

SEPT  
1977

# practical WIRELESS

40p

THE



## 'jubilee'

ELECTRONIC ORGAN  
Part-1



Also:

IC CAR VOLTAGE REGULATOR

GP SHORT-WAVE RECEIVER-1

New  
Series

DESIGN YOUR OWN PROJECTS  
PASSING THE RADIO AMATEURS EXAM.

# T.T.L. 74 I.C.'s By TEXAS, NATIONAL, I.T.T., FAIRCHILD Etc

7400 14p	7413 30p	7432 25p	7454 15p	7490 35p	74121 25p	74139 100p	74156 70p	74174 100p	74189 350p
7401 14p	7414 60p	7437 15p	7460 15p	7491 75p	74122 40p	74141 60p	74157 70p	74175 75p	74190 140p
7402 14p	7416 30p	7438 25p	7470 30p	7492 45p	74123 60p	74142 20p	74160 90p	74176 100p	74191 140p
7403 14p	7417 30p	7440 15p	7472 25p	7493 40p	74125 50p	74143 270p	74161 90p	74177 100p	74192 120p
7404 14p	7420 15p	7441 65p	7473 30p	7495 60p	74126 50p	74144 270p	74162 90p	74178 140p	74193 120p
7405 14p	7422 20p	7442 65p	7474 30p	7496 70p	74130 130p	74145 75p	74163 90p	74179 140p	74194 100p
7406 40p	7423 25p	7445 80p	7475 30p	74100 95p	74131 100p	74146 230p	74164 125p	74180 100p	74195 100p
7407 40p	7425 25p	7446 85p	7476 30p	74105 40p	74132 65p	74148 160p	74165 125p	74181 200p	74196 100p
7408 20p	7426 25p	7447 75p	7477 30p	74109 50p	74133 100p	74150 120p	74166 125p	74182 75p	74197 100p
7409 20p	7427 25p	7448 70p	7483 85p	74117 30p	74134 80p	74151 60p	74167 325p	74183 150p	74198 185p
7410 15p	7428 40p	7449 15p	7485 100p	74120 90p	74135 125p	74152 70p	74168 200p	74184 350p	
7411 20p	7430 15p	7451 15p	7486 30p						
7412 20p		7453 15p	7489 250p						

## SEMICONDUCTORS by MULLARD, TEXAS, MOTOROLA, SIEMENS, I.T.T., R.C.A.

AA113 10p	BA138 16p	BC188B 14p	BC348C 14p	BF123 45p	BF336 35p	BY164 50p	OC140 150p	TIP35A 230p	2N1305 30p
AA144 10p	BA148 16p	BC188C 15p	BC349B 13p	BF125 45p	BF337 35p	BYX94 8p	OC171 40p	TIP36C 280p	2N1306 38p
AAZ17 30p	BA154 12p	BC169C 15p	BC349C 14p	BF127 50p	BF363 60p	C1120 30p	OC200 80p	TIP36A 350p	2N1308 50p
AC121 30p	BA157 15p	BC171 15p	BC357 13p	BF128 50p	BF364 60p	C1164 20p	ORP12 70p	TIP41A 70p	2N1711 22p
AC126 19p	BA173 15p	BC172C 12p	BC374 30p	BF167 25p	BF368 20p	E100 45p	R1039 150p	TIP41B 75p	2N2219A 25p
AC127 19p	BA216 16p	BC178A 16p	BCV70 15p	BF173 25p	BF379 30p	E300 47p	E430 125p	TIP42A 80p	2N2463 30p
AC127/01 25p	BA316 16p	BC182 10p	BCV71 15p	BF179 35p	BF381 130p	E300 47p	OA31 6p	TIP42A 80p	2N2506 18p
AC128 18p	BA316 16p	BC182L 12p	BCV72 15p	BF179C 40p	BF384 25p	MJE340 45p	TIP29A 47p	TIP42B 85p	2N2907 20p
AC151 25p	BA316 16p	BC183 10p	BD121 85p	BF180 30p	BF385 30p	MPSA06 25p	TIP30 75p	TIP295 70p	2N3053 20p
AC153K 40p	BA316 16p	BC183L 12p	BD123 100p	BF181 30p	BF387 25p	OA10 40p	TIP30A 58p	TIP305 55p	2N3054 50p
AC176 20p	BB110 45p	BC184 10p	BD124 85p	BF182 30p	BF388 25p	OA47 15p	TIP30B 65p	TIP305 55p	2N3055 60p
ACY17 35p	BC107 10p	BC184L 12p	BD132 35p	BF183 30p	BF390 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
ACY21 30p	BC108 10p	BC186 24p	BD133 35p	BF184 25p	BF391 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AD149 60p	BC108C 15p	BC205 14p	BD132 35p	BF184 25p	BF391 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AD161 40p	BC109 10p	BC212 11p	BD135 40p	BF195 10p	BF392 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AD182 40p	BC109C 14p	BC213L 12p	BD136 40p	BF196 10p	BF393 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AD161/2MP 90p	BC113 12p	BC213L 12p	BD137 40p	BF197 10p	BF394 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF114 22p	BC117 19p	BC214 13p	BD139 38p	BF199 25p	BF395 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF115 22p	BC125 20p	BC214L 14p	BD140 40p	BF200 30p	BF396 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF116 22p	BC126 15p	BC258 13p	BD141 40p	BF201 30p	BF397 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF117 22p	BC146 12p	BC294 35p	BD181 80p	BF224 20p	BF425 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF118 50p	BC148 10p	BC303 55p	BD182 80p	BF225 20p	BF426 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF125 25p	BC148C 14p	BC317 15p	BD207 70p	BF226 20p	BF427 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF139