design fully counterbalanced, with calibrated stylus pressure control for perfect tracking), and conveniently grouped easy to read linear controls. The turntables have viscous cueing devices which allows the tonearms to be placed or lifted at any point on the record.
The two lightweight cartridge shells have slide-in-holders to facilitate easy inspection of needles and cartridges.

TECHNICAL SPECIFICATION:
Pre-amp – Output – 200mV.
Auxiliary inputs – 200mV and 750mV into 1 meg.
Mic input – 6mV into 100K. 240 volt operation.
Turntables capacity – 7″, 10″ or 12″ records.
Rumble, wow and flutter –
Rumble Better than –35dB. Wow Better than 0.2%.
Flutter Better than 0.06% (Gaumont kalee meter).
Finish – Satin black mainplate with black turntable mat inlaid with brushed aluminium trim. Tonearm and controls in black and brushed aluminium.
Console size –
Unit Closed – 17¾″ × 13¾″ × 8¾″ (approx.)
Unit Open – 35¾″ × 13¾″ × 4⅛″ (approx.)

This disco console is ideally matched for the Reliant IV and Oisco 50 or any other quality amplifier.

The unit is finished in black PVC with contrasting simulated teak edging diamond spun control knobs with matching control panel.

Yours for only £45.00 + £3.50 P. & P.

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

Mail orders to Acton. Terms C.W.O. All enquiries stamped addressed envelope. Goods not despatched outside U.K. Leaflets available for all items listed thus * Send stamped addressed envelope. All items subject to availability. Prices correct at 1st Jan. 1975 and subject to change without notice. All prices include V.A.T. at 8% rate.

R T V C Radio and TV Components (Acton) Ltd.
21c High Street, Acton, London W3 6NG
323 Edgware Road, London W2

Personal Shoppers 9a.m.–5.30p.m. Half day Thurs. 9.30a.m.–5p.m. Closed all day Wed.

SPOT FREQ OSC UNITS suitable for testing A.F. Amps etc., these give a low distortion Sine Wave O/P of 1 volt RMS into 1K, with Thermistor stabiliser, reqs supply of 9 to 12v DC, contained in Ali case 4½x1½x1½" fitted standard coax sk plug supplied, available in the following freqs 100, 500c/s, 1, 2, 5, 10, 20, 50 & 100Kc. Price £4 other freqs in this range 25p extra. See Feb. P.W. for Sq Wave Osc units.

INDICATOR UNIT 266 contains 6" VCR97 tube, 18 valves, slow motion dial, tuning conds etc in case 11 x 9 x 18" with cover **£7·50.**
BLOWER MOTORS. Small double ended blower for use on 6 to 28v DC new boxed **£2·55.**
AERIAL LOOP CONTROLLER were used for R1155 loops consists of handwheel & 360' Indicator new **£2.**
ELECTRONIC MULTIMETERS AV0 type CT38 bench unit for 200/250v 50c/s covers AC/DC volts, AC/DC Amps, Res, Watts, with copy of H/B tested **£24.**
DUAL GANG POTS 10K ohm ea section 2½" dia okay for AF osc with knob & dial **£1·35.**
CODER UNIT with 10 min valves, 13 min relays 12v, 12 min micro swts in case with cover **£3·75.**
REED RELAYS coils 12 v DC as 2 N.C. & 3 N.O. reeds **55p.**
TEST SET 502 contains meter 2·5 Ma FSD, 3x Yax swts, close tol res etc in neat case 8 x 12 x 4" okay for portable meter **£2·32.**
POWER UNITS mains operated & stabilised made to operate BC221 freq meter. Fits in battery compartment. Tested with circ. **£7·16.**
CRYSTAL FILTER UNITS 100Kc SSB Rx filter contain 4 xtals, coils, trimmers etc with connectors **£2·30.**
SANTON TYPE SWT 2p 4w rated 250v/10a new **75p.**
LARGE INST TYPE SWTS 8p 12w 8b & 2p 23w 2b both **£1·30.** ea. 7p 23w 7b **£1·60** all new.
COAX CABLE 75 ohm 15 mts for **£1·20** also low loss type 10 mts f or **£1·90.**
MAINS CABLE 3 core 3 amp 10 mts for **86p.**
METER UNIT X pointer type dual 110 Ua for use with R1155 **£1·79.**

INDICATOR UNIT. 6" display, module construction with min & sub valves, int RF type EHT unit 3 counter dial linked to CRT cursors, thought to be Sonar Ind first MOD release **£12·50** new, **£10·50** S/H.

SCOPES. American service general purpose bench scopes 115v 50c/s I/P, single beam, 3" tube, Y amp 2c/s to 11 Mc/s at 50 Mill/V per inch, Time & Voltage Calibrators, with probes & Accs tested with copy of Inst Book. **£40.**

SILICON DIODES 200 PIV 8 amps 4 for **75p** also 800 PIV 750 Ma new 15 for **£1·10.**

VALVES. Ex equip 5U4, 6X5, 6SN7, 12AT7, 12AU7, 12AX7, 6BH6, EL85, 6H6, 6Y6, 6SK7, 6N7, 6J6, 6AK6, 6X4, CV173, EF50, OB2, 12SJ7, 12J5, 12A6, 6BE6, 5R4, 6CH6, CV286 95v stab, CV284 75v stab, 85A2, any 3 for **65p.**

METER 1 Ma FSD scale knots 2¾" dia **£1.**
CRYSTAL OVEN with 12 type Hc6/u holders can be removed oven 24v **76p.**
MIKES American type T17 carbon with swt new **£1·35.**
DYNAMOTOR UNITS American 12v DC I/P O/P 440v at 200 Ma **£2·65.**
TAG STRIPS solder type 24 way new 10 for **40p.**
LAMPS double filament type with silvered reflector 28v 14w new 5 for **65p.**
SPEAKERS p.m. type 4 x 4" coil 3 ohm with trans to match o/p pentode **80p.**
I.F. TRANS double wound 100Kc 2 for **60p.**
NUTS & BOLTS etc in 2, 4, 6 & 8 Ba assorted 250 items new **£1.**
FLAME STATS operate about 90' C new **£1.**

INVERTOR UNITS rotary type I/P 28v DC, O/P 115v 400c/s 6·5 amps 1 phase, with V.R. & circ. American Surplus. **£18.**

VEEDER COUNTERS 4 digit with reset coil 230v DC new **£2.**
Copies of Manuals & circs available List on request
Above prices inc carr & VAT. SAE for list or enquiry.
Goods are ex equipment unless stated otherwise.

A. H. SUPPLIES 57 MAIN RD, SHEFFIELD S9 5HL 444278 (0742)

ELECTROVALUE

IMPORTANT ANNOUNCEMENT ON PRICES

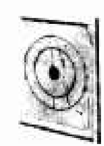
1975 is the year of challenge. Rather than sit back and wait for things to happen, we have produced our own policy to help stabilize price structure and maintain the services which have made **ELECTROVALUE** pre-eminent.
PRICES as shown in our latest catalogue (No. 7, issue 3) will be maintained at least until March 31st next (except in severe cases of market fluctuation) and then held after review for further 3-month periods instead of day to day price changes.
CATALOGUE No. 7, ISSUE 3 is now ready with 108 pages of bargains and information. Price—30p post paid, including 25p refund voucher for use on orders for £5 or more.
DISCOUNTS apply on all items except the few where prices are shown NETT. 5% on orders from £5 to £14·99; 10% on orders value £15 or more.
FREE POST AND PACKING in U.K. for pre-paid mail orders over £2 (except Baxendall cabinets). If under there is an additional handling charge of 10p.
QUALITY GUARANTEE. All goods are sold on the understanding that they conform to maker's specification. No rejects, seconds or sub-standard merchandise.
SUPPLIERS OF QUALITY COMPONENTS AND SEMI-CONDUCTORS AT COMPETITIVE PRICES.

ELECTROVALUE LTD

All communications to Dept. PW3, **28, ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY TW20 0HB** Telephone Egham 3603, Telex 264475 *Shop hours: 9–5.30 daily, 9–1 pm Sats.*
NORTHERN BRANCH: 680, Burnage Lane, Burnage, Manchester M19 1NA Telephone (061) 432 4945 *Shop hours: Daily 9–5.30pm; 9–1pm Sats.*

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.

£8·00 each Stereo pair £15·50
INCLUSIVE OF VAT AND POSTAGE

web europa
P.O. Box 9, Ruthin Clwyd

VHF MODULATOR

Which enables the use of a standard TV as a monitor for CCTV and Video games (TV Tennis). Operates from 8V–12 VDC. Tuneable over VHF Channels 27–40. Input—Standard 1V poss Video. Output—7 5mV into 75ohm at 600 MHZ. Dimensions 2¼" x 2" x ½"—6' Coax.

Price—Fully Assembled and Tested £6·50 inc. VAT and postage.

Please send cheque or P.O. with order to:

STRONG ELECTRONICS LIMITED
Bourne Works, Whyteleafe, Surrey CR3 0YD

BRITAIN'S FASTEST SERVICE!

A SELECTION FROM OUR COMPREHENSIVE CATALOGUE

ALL ITEMS ARE BRAND NEW AND FULLY GUARANTEED

AA119	7p
AC107	68p
AC126	25p
AC128	22p
AC128/AC176	51p
AC151	26p
AC152	40p
AC153	42p
AC176	29p
AC153/176K	71p
AC187K	40p
AC188K	36p
AC187/188K	76p
ACY17	41p
ACY18	28p
ACY19	32p
ACY20	26p
ACY21	30p
ACY22	16p
AD140	80p
AD149	70p
AD161	64p
AD162	64p
AD161/162	£1·28
AF106	40p
AF114	46p
AF115	40p
AF116	68p
AF117	40p
AF124	38p
AF125	38p
AF126	39p
AF139	64p
AF186	30p
AF239	69p
AF279	74p
ASY26	70p
ASY27	72p
BA138	35p
BB103	27p
BB104	50p
BB105	37p
BC107	16p
BC107/BC177	46p
BC108	14p
BC108/BC178	49p
BC109	16p
BC109/BC179	44p
BC109C	18p
BC140	52p
BC147	16p
BC148	16p
BC149	16p
BC157	17p
BC158	15p
BC159	17p
BC147/157	33p
BC148/158	31p
BC149/159	33p
BC167	15p
BC168	14p
BC169	14p
BC169C	15p
BC177	30p
BC178	35p
BC179	28p
BC182	15p
BC182L	15p
BC183	14p
BC183L	14p
BC184	16p
BC184L	13p
BC212	19p
BC212L	19p
BC238	14p
BC238/308	28p
BC257	16p
BC258	15p
BC259	16p
BC307	17p
BC308	14p
BCY70	22p
BCY71	33p
BCY72	19p
BD241A	54p
BD242A	60p
BD243A	72p
BD244A	78p
BD124	£1·00
BD132	32p
BDY20	96p

BF115	30p
BF167	29p
BF180	50p
BF194	18p
BF195	18p
BF196	18p
BF200	46p
BF254	17p
BF255	17p
BFX29	39p
BFX84	34p
BFX85	41p
BFX86	35p
BFX87	33p
BFX88	30p
BFY50	33p
BFY51	30p
BFY52	31p
BFY53	28p
BFY90	£1·35
BPX29	£1·62
BR100	22p
BRY39	66p
BSX19	26p
BSX20	25p
BSY27	27p
BSY95A	12p
BT106	£1·26
BTY79/400R	£2·52
BY100	20p
BY127	12p
BZY88C3V3 to BZY88C30V	10p
BZX61C7V5 to BZX61C30V	28p
BZY93C9VI	80p
BZY93C12V	80p
BZY93C15V	80p
BZY93C18V	80p
CA3005	£1·35
CA3011	83p
CA3013	£1·17
CA3014	£1·37
CA3018	72p
CA3018A	83p
CA3020	£1·39
CA3028A	79p
CA3035	£1·37
CA3043	£1·57
CA3046	70p
CA3048	£2·11
CA3052	£1·62
CA3053	47p
CA3065	£1·28
CA3088E	£1·24
CA3089E	£1·94
CA3090AQ	£4·28
CA3123E	£1·48
CR1/051C	65p
CR1401C	86p
CZ6	17p
D10 (NTGD10)	50p
IR2160	82p
IRC20	60p
JA424	£2·08
LD30A	29p
MC1303L	£1·59
MC1305P	£1·99
MC1307P	£1·38
MC1310P	£2·60
MC1330P	88p
MC1352P	90p
MC1466L	£3·50
MC1468L	£2·41
MC4024P	£1·84
MC4044P	£1·84
MFC4000B	50p
MFC6030	£1·21
MFC6040	£1·15
MFC8010	£1·44
MFC8040	£1·24
MFC9020	£1·50
MJE371	94p
MJE520	70p
MJE521	82p
MJE2955	£1·49
MJE3055	87p
MJ480	£1·15
MJ481	£1·45
MJ491	£1·84
MJ802	£3·65
MJ802/MJ4502	£7·65

MJ900	£1·88
MJ1000	£1·50
MJ4502	£4·00
MLM309K	£2·08
MPF102	49p
MPF103 (2N5457)	45p
MPF104 (2N5458)	61p
MPF105 (2N5459)	45p
NE555V	78p
NKT0033	92p
NKT211	32p
NKT212	32p
NKT271	22p
NKT274	22p
NKT275	29p
NKT279A	36p
NKT281	22p
NKT401	88p
NKT402	96p
NKT403	82p
NKT404	78p
NKT405	£1·00
NKT406	79p
NTGD10	50p
OA10 (NTGD10)	50p
OA47	10p
OA79	6p
OA90	6p
OA91	6p
OA95	9p
OA200	8p
OA202	8p
OC25	72p
OC28	87p
OC29	88p
OC35	78p
OC36	78p
OC41	57p
OC44	20p
OC45	20p
OC71	20p
OC72	20p
OC75	20p
OC76	46p
OC77	62p
OC81	32p
OC81D	29p
OC83	32p
OC84	32p
OC170	44p
OC171	47p
OCP71M	42p
ORP12	50p
PM7A2	£1·98
PM7A6	£2·62
PN70	13p
PN71	13p
PN107	9p
PN108	9p
PN109	9p
PN3819 (2N3819)	24p
SL103A	54p
SL403A (Rectifier)	71p
SL803A	94p
ST2	22p
T2700D	£1·01
T2800D	98p
T2800M	£1·33
TAD100	£1·97
TAD110	£1·97
TBA810S	£1·32
TIL112	£2·00
TIL209	30p
TIS43	38p
TR1	22p
VA1039	15p
VA1040	15p
VA1066s	15p
VA1077	17p
W005	25p
W01	28p
W02	26p
W04	27p
W06	32p
W08	40p
ZTX107	14p
ZTX108	11p
ZTX300	19p
ZTX302	24p
ZTX303	15p

ZTX304	30p
ZTX314	18p
ZTX320	40p
ZTX500	20p
ZTX501	22p
ZTX502	25p
ZTX503	20p
ZTX504	60p
1N914	4p
1N4001	4p
1N4002	4p
1N4003	5p
1N4004	7p
1N4005	7p
1N4006	8p
1N4007	9p
1N4148	4p
1N5400	16p
1N5404	22p
1N5408	33p
1S44	4p
1S920	10p
2N404	58p
2N697	26p
2N706	25p
2N706A	27p
2N708	20p
2N914	25p
2N918	54p
2N930	25p
2N1303	61p
2N1305	65p
2N1307	69p
2N1309	73p
2N1613	26p
2N1711	30p
2N1893	46p
2N2218	34p
2N2218A	48p
2N2219	43p
2N2219A	50p
2N2368	26p
2N2369	23p
2N2369A	25p
2N2484	48p
2N2646	58p
2N2904	32p
2N2904A	35p
2N2905	38p
2N2905A	40p
2N2924	23p
2N2925	27p
2N2926	10p
2N3053	30p
2N3054	60p
2N3055	65p
2N3228	88p
2N3391A	40p
2N3525	£1·04
2N3702	14p
2N3703	14p
2N3704	14p
2N3705	14p
2N3706	14p
2N3707	14p
2N3708	14p
2N3709	14p
2N3710	14p
2N3711	14p
2N3773	£3·20
2N3819	35p
2N3866	82p
2N3904	20p
2N3906	24p
2N4058	15p
2N4060	16p
2N4061	16p
2N4062	16p
2N4441	70p
2N4444	£2·20
2N4871	48p
2N4990	54p
2N4991	46p
2N5245	68p
2N5457 (MPF103)	45p
2N5458 (MPF104)	61p
2N5459 (MPF105)	45p
2N5756	£1·00
2N5777	54p
2N6027 (D13T1)	58p
3N128	74p

3N140	92p
3N141	82p
3N152	92p
741/T05	50p
741/8DIL	34p
747/14DIL	85p
748/T05	41p
3015F	£1·40
3015G	£2·00
7400	24p
7401	24p
7402	24p
7403	24p
7404	30p
7405	30p
7408	30p
7409	30p
7410	24p
7413	38p
7420	24p
7425	38p
7430	24p
7440	29p
7442	£1·39
7443	£1·74
7444	£1·74
7445	£2·47
7446	£1·74
7447	£1·50
7450	24p
7451	24p
7453	24p
7454	24p
7460	24p
7470	54p
7472	36p
7473	54p
7474	55p
7475	54p
7476	54p
7480	80p
7482	£1·04
7483	£1·58
7486	39p
7490	84p
7491A	£1·54
7492	£1·02
7493	90p
7494	£1·36
7495	96p
7496	£1·78
74100	£1·97
74107	62p
74121	51p
74141	£1·20
74150	£4·02
74151	£1·32
74153	£1·62
74154	£2·40
74155	£1·86
74156	£1·86
74190	£2·16
74191	£2·16
74192	£2·09
74193	£2·09
74196	£1·80
74197	£1·80
40250	58p
40310	56p
40312	56p
40360	40p
40361	38p
40362	40p
40406	44p
40407	34p
40408	50p
40409	52p
40410	52p
40430	£1·01
40468A	44p
40575	£1·13
40576	£1·31
40602	46p
40673	52p

COSMOS LOGIC

CD4000AE	46p	CD4017AE	£2·27	CD4030AE	89p
CD4001AE	46p	CD4018AE	£2·27	CD4035AE	£2·23
CD4002AE	46p	CD4019AE	£1·04	CD4040AE	£2·70
CD4007AE	46p	CD4020AE	£2·53	CD4042AE	£1·80
CD4009AE	91p	CD4022AE	£2·23	CD4043AE	£2·02
CD4010AE	91p	CD4023AE	46p	CD4044AE	£2·02
CD4011AE	46p	CD4024AE	£1·62	CD4049AE	72p
CD4012AE	46p	CD4025AE	46p	CD4050AE	72p
CD4013AE	83p	CD4026AE	£3·04	CD4051AE	£2·36
CD4014AE	£2·27	CD4027AE	£1·35	CD4056AE	£1·80
CD4015AE	£2·27	CD4028AE	£1·97	CD4060AE	£3·56
CD4016AE	66p	CD4029AE	£3·06	CD4069AE	46p

MULLARD MODULES

LP1185	FM IF Module	£4·89
LP1186	FM Tuner Module with Diode Tuning	£6·00
LP1400	High performance stereo decoder module using frequency multiplex system	£6·06

ORDER AS TYPE NO. + "MULLARD MODULES"
DATA & APPLICATION CIRCUIT FREE WITH MODULE UPON REQUEST
N.B. SEE BELOW FOR SPECIAL DISCOUNT ALLOWANCE

LOGIC PROBE

Powered by 5v DC supply of circuit under test, this device gives instant Indication of Logic High (Red) "1" and Logic Low (Green) "0". L.E.D. Indicators.
Leaflet on request — £9.36 each
N.B. See below for special discount allowance

LIGHT DIMMER BY ANCO

For exciting lighting from "Off" to full brilliance controlling up to 250 watts. Designed to fit in place of standard wall switches. (Not suitable for Fluorescent Lighting.) £3.85

CA3401E QUAD OP. AMP

(Interchangeable with MC3401P) 65p

INTEGRATED CIRCUIT PINS

The lowest priced IC mounting available. Pin Sockets come in a reel, just drill your board at required centres, drop in pins and solder, break off frame holders—your DIL mounting is complete!!

Pin Sockets	1,000 pieces	£7·00
Pin Sockets	100 pieces	£1·00

NE555V TIMER I.C.

As used in magazine articles including July Practical Wireless. 78p
DATA AND CIRCUITS 15p

CA3123E I.C. Superhet System with RF Amp. IF Amp, Mixer, OSC. g.c. Detector and Voltage Regulator. Ideal for car radio applications. £1·48
APPLICATION SHEET & DATA 15p

SEVEN WATT AUDIO AMP. I.C.

TBA810S £1·32
Featuring thermal protection. Ideal for car radio applications.
APPLICATION SHEET & DATA 15p

ARROW SPECIALISE IN EDUCATIONAL AND GOVERNMENT ORDERS
—See catalogue for further details.

ARROW SERVICE PLUS
10% DISCOUNT OVER £4. NO POSTAGE AND PACKING. TOP QUALITY PRODUCTS ALWAYS BY RETURN
COMPREHENSIVE CAT. I enclose PO/Cheque for 10p

Important Notice "All prices are *exclusive* of V.A.T. Please add V.A.T. to the final total of your order *after* deducting any discount which may be due" VAT. REG. 246062672

Name
Address

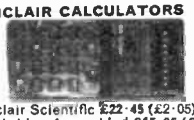
Arrow Electronics Limited
Dept. PW 15
7 Coptfold Road
Brentwood,
Essex
CM14 4BN

REGISTRATION No. 1062424

ARROW ELECTRONICS LTD.

DEPT. PW 15, 7 COPTFOLD ROAD
BRENTWOOD
ESSEX CM14 4BN

SINCLAIR CALCULATORS



Sinclair Scientific £22·45 (£2·05)
Cambridge Assembled £15·95 (£1·55)
Cambridge Memory £20·95 (£1·95)

FERRANTI ZN414

IC radio chip with data £1·20 (22p). Also available kit of extra parts to complete a radio £2·55 (43p). Send sae for free leaflet.

SINCLAIR PROJECT 80

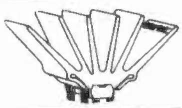
AFU £6·38 (73p)
Z40 £5·12 (63p)
Z60 £6·38 (73p)
Q16 £7·21 (80p)
PZ5 £5·11 (63p)
PZ6 £7·79 (84p)
PZ8 £7·36 (80p)
Decoder £7·75 (84p). Trans for PZ8 £3·85 (50p).
Tuner £11·62 (£1·37). Stereo 80 £11·62 (£1·37).
Project 805 £29·95 (£2·80).
Project 805SQ £33·95 (£3·10).
Project 80 SQ Quad Decoder £15·95 (£1·18)

ECONOMICAL QUADRAPHONICS

Introducing the Napolex QA10 self contained matrix quadraphonic synthesizer. Just feed the output of any stereo system (including Project 80 or 60) into it and hook on 4 speakers to obtain the latest experience in sound. Send sae for free leaflet. Only £10·15 (£1·10).

SINCLAIR SUPER IC12

6watt IC power, amp and preamp. With 44 page booklet and printed circuit £1·80 (40p).



NEW SINCLAIR IC20

High power IC audio amplifier £6·95 (82p).

DELUXE KIT FOR THE IC12

Includes all parts for the printed circuit and volume, bass and treble controls needed to complete the mono version £1·80 (28p). Stereo model with balance control £3·90 (46p).

IC12 POWER KIT

Supplies 28V 0·5 Amps £3·07 (52p).

LOUDSPEAKERS FOR THE IC12

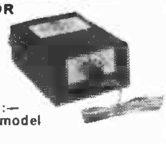
5" 8 ohm £1·40 (39p). 5" x 8" 8 ohm £1·75 (47p).

PREAMP KITS FOR THE IC12

Type 1 for magnetic pickups, mics and tuners Mono model £1·50 (27p). Stereo model £2·70 (35p). Type 2 for ceramic or crystal pickups. Mono 80p (20p). Stereo £1·60 (27p).

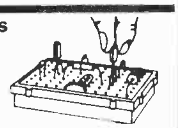
SEND SAE FOR FREE LEAFLET ON KITS

BATTERY ELIMINATOR BARGAINS



The most versatile battery eliminator ever offered. Switched output of 3, 4½, 6, 7½, 9 and 12V at 500 mA £3·90 (70p).
Other eliminators stocked:—
250mA:—3 way switched model giving 6, 7½ and 9V £2·50 (58p).
50mA:— 4½V £2·40 (40p). 6V £2·40 (40p). 9V £2·40 (40p). 7½V cassette type £2·80 (50p). Double 4½V + 4½V £2·95 (50p). 6V + 6V £2·95 (50p). 9V + 9V £2·95 (50p).
500mA:— Heavy duty deluxe models 6V £2·78 (55p). 7½V £2·78 (55p). 9V £2·78 (55p).

S-DECS AND T-DECS



S-DeC £1·98 (31p)
T-DeC £3·63 (47p)
μ-DeC A £3·99 (51p)
μ-DeC B £6·99 (81p)
IC carriers:—
16 dil: plain 81p (15p)
with socket £1·77 (25p)
10 TO5: plain 78p (15p). With socket £1·68 (24p).
Experiment guides:—A £1·50 (36p), B £1·77 (39p), C 90p (28p), D £2·40 (45p), E £4·20 (63p).

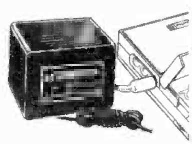
SWANLEY ELECTRONICS
PO BOX 68, SWANLEY, KENT BR8 8TQ.

Please add the sum shown in brackets after the price to cover the cost of post and new VAT. Official credit orders from schools etc. welcome. No VAT charged on overseas orders.

MAINS UNITS for all types of TRANSISTOR EQUIPMENT

RUN YOUR TRANSISTOR RADIO OR CASSETTE RECORDER FROM YOUR CAR BATTERY (Similar to illustration)

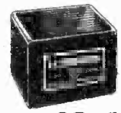
This unit enables you to run your cassette tape recorder from the car whilst travelling. It is easily fitted and comes complete with fitting instructions. Please state make of cassette, voltage and type of plug required.



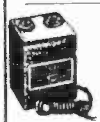
ONLY **£2·86**

RUN YOUR TAPE RECORDER OFF AC MAINS

Mains unit supplied complete and ready to plug into your cassette recorder. (State voltage, make and type of plug required, if in doubt send diagram of recorder socket.)



ONLY **£3·40**



RUN YOUR TRANSISTOR RADIO OFF AC MAINS

For single outputs, 6v, 9v **£2·86**
For two separate outputs, 6v + 6v, 9v + 9v **£3·52** per unit. (Please state outputs required.)

All units are completely isolated from mains by double wound transformer ensuring 100% safety.

All British Made. All Prices inc. V.A.T. and P. & P.

R.C.S. PRODUCTS (RADIO) LTD.
(Dept. P.W.M.)
31 Oliver Road, Walthamstow, London, E17

Full refund if not completely satisfied.

TELEVISION CAMERA KITS

Complete kits are available for both "Mullard" and "P.E." design. Each kit includes a comprehensive construction manual, and a completely FREE technical back up service to ensure your success. VHF and UHF Modulator kits also available to allow standard domestic T.V. to be used as monitor.

All parts available separately, including a wide range of lenses, vidicon tubes and focus/scan coil assemblies. Ready built cameras also available. Complete kits available for P.W. tele-tennis game. Send 5" x 7" S.A.E. for full details, or come along for a demonstration and a chat with our technical staff.

CROFTON ELECTRONICS

124 Colne Road, Twickenham, Middlesex, TW2 6QS
Tele: 01-898 1569
Telex 934642
Cadanac LDN

BARCLAYCARD

Wire Wound Resistors. Our selection of mixed values. 30 for £1·50, 100 for £4·00.

Audio Amplifier Module. Mullard LP1173, output power, nominal 10 watt, supply voltage +24 volt, with data and circuit, £2·50.

Ferguson Stereogram chassis Model 3357, all transistor, medium long, VHF/FM. 3 watts per channel S/M. with connection data, less tuning scale, £20. Post paid.

Crystals HC6U: 52·03333 MHz: 52·02500: 52·01667: 51·56667: 51·58330: 37·76250: 37·75000: 12·895·8: 12·891·6: 12·700·0: 9·458·33: 9·456·25: 9·455·55: 9·533·33: 9·531·94: 9·530·55: 9·090·62: 9·087·5 50p each.

Electrolytics. 32/32/32μF, 325v, 2"×1¼" 35p: 80μF 150vt 1½"×1" 20p; 2000μF 30v, 2½"×1" 25p: 2000μF 35v 3"×1" 30p: 470μF 100v 3"×1¼" 25p: 2000/2000μF 25v 2"×1¼" 35p: 30,000μF 25v 4½"×2½" 50p: 700μF 200v 3½"×1¼" 30p: 16/16μF 275v 1¾"×1" 20p: 40/40/20μF 275v 3"×1" 20p: 4500/900/900μF 30v 2½"×1½" 50p: 4000μF 35v 3"×1¾" 40p: 4000μF 35vt 3"×1½" 35p: 2500μF 40vt 2½"×15" 40p: 4000μF 18v 2"×1" 20p: 470μF 25v 1¼"×½" 15p.

Matched pair of bookshelf speakers. Teak finish, size 12"×8"×5". 8×5 8" ohms ceramic, 5 watts RMS. Complete with din leads. £11·00 pair.

Thorn TV IF chassis, 950 series (less valves), £1·75.

UHF 625 transistor push button tuner (NSF Telefunken) as used on Decca MS2400. Brand new and boxed, £3·25.

Light Dependent Resistors (RCA sq3536) 30p each 4 for £1·00.

P-C Boards (not computer panels) 1 off 6 transistor single wave band. 1 off 4 transistor audio 1 off 3 transistor £1·60, three boards.

Rank EVR Teleplayer colour translator panels, type and components on new panels listed as follows, £2·50, each panel. Z605—14 off BC148: 2 RCA ca3054 (ic): 1 crystal 4·433618 MHz—Z607—12 off BC148: 1 BC108: 1 BC158: 1 RCA ca3046 (ic), 1 RCA ca3045 (ic): Z608—23 off BC148: 2 BC158—Z612—12 off ME4103: 2 BC-251B: 1 BFY50.

Mains Droppers, 10 mixed values, £1·00.

Edgewise Level meters, 200μA, size ¾" overall. 50p.

Chrome Plastic knobs, 3 types, 4 off each with spring clip, £1·25.

Aluminium Chassis, 7½"×5½"×2¼" 70p: 10"×7½"×2¼" 85p. 11"×7½"×2¼" 95p.

BSR P128, similar to HT70 single play, with heavy die cast turntable, less cartridge, £11·00.

Transistorised FM tuner head, with A.M. gang slow motion drive 88–108 Mcs, with circuit diagram, £2·30.

Ferguson Stereogram Chassis. MW/LW/VHF with tuning scale (5+5 watts sine wave) 15 ohms £28·50. Post paid

15 ASSORTED SWITCHES £2.00. 50—3 way to 7 way TAG STRIPS, £1.25. ALMA REED RELAY TYPE DRH. 3 VOLTS. 55p.

REPANCO & DENCO COILS. NEW/BOXED OUR SELECTION—5 FOR £1.25

Goods not despatched outside UK
15p Handling charge on orders under £1·00. Please add 10% for post and packing on all items except gram chassis. All items include VAT.

SURPLECTRONICS
216 LEAGRAVE ROAD, LUTON, LU3 1JD, BEDS.

Practical Wireless Classified Advertisements

Classified advertisements 12p per word (minimum 12 words). Box No. 30p. Semi-display setting £10 per single column inch. Advertisements must be prepaid and addressed to Classified Advertisement Manager, PRACTICAL WIRELESS, IPC Magazines Ltd., Fleetway House, Farringdon Street, London EC4A 4AD. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd."

Receivers and Components

NEW COMPONENTS post free, 8% VAT included. 2N3702, 2N3704, 9p. Guest UPM 050 ½W Carbon Film resistors 1p each. Seven segment common anode LED displays, 0·3in. DL707 £1·90, 0·6in DL747 £2·38. Siemens B32540 250V Polycarbonate 0·01, 0·015, 0·022, 0·033, 0·047, 4p; 0·068, 0·1µF, 5p. Triac TAG 250 400V/8A, 75p. D32 diac 25p. 300W Light Dimmer, £2·75. Delivery from stock or your money returned. Greenbank Electronics, 94 New Chester Road, Wirral, Merseyside L62 5AG.

COMPONENTS GALORE. Pack of 500 mixed components manufacturers surplus plus once used. Pack includes resistors, carbon and W.W., capacitors various, transistors, diodes, trimmers, potentiometers etc. Send £1+10p p&p, C.W.O. To: Caledonian Components, Strathore Road, Thornton, Fife.

BRAND NEW COMPONENTS by return. Electrolytics, 15V, 25V, 50V 0·47, 1, 2·2, 4·7, 10 Mfds.—4p. 22, 47—4½p (50V—5p). 100—5½p (50V—7p). 220—6p (50V—9p). Subminiature bead-type tantalums 0·1/35V, 0·22/35V, 0·47/35V, 1/35V, 2·2/35V, 4·7/35V, 10/16V, 22/16V, 47/6V, 100/3V—9p. Mylar Film 100V 0·001, 0·002, 0·005, 0·01, 0·02—2½p. 0·04, 0·05—3p. Mullard Tubular Polyester 400V E6 series, 0·001-0·022—3p. 0·033-0·1—4p. Mullard miniature C333 ceramics E.12 series 2% 1·8pf.-47pf.—2½p. 56pf.-330pf.—3p. Polystyrene 63V. E12 series 10pf.-1,000pf.—2½p. 1,200pf.-10,000pf.—3½p. Miniature Highstab Carbon Film Resistors ⅓W E12 series 5% 1Ω-10MΩ (10% over 1 Megohm)—1p. Postage 8p. Prices VAT inclusive. The C.R. Supply Co., 127 Chesterfield Road, Sheffield S8.

PW TENNIS KITS. Post free inclusive. Semiconductors, £12·75. Sockets £3·50. Order both, £16. Island Devices, PO Box 11, Margate, Kent.

MULLARD 10W RMS AMPLIFIER MODULES. Absolutely complete. £2·65 inclusive. LTE, 46 Minehead Road, South Harrow, Middx.

Wanted

WANTED. Murphy A92 ("Stationmaster") bandspread, or G.E.C. BC4141 alldry portable receivers. Box No. 113.

SINCLAIR MICRO FM or **MINI-POP** '74. Garwood. Phone Winchester 66764.

VINTAGE RADIOS are a fascinating and lucrative hobby. We have sets, literature, etc from £2—£100 and we urgently need more. Write for details to Vintage Radio Mart, 26 Bowden Lane, Chapel-en-le-Frith, Stockport, Cheshire.

"RADIO & TV SERVICING" books wanted from 1962 edition onwards. £2 paid per copy by return post. Bell's Television Services, 190 Kings Road, Harrogate, Yorks. Tel. (0423) 55885.

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

EARLY WIRELESS receivers, components and magazines, details to Johnson Raffles, Haverbreaks, Lancaster.

AVO. 7 & 8 any condition. Any quantity. Huggett's, 2 Pawsons Road, W. Croydon.

Ladders

LADDERS, timber and aluminium. Tel: Telford 586644 for brochure.

Situations Vacant

ELECTRONIC ENGINEER

required in an expanding electronic services company in the Sultanate of Oman, specialising in commercial/industrial television and radio installations, also the installation and servicing of electronic security systems. Applicants should have a minimum of either Ordinary National Certificate or City & Guilds Final.

Salary £3,500 pa nett, free furnished accommodation supplied, limited free utilities, i.e. electricity and water, company car and petrol supplied free, annual paid leave of one month with air fares provided, initial contract period minimum of two years. Applications should be made to P.O. Box 1000, Muscat, Sultanate of Oman.

MEN! £70p.w. can be yours

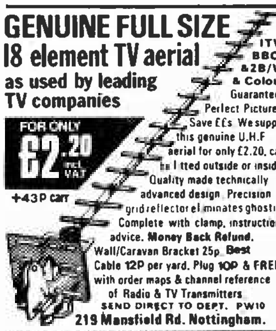
Jobs galore? Tens of thousands of new computer personnel needed over the next few years alone. With our revolutionary, direct-from-America, course, you train as a Computer Operator in only 4 weeks! Pay prospects? £3500 + p.a.

London Computer Operators Training Centre subscribes to the British Government backed National Computing Centre code of practice for Computer Training Schools so you know your training will be second to none.

After training, our executive appointments bureau—one of the world's leaders of its kind—introduces you FREE to world-wide opportunities. Write or 'phone TODAY, without obligation.

London Computer Operators Training Centre
Y22, Oxford Hse.,
9-15 Oxford St. W1. Tel: 01-734 2874

Aerials



GENUINE FULL SIZE 18 element TV aerial as used by leading TV companies

ITV, BBC1 & 2B/W & Colour

FOR ONLY £2.20 incl VAT +43P carr

Guaranteed Perfect Pictures. Save ££s We supply this genuine U.H.F aerial for only £2.20, can be fitted outside or inside. Quality made technically advanced design. Precision grid reflector eliminates ghosting. Complete with clamp, instructions advice. **Money Back Refund.** Wall/Caravan Bracket 25p. Best Cable 12P per yard. Plug 10P & FREE with order maps & channel reference of Radio & TV Transmitters

SEND DIRECT TO DEPT. PW10
219 Mansfield Rd. Nottingham.

IMPERIAL TRADING (AERIALS) LTD.

J. and A. TWEEDY
(Electronic Supplies) Limited
Full range of Jaybeam Aerials available
We supply High Gain Multibeam aerials. Carriage and VAT included in the quoted price.
MULTIBEAN UHF TV AERIALS MBM 28 £5·00, MBM 48 £8·00, MBM 70 £11·00.
PARABEAM UHF TV AERIALS PBM 12 £4·00, PBM 18 £5·00.
STEREOBEAMS FM AERIALS SBM 2 £3·00, SBM 3 £4·00, SBM 5 £5·00, SBM 6 £8·00.
SAE for full list of accessories available—Low Loss Co-ax 12p/m.
79 Chatsworth Road, Chesterfield, Derbyshire
Tele: 34982

Educational

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

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

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

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

Free details from:
INTERNATIONAL CORRESPONDENCE SCHOOLS,
Dept 732, Intertext House, London SW8 4UJ.
Or Phone 01-622 9911 (All Hours)

Service Sheets

LARGE SUPPLIER OF SERVICE SHEETS

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

"PLEASE ENCLOSE LARGE S.A.E WITH ALL ENQUIRIES & ORDERS"
Otherwise cannot be attended to
(Uncrossed P.O.'s please, original returned if service sheets not available.)

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

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

We have the largest supplies of Service Sheets (strictly by return of post). Please state make and model number alternative.

Free TV fault tracing chart or TV list on request with order.

Mail order or phone 01-458 4882

BELL'S TELEVISION SERVICES for Service Sheets, Manuals, Books on Radios, TVs, etc. Service Sheets 40p plus s.a.e. Free booklists on request. Back issues of PW, PE, EE, TV available 25p plus 7p post. S.a.e. with enquiries.—B.T.S. (Mail Order Dept.), 190 Kings Road, Harrogate, Yorks. Telephone (0423) 55885.

SERVICE SHEETS for over 6,000 models of Televisions, Radios, Transistors, Stereo, Tape Recorders, Record Players, etc., at only 30p plus SAE with free Fault-Finding Guide. Over 50,000 sheets in stock for 10,000 models. SAE enquiries. Catalogue 20p plus SAE. Hamilton Radio, 47 Bohemia Road, St. Leonards, Sussex. Telephone Hastings 429066.

SERVICE SHEETS, Radio, TV etc., 8,000 models. Catalogue 20p. S.A.E. enquiries. Telray, 11 Maudland Bank, Preston.

Books and Publications

ELECTRONICS MEN. You are worth more than a measly £40 or £50 a week. Last year I earned £3,600 for six months' work, the other six I had off. You could do similar, my booklet explains how. It's 65p from Alben, 3 Church Street, Diss IP22 3DD.

Technical Books – Radio & Electronics

World's Radio & TV Stations (International Edit)	£0.60
Audio Amplifiers	£0-53
Boys Book of Crystal Sets & Simple Circuits	£0-25
Television Timebase Circuits	£1-00
Radio TV and Industrial Tube & Valve Equiv	£0.60
How to get the best out of your Tape Recorder	£1.50
Modern Electronic Troubleshooting	£1-30
Jack Darr's Service Clinic	£1-35
Transistor Circuits for Modern Test Equipment	£0-60
Rad & Electr Colour Codes and Data Chart	£0-15
Handbk of Transistor Equiv. and Substitutes	£0-40
Hi Fi, PA & Disco Amplifier Design Hndbk.	£0-75
Radio Servicing Problems	£0-60
Electronic Circuits for the Amat Photographer	£0-60
Handbook of Simple Transistor Circuits	£0-35
How to build Solid State Audio Circuits	£1-75
Sound and Loudspeaker Manual	£0-50
TV Technicians Bench Manual	£2-50
Radio Amateur Operator's Handbook	£0.70
Television Servicing Vol. No. 1	£0-85
Television Servicing Vol. No. 2	£1-10
Television Servicing Vol. No. 3	£0-60
Television Servicing Vol. No. 4	£0-85
Radio Technicians Bench Manual	£3-00
Servicing Transistor Radio Receivers	£0-75
1st Book of Hi Fi Loudspeaker Enclosures	£0.60
2nd Book of Hi Fi Loudpeaker Enclosures	£0-60
Manual of Electronic Circuits for the Home	£0-50
Modern Crystal Set Circuits for Beginners	£0-35
Electronic Novelties for the Motorist	£0-50
2nd Book of Transistor Equiv. & Substitutes	£0-95
Handbook of Electronic Musical Novelties	£0-50
Transistorised Novelties for Hi Fi Enthusiast	£0-35
Fault Location Exercises in Rad. & TV Vol.1	£0-80
Fault Location Exercises in Rad. & TV Vol.2	£1-35
Colour TV Picture Faults	£2-50
Practical Transistor Novelty Circuits	£0.40
Boys Book of Practical Radio & Electronics	£0-60
Radio Receiver Construction using ICs & Transis.	£0-60
ICs & Transistor Gadgets Construction Handb'k	£0-60
Integrated Circuits Equiv. & Substitutes Hbk	£0-75
Audio Technicians Bench Manual	£3.00
Improving your Hi-Fi	£3.00
Guide to Printed Circuits	£2.50
Receiving Pal Colour Television	£5.00
World Radio TV Handbook 1975	£3.50

PLEASE ADD 10% FOR POSTAGE & PACKING

RADIO BOOK SERVICE
40 Elwill Way, Beckenham BR3 2RZ

UFO CHARTS: Wave Prediction 54p; Daily Flight Pattern, 50p; Map, 50p; TV UFO Detection, 2 Optical Circuits, 63p; Propulsion Theory, 55p; "Anti-Gravity", 55p. Circuits: Transistor Optical Detector, 66p; Radiation/Optical, 44p; Microdetectors, memory, auto-record, 80p. Sighting Recorder, 55p. R. & E. Highlands, Needham, Suffolk.

For Sale

COPPER CLAD LAMINATE FOR PRINTED CIRCUITS
Single sided 1/16" paper base—1·0p/sq. inch.
Single sided 1/16" glass-epoxy—1·5p/sq. inch.
Any rectangular sizes cut to your requirements.
Please send cash with order.
Price includes postage and packing.
From: **SIMTECH ENGINEERING LTD VOLUNTARY PLACE WANSTEAD LONDON E.11.** 01-530-4240.

MICROPHONES: AKG D109, £12·65; AKG D202EI, £43·45; AKG D190C, £18·70; AKG D190E, £20; AKG D224 £55; Sennheiser MD211N, £49·50; Sennheiser MD413N, £29·70. All brand new and boxed. Send CWO to J. J. Francis, (Wood Green) Ltd., Manwood House, Matching Green, Harlow, Essex. Tel: Matching 476.

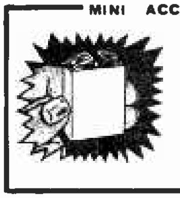
SOUNDLIGHT CONVERTORS. 3 channel 1·5 kW £17; 3kW £25; 1 channel 1kW £9. STROBES: from £21. SEQUENCERS (Chasers): £33, etc. Call or catalogue sent. Aarvak Electronics, 98A (P), West Green Road (side door), London N15 5NS. Tel. 01-800 8656.

VALVES, VALVES & MORE VALVES. Large stocks 1930-1974, many obsolete. Also available many types of transistors and styli. Price lists available, 15p. Cox Radio, The Parade, East Wittering, Sussex. West Wittering 2023.

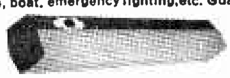
OSCILLOSCOPES: Telequipment 720; damaged Cossor 1049 Mk. III, £30 pair. 0628 21268 (Maidenhead) evenings.

B.B.C. GECOPHONE crystal set with loading coil and headphones. Morgan, 13 Devon Place, Mumbles, Swansea.

Miscellaneous

MINI ACCUMULATORS

2 volt **MULTI-USE** Sealed Lead Acid Rechargeable Cells.
Size L450—1·4" x 1·1" x ·44". 3 for £1·85 inc. P. & P.
Size GA2—1·7" x 1·3" x ·5". 3 for £2·35 inc. P. & P.
GARFIELDS, 269 Rye Lane, London, S.E.15

LOWEST COST IC SOCKETS. Use Soldercon IC socket pins for 8 to 40 pin DIL's. Make 8 pin sockets for 4p, 14 pin for 7p (at 300 pin price). 70p for strip of 100 pins, £1·50 for 3 x 100 £4 for 1000. 10p p&p for orders under £2. Add 8% VAT. Instructions supplied—send sae for sample. SINTEL, 53n Aston Street, Oxford. Tel: 0865 43203.

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

£5·50 inc. VAT & Post. List price £7·02 inc. VAT
SALOP ELECTRONICS 23 Wyle Cop, Shrewsbury, Shropshire Tel. 53206

"VINTAGE RADIO 1887-1929", £3·15 soft cover, £4·15 hard cover. "Gernsbacks 1927 Radio Encyclopaedia", £5·65 soft cover, £7·15 hard cover. All post paid. These two brilliant American publications about early radio are now available in the U.K. from: Tudor Rees's, Antique Wireless Service, 64 Broad Street, Staple Hill, Bristol. Tel: 0272 565472.

HEADPHONES: 8 ohms. Suitable communications receivers, £3·39. Partridge Electronics Ltd., Broadstairs, Kent.

BUILD THE STEREO FM TUNER
PW **SANDOWN**
LOOK
- PCB & Cmpnts Inc.TR & BOX ... £ 26.32
- Push Button Unit. 6 Position ... £ 2.97
- METERS, Tuning & Level ... each £ 1.50
- Subminiature Switches ... set of 4 £ 2.62
- Cabinets & Front Panels ... to order
- VAT INCLUSIVE PRICES P & P 25p

S.A.E. for further details
FW ELECTRONICS, 40 TUDDENHAM RD, IPSWICH, SUFFOLK IP4 2SL. Mail Order only

SUPERB INSTRUMENT CASE by Bazelli, manufactured from heavy duty PVC faced steel. Hundreds of Radio, Electronics and Hi-Fi enthusiasts are choosing the case they require from our range of over 200 models. Generous trade discount. Fast despatch. Free literature, Bazelli, Department No. 25, St. Wilfrids, Foundry Lane, Halton, Lancaster LA2 6LT.

Synthesiser "Sounds Supreme"
by Dewtron (VAT extra.)
Famous kits, e.g. waa-waa complete kit £3·50; Fuzz kit £5·50. P & P 25p under £10. Ring Modulator modules £9. "Mister Bassman" Bass Pedal Units and whole range of synthesiser modules, musical novelties, etc. Catalogue 15p from D.E.W. Ltd., 254 Ringwood Road, Ferndown, Dorset.

EX-EQUIPMENT COMPONENTS. Indicators modifiable to aerial direction monitors, chokes, relays, switches, instruments, fuse holders, push buttons, caps, etc. SAE for list. Eldun Electronics, 16 Raven Road, Timperley, Cheshire.

SIMPLE TO FORM
NON-MAGNETIC RUST PROOF
MILL FINISH
ALUMINIUM
FLAT MINI SHEETS
10ins. x 14ins. 20 swg (0.90mm.)
6 sheets for £2 incl P&P
OTHER SIZES AVAILABLE
For general car repairs, trims, kick plates, etc.
BAYKIN ENGINEERING LTD.
GREVILLE ROAD, BEDMINSTER, BRISTOL, BS3 1LL

LOUD 6v SIRENS. For Burglar Alarms, etc. (new and boxed), £1·20; add 10p P.P. List 6p. Grimsby Electronics, 64 Tennyson Road, Cleethorpes, South Humberside. (Callers to Lambert Road, Saturdays only.)

HAVE YOU HAD YOUR CHIPS? AY-5-1224 Digital Clock chip now £3·95 inc. VAT, post free. Circuit and details s.a.e. GREENBANK ELECTRONICS (Dept. 322), 94 New Chester Road, Wirral, Merseyside L62 5AG.

DON'T LOOK
unless you can resist the temptation to get these super 'attention-getters'!
- ★ Pocket-sized **MAXI-VOLT** Big ½inch Spark Generator (instant 15,000 volts!). Ready-made, needs no batteries. Carry it around anywhere. Only weighs about 3 oz. (89g.) send **£1·90** for your Maxi-Volt now!
- ★ Unique **TRANSMITTER/RECEIVER** Kit. No licence examinations or tests required to operate this transistorised equipment. Easy to build. Get transmitting. Send **£6·90** for yours now!
- ★ Psychedelic **MINI-STROBE** Kit. Take a pocket-sized lightning storm to Disco's & parties. 'Brain-freeze' 'em with vari-speed stop-motion flashes. Includes super case too. Send **£2·90** now!

(all prices include V.A.T., packing & postage.)
Send remittance to:
BOFFIN PROJECTS, 4 CUNLIFFE ROAD, STONELEIGH, EWELL, SURREY
(*Mail order U.K. only*)
Or for more details, send 20p for lists

PRINTED CIRCUIT MANUFACTURERS OFFER, PCBs for All PE and PW projects published after June '74, at one price 70p each. Any 5, £2·85. PCB sets for: PW Tele-tennis, £3·50. Sandown Tuner with screens, £2·20. PE CCTV, £1·45, Power Slaves, £1·35; Scorpio Ignition, 'WW' Ferret Metal Locator, 65p each. CWO Prices inclusive. PRODUCTION SPACE AVAILABLE FOR: PCB production, PCB and electronic design, electroplating, silk-screening, roller tinning, photography and all artwork. Estimates by return post or phone. WKF Electronics Wellbeck Street, Whitwell, Worksop, Notts. Tel: 695.

BUILD THE **TREASURE TRACER MK III** Metal Locator

- Varicap tuning
- Britain's best selling metal locator kit
- Weighs only 22oz.
- Speaker and earphone operation
- Knocks down to only 17in.
- Prebuilt search coil assembly
- Ministry approved design
- As seen on BBC1 and BBC2 TV
- You only need soldering iron, screwdriver, pliers and snips
- Five transistor circuit

Send s.a.e. for leaflet
Complete Kit **£9·80** P & P 60p + 78p VAT
Built, tested and guaranteed **£13·75** P & P 60p, + £1·10 VAT
MINIKITS ELECTRONICS, 6a CLEVELAND ROAD, LONDON, E18 2AN (Mail order only)

HARDWARE. Comprehensive range of screws, nuts, washers, etc. in small quantities, and many useful Constructors' items. Sheet aluminium to individual requirements, punched, drilled, etc. Fascia panels, dials, nameplates in etched aluminium. Printed circuit boards for this magazine and other individual requirements, one-offs and small runs. Machine engraving in metals and plastics, contour milling. Send 2 x 4½p stamps for catalogue. Ramar Constructor Services, Masons Road, Stratford on Avon, Warwicks., CV37 9NF.

WATFORD ELECTRONICS

35 CARDIFF ROAD, WATFORD, HERTS, ENGLAND
MAIL ORDER. CALLERS SATURDAYS ONLY
C.W.O. Please. P. & P. add 15p to orders under £3. Prices exclusive of VAT

ALL DEVICES BRAND NEW AND FULLY GUARANTEED. ORDERS DESPATCHED BY RETURN OF POST. TERMS OF BUSINESS: CASH/CHEQUE/P.O.s OR BANKERS DRAFT WITH ORDER. GOVERNMENT AND EDUCATIONAL INSTITUTIONS OFFICIAL ORDERS ACCEPTED. TRADE AND EXPORT INQUIRY WELCOME. P & P ADD 15p TO ORDERS UNDER £3·00. OVERSEAS ORDERS POSTAGE AT COST, AIR/SURFACE PRICES EXCLUSIVE OF VAT.

Send 10p postage for our comprehensive catalogue

TRANSISTORS (less 10% for 25+ of one type)

AC125	13p	BC149C	8p	BF181	33p	OC82	15p	2N1132	20p	2N3819	24p
AC126	11p	BC157	13p	BF184	22p	OC83	20p	2N1301	20p	2N3820	38p
AC127	11p	BC158	11p	BF185	22p	OC140	100p	2N1302	20p	2N3823	60p
AC128	11p	BC159	13p	BF194	10p	OC201	70p	2N1303	20p	2N3904	15p
AC176	11p	BC167	12p	BF195	10p	OC202	80p	2N1304	24p	2N3905	17p
AC187	12p	BC168	12p	BF196	12p	TIP29	43p	2N1305	24p	2N3906	17p
AC188	11p	BC169	12p	BF197	15p	TIP29A	45p	2N1306	24p	2N4037	35p
ACY17	35p	BC170	11p	BF257	32p	TIP30	48p	2N1307	24p	2N5457	30p
ACY19	25p	BC171	11p	BF595	18p	TIP30A	54p	2N1893	30p	2N5458	30p
ACY20	24p	BC172	11p	BFX86	21p	TIP31	54p	2N1990	45p	2N5459	30p
ACY21	29p	BC177	16p	BFX88	22p	TIP32	64p	2N2217	23p		
ACY22	16p	BC178	16p	BFY50	15p	TIP33	95p	2N2303	25p		
AD140	48p	BC179	18p	BFY51	15p	TIP34	130p	2N2483	30p		
AD149	48p	BC182	10p	BFY52	15p	TIP41A	68p	2N2646	31p		
AD161	78p	BC183	10p	BFY53	17p	TIP42	70p	2N2906	15p	**DIODES**	
AD162	78p	BC184	11p	BSX20	16p	TIP42A	74p	2N2907	18p	AA120	10p
AF114	13p	BC212	12p	BU105	£2·20	TIS43	26p	2N2926R	9p	BY100	18p
AF115	13p	BC213	12p	MJE370	63p	TIS44	17p	2N2926O	9p	BY164	35p
AF116	18p	BC214	17p	MJE371	78p	ZTX107	10p	2N2926Y	9p	BYZ11	25p
AF117	13p	BCY42	28p	MJE520	62p	ZTX108	10p	2N2926G	9p	OA5	38p
AF118	40p	BCY43	25p	MFP102	30p	ZTX109	12p	2N3053	18p	OA9	9p
AF121	33p	BCY58	18p	MPF103	30p	ZTX300	12p	2N3054	42p	OA79	10p
AF124	30p	BCY59	18p	MPF104	30p	ZTX301	14p	2N3055	45p	OA81	8p
AF125	30p	BCY70	15p	MPF105	35p	ZTX302	18p	2N3614	59p	OA85	13p
AF126	30p	BCY71	18p	OC26	40p	ZTX304	22p	2N3615	65p	OA90	6p
AF127	30p	BCY72	12p	OC28	48p	ZTX311	10p	2N3702	12p	OA91	6p
AF139	33p	BD131	40p	OC35	48p	ZTX341	19p	2N3703	12p	OA200	6p
AF181	45p	BD132	40p	OC36	52p	ZTX500	15p	2N3704	12p	OA202	6p
AF186	48p	BD137	45p	OC41	15p	ZTX502	18p	2N3705	12p	PL4001	6p
AF239	38p	BD145	55p	OC42	15p	ZTX504	42p	2N3706	10p	PL4004	6p
BC107	9p	BDY60	59p	OC44	11p	ZTX531	23p	2N3707	10p	PL4007	6p
BC108	9p	BDY61	53p	OC45	11p	ZTX550	18p	2N3708	8p	1N914	5p
BC108B	11p	BF115	22p	OC70	11p	2N706	11p	2N3709	8p	1N4001/2	5p
BC109	10p	BF177	26p	OC71	11p	2N708	16p	2N3710	9p	1N4003	6p
BC109C	11p	BF178	28p	OC72	11p	2N918	40p	2N3771	140p	1N4004/5	6p
BC147	7p	BF179	33p	OC74	28p	2N930	18p	2N3772	160p	1N4006/7	7p
BC148	7p	BF180	33p	OC81	24p	2N1131	20p	2N3773	240p	1N4148	5p

TTL 74 DIGITAL ICs

Discounts Less 5% for 15+ mixed
Less 10% for 25+ mixed
Less 15% for 50+ mixed

7400	15p	7428	38p	7473	33p	74121	32p
7401	15p	7430	15p	7474	32p	74123	63p
7402	15p	7432	25p	7475	47p	74141	75p
7403	15p	7433	36p	7476	32p	74151	69p
7404	18p	7437	27p	7480	44p	74153	69p
7405	18p	7438	27p	7481	99p	74155	69p
7406	38p	7440	15p	7482	75p	74156	70p
7407	38p	7441	75p	7483	83p	74160	101p
7408	15p	7442	65p	7484	90p	74166	143p
7409	15p	7443	120p	7485	125p	74167	315p
7410	15p	7444	105p	7489	334p	74170	215p
7411	20p	7445	86p	7490	47p	74172	540p
7412	20p	7446	105p	7491	80p	74176	103p
7413	35p	7447	100p	7492	48p	74180	106p
7414	60p	7448	86p	7493	47p	74184	160p
7416	35p	7450	15p	7495	63p	74185	169p
7417	35p	7451	15p	7496	72p	74190	160p
7420	15p	7453	15p	74100	135p	74191	160p
7422	24p	7454	15p	74104	40p	74192	128p
7423	27p	7460	15p	74105	40p	74193	128p
7425	27p	7470	30p	74107	33p	74198	210p
7426	27p	4772	26p	74110	43p	74199	210p

SPECIAL OFFER
While stocks last

709C 8 pin	27p
723C 14 pin	50p
741C 8 pin	26p
748C 8 pin	26p
TBA 800	95p
ZN 414	105p

OPTO ELECTRONICS
Minitrons 3105F
7 seg display 110p
OCP70 40p
OCP71 85p
ORP12 58p
ORP60 45p
ORP61 46p

LED TIL 209 (Red) (with socket) 18p
2N5777 40p

LINEAR IC'S (less 5% 50+ mixed)

709C	27p	LM300	170p
723C	50p	LM380	100p
741C	26p	MC724	60p
747C	80p	MC1303L	130p
748C	26p	MC1304P	360p
7805 (Reg.)	160p	MC1310P	240p
AY-1-0212	5·50p	MC1710CG	60p
AY-1-5051	1·15p	MFC4000B	39p
CA3018	72p	MLM309K	158p
CA3020	140p	NE555	55p
CA3035	135p	NE562	310p
CA3036	90p	PA263	195p
CA3046	55p	TBA810	150p
CA3048	210p	SL403D	150p
CA3075	150p	SL414A	150p
CA3081	150p	SN76033	250p
CA3089E	199p	SN76115	250p
CA3090Q	310p	TAD100	140p
		TBA800	95p
		ZN414	150p

BRIDGE RECTIFIER
(plastic case)
1A50V 20p
1A100V 21p
1A600V 25p
2A50V 30p
2A100V 35p
2A400V 44p
2A600V 45p
4A800V 90p
6A100V 58p
6A400V 75p
6A600V 87p

ZENER DIODES
Range
3·3V – 33V
400mW 9p
1·3W 17p

SCR (Thyristor)
1A 50V 38p
1A 100V 42p
1A 400V 52p
1A 600V 70p
3A 100V 44p
3A 400V 75p
3A 600V 91p
7A 600V 109p
16A 400V 99p

TRIACS
400V 3A 85p
500V 3A 120p
400V 6A 120p
500V 6A 150p

DIAC
ST2 25p

DIL SOCKETS
8 pin 14p
14 pin 14p
16 pin 15p
24 pin 75p

ALUM. BOXES
2¾x5¼x1½" 45p
4x4x1½" 45p
4x2¾x1½" 45p
4x5¼x1½" 48p
4x2¼x2" 50p
3x2x1" 38p
7x5x2½" 78p
8x6x3" 99p
10x7x3" 118p
10x4½x3" 99p
12x5x3" 120p
12x8x3" 150p

FUSES AND HOLDERS
20mm 150mA–5A 3p
1" 2A–13A mains 4p
1¼" 250mA–15A 3p
Panel Holder Single 6p
Chassis Holder 20mm 16p
Chassis Holder 1¼" 22p

ENAMEL COPPER WIRE (2oz reel)
16, 18, 20, 22 SWG 32p
24, 26, 28, 30 SWG 39p
32, 34, 36, 40 SWG 48p

FERRITE RODS: ⅜" diam.
2" – 8p; 5½" – 12p; 6⅞" – 16p

STEREO JUNCTION BOXES
Provides multiple output to your Amplifier.
JB31: 4 outputs. 2 for two sets of stereo headphones and 2 for two speakers.
Price: £1·48 only.
JB11D: Has output for two sets of stereo headphones, 2 speakers and 3 position switch for headphones, loudspeakers or both.
Price: £1·95 only.

AIRCRAFT BAND CONVERTOR
Mod. VHF 105
Enjoy listening to Aircraft band by merely placing it beside a radio.
Price: £4·75 p & p 15p.

STEREO HEADPHONES
Light weight, 8 ohm impd. attractive, Dynamic.
Price: £3·00 p & p 15p.

POLYESTER CAPACITORS: Axial lead type. (Values are in μf).
400V: 0·001, 0·0012, 0·0015, 0·0018, 0·0022, 0·0033, 0·0047, 0·0068, 0·01 **3p**; 0·015, 0·022, 0·033, 0·047, 0·068, 0·1 **4p**; 0·15, 0·22, **7p**; 0·33, **10p**; 0·47, **13p**; **160V:** 0·1, 0·15, **4p**; 0·22 **5p**; 0·33 **6p**; 0·47 **9p**; 0·68 **10p**; 1·0 **13p**. **250V:** 0·22 **6p**; 0·33 **8p**; 0·68 **12p**; 0·47 **9p**; 2·2 **18p**.

RADIAL LEAD P.C. TYPE (Values are in μf).
250V: 0·01, 0·015, 0·022, **3p**; 0·033, 0·047, 0·068, **3½p**; 0·1 **4p**; 0·15 **4p**; 0·22, 0·33 **5p**; 0·47 **7p**; 0·68 **10p**; 1·0 **11p**; 1·5 **20p**; 2·2 **22p**.

ELECTROLYTIC CAPACITORS. Axial lead type (Values are in μf)
63V: 0·47, 1·0, 1·5, 2·2, 3·3, 4, 4·7, 6·8, 10, 15, 20, 22, 47, 68, **6p**, 100, **12p**. **40V:** 100, **6p** **30V:** 3500, **35p**. **25V:** 68, 150, **6p**; 220, **11p**; 470, **13p**. **25V:** 680, **18p**: 1000, **24p**; 2200, **34p**, 3000, **33p**. **16V:** 40, 125, 250, **6p**. **16V:** 1000, 1500, **16p**. **10V:** 4, 100, **5p**; 640, **10p**; 1000; **14p**; 2200, **18p**.

POTENTIOMETERS (AB) Carbon
Track, 0·25W Log & 0·5W Linear values
1KΩ–2MΩ single gang 14p
5KΩ–2MΩ single gang D/P switch 23p
2KΩ–2MΩ dual gang stereo 42p

SLIDER POTENTIOMETERS
0·25W log and linear values
5KΩ–500KΩ single gang 35p
10K–500K ohm Dual gang 50p
KNOBS for above Black or Silvered 8p

PRESET POTENTIOMETERS
0·1W 50Ω–1MΩ 5p
0·25W 100Ω–2MΩH 6p
0·25W kΩ–2MΩV 6p

TANTALUM BEAD CAPACITORS
25V: 0·1μF, 0·2, 0·47, 1·0, 2·2, 4·7, 6·8
35V: 0·1μF, 0·2, 0·47, 1·0, 2·2, 4·7
20V: 10μF; 16V: 22μF; 10V: 33μF, 22μF. 6V: 33μF, 47μF; 3V: 47μF, 100μF.
Price: 10p each.

MYLAR FILM CAPACITORS
100V: 0·001, 0·002, 0·005, 0·01μF 3p
0·015, 0·02, 0·04, 0·05μF 4p
0·15, 0·2 100V 50V: 0·47μF 6p

CERAMIC CAPACITORS
50V d.c. Plaquette body 25mm leads.
Range: 5pf–10,000pf 2p.
0·015μf, 0·022μf, 0·033μf, 0·047μf 3p

QUALITY RESISTORS. ERIE MAKE
Small Size, High Stability, Low Noise

Type	Pwr	Tol.	Range	Val.	PRICE 1-49	50-100	100+
Carbon	¼W	5%	2·2Ω–10M	E24	1p	0·8p	0·7p
Carbon	½W	5%	2·2Ω–10M	E12	1p	0·8p	0·7p
Carbon	1W	5%	2·2Ω–10M	E12	2·5p	2p	—
WW	4W	10%	2·2Ω–100Ω	E12	8p	7p	—

Quantity price applies to resistors of each value not mixed.

JACKSONS DIELECTRIC TUNING CAPACITORS
100pf 80p
300pf 88p
500pf 95p

JACK PLUGS / SOCKETS

	Jack Plugs: Screened chrome	Jack Plugs: Plastic body	Sockets: Open metal	Sockets: Moulded with break contacts
2·5mm	10p	8p	8p	
3·5mm	14p	10p	8p	
Standard Mono	17p	13p	13p	17p
Standard Stereo	30p	18p	15p	25p

	PLUGS	SCKTS.	CLPLRS.
DIN 2PIN LOUDSPEAKER TYPE. 3, 4, 5 (180° & 240°) 6PIN	12p	8p	15p
CO-AXIAL (TV)	10p	8p	15p (f.f.)
PHONO assorted colours	6p	5p (sgl.) 7p (dbl.) 10p (trpl.)	9p
BANANA	7p	7p	—

PANEL METERS
60mm x 46mm x 35mm requires 1½" hole
FULL SCALE
ME 6 0–50μA
ME 7 0–100μA
ME 8 0–500μA
ME 9 0–1mA
ME 10 0–5mA
ME 11 0–10mA
ME 12 0–50mA
ME 13 0–100mA
ME 14 0–500mA
ME 15 0–1 amp
ME 16 0–50V AC
ME 17 0–300V AC
ME 18 "S" Meter
ME 19 "VU" meter
Price £2·48, p & p 10p

SWITCHES
TOGGLE: SPST 18p
DPDT 22p

SUB-MIN TOGGLE
SP changeover 40p
SPST on/off 45p
DPDT 6 Tag 64p
SLIDE:
1A DP 250V 10p
1A DP 250V 12p
½A DP 250V 9p

PUSH BUTTON: Miniature push to make or break non locking 15p
ROCKER (white): 10A 250V SP changeover centre off 25p
ROCKER: Illuminated (white) incorporates neon lights when on 45p
ROTARY SWITCH: 1 pole/12way 2p/6w, 2p/2w, 2/p4w, 3p/3w 3p/4w, 4p/2w, 4p/3w 24p

R.F.C. CHOCKES
1·5mH 15p
2·5mH 15p

HEAT SINKS
Low Power
To5 15p
To18 15p
To66 (TV2) 15p
To1 (H13) 5p

TRANSFORMERS MAINS
Primary 220–240V

6–0–6 (miniature	100mA	90p
9–0–9 (miniature)	100mA	90p
12–0–12 (miniature)	100mA	90p
18–0–18 also 24V	100mA	90p
24–0–24V	500mA	220p
30-24-20-15-12-0	2A	340p
Pulse Transformer PT ATA		85p

LAMP HOLDERS AND LAMPS
LES HOLDER Dome shaped, Red, Blue, Green, Yellow, White 14p
LES BULBS 6v and 12v 6p
MES HOLDERS Chrome cover, Red or Amber, Jewelled top 28p
MES BULBS 3·5V 6V and 24V 6p
NEON: RED round top 250V 21p
NEON: ½" square top, red, green, amber. Req. ⅜" hole 21p

VEROBOARD

Pitch	0·1 (copper	0·15 clad)	0·15 (plain)
2½x3¾"	30p	23p	14p
2½x5"	32p	32p	15p
3¾x3¾"	32p	32p	—
3¾x5"	38p	38p	26p
2½x17"	96p	75p	53p
3¾x17"	130p	105p	79p
4¾x17"	173p	—	109p

Pkt of 36 pins 22p
Spot face cutter 48p
Pin Insertion tool 99p

KNOBS (To fit ¼" shaft)
K1 Black or white pointer type 9p
K2 Slim silvered aluminium 10p
K3 Black 1¼" with chrome rim 15p
K4 Black serrated. Metal top with line indicator 33m diam. 18p
K5 Black fluted metal top and skirt calibrated 0–10. 37mm dia. 20p
K6 PK2 as K5 with pointer on skirt 20p
K7 Black, knurled, tapered. Metal top and skirt. Calibrated 0–10, 30mm 20p
K8 Black or silvered for slider pot 9p

INDEX TO ADVERTISERS

FREE!

Practical Radio & Electronics Certificate course includes a learn while you build ***3 transistor radio kit.*** Everything you need to know about ***Radio & Electronics*** maintenance and repairs for a ***spare time income*** and a ***career*** for a better future.

Over 150 ways to engineer a better future

HIGHER PAY
A BETTER JOB
SECURITY

find out how in just 2 minutes

That's how long it will take you to fill in the coupon. Mail it today and we'll send you full details and a free book. We have successfully trained thousands of men at home—equipped them for higher pay and better, more interesting jobs. We can do as much for YOU. A low-cost home study course gets results fast—makes learning easier and something to look forward to. There are no books to buy and you can pay-as-you-learn.

Why not do the thing that really interests you? Without losing a day's pay, you could quietly turn yourself into something of an expert. Complete the coupon (or write if you prefer not to cut the page). No obligation and nobody will call in on you . . . but it could be the best thing you ever did.

Others have done it, so can you

"Yesterday I received a letter from the Institution informing that my application for Associate Membership had been approved. I can honestly say that this has been the best value for money I have ever obtained, a view echoed by two colleagues who recently commenced the course". Student D.I.B., Yorks.
"Completing your course, meant going from a job I detested to a job that I love, with unlimited prospects"—Student J.A.O. Dublin.
"My training quickly changed my earning capacity and, in the next few years, my earnings increased fourfold". Student C.C.P., Bucks.

FIND OUT FOR YOURSELF

These letters and there are many more on file at Aldermaston College, speak of the rewards that come to the man who has given himself the specialised know-how employers seek. There's no surer way of getting ahead or of opening up new opportunities for yourself. It will cost you a stamp to find out how we can help you. **Write to**

ALDERMASTON COLLEGE

Dept. RPW02, Reading RG7 4PF.

HOME OF BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

CUT OUT THIS COUPON

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

MECHANICAL
Society of Engineers—A.M.S.E. (Mech) ☐
Institute of Engineer & Technicians (A.M.I.E.) ☐
CITY & GUILDS
Gen. Mech. Eng. ☐
Maintenance Eng. ☐
Welding ☐
Gen. Diesel Eng. ☐
Sheet Metal Work ☐
Eng. Inspection ☐
Eng. Metallurgy ☐

ELECTRICAL & ELECTRONIC CITY & GUILDS
Gen. Electrical Engineering ☐
Electrical Installations ☐
Electrical Maths ☐
Computer Electronics ☐
Electronic Eng. ☐
Practical Radio & Electronics (with kit) ☐

MANAGEMENT & PRODUCTION
Institute of Cost & Management Acctnts. ☐
Computer Programming ☐
Works M'ment ☐
Work Study ☐
Gen. Production Eng. ☐
Estimating & Planning ☐
Storekeeping ☐
Management Skills ☐
Quality Contro ☐

DRAUGHTSMANSHIP
Institute of Engineering Designers (A.M.I.E.D.) ☐
General Draughtsmanship ☐
Elec. Draughtsmanship ☐
Architectural Draughtsmanship ☐
Technical Drawing ☐

RADIO & TELECOMMUNICATIONS
City & Guilds Telecoms. ☐
Gen. Radio & TV Eng. ☐
Radio Amateurs Exam ☐
Radio Servicing ☐

AUTOMOBILE & AERONAUTICAL
Institute of the Motor Industry ☐
A.M.I.I. ☐
MAA/IMI ☐
City & Guilds Auto Eng. ☐
Gen. Auto Eng. ☐
Motor Mechanics ☐
Auto Diesel Eng. ☐
Garage M'ment ☐
AEC Aero ☐
Engineering Exams ☐
Gen. Aero Eng. ☐

CONSTRUCTIONAL
Institute of Building L.I.O.B. ☐
A.B.T. Clerk of Works ☐

Construction Surveyors Institute L.C.S.I. ☐
City & Guilds General Building (all branches) ☐
Heating & Vent. ☐
Inst. Clerk of Works ☐
Site Surveying ☐
Health Engineering ☐
Road Construction ☐
Quantities Estimates ☐
Hydraulics ☐
Structural Eng. ☐

GENERAL
Agricultural Eng. ☐
Council of Eng. Institutions ☐
Farm Science ☐
Plastics ☐

Supplimentary courses for Nat. Certificates.

G.C.E. —choose from 58 'O' & 'A' level subjects

Coaching for many exams, including C & G

POST TODAY FOR A BETTER TOMORROW

To **Aldermaston College,**
Dept. RPW02, Reading RG7 4PF.

NAME ....
Block capitals please
ADDRESS ....
....
.... POSTCODE ....
OTHER SUBJECTS ....
.... AGE ....

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

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. Publisher's subscription rate (including postage): for one year UK £3·85, Overseas £4·95 ($13·50 USA/Canada) International Giro facilities Account No. 5122007. Please state reason for payment "message to payee". Practical Wireless is sold subject to the following conditons, 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.

1037

130 LOVE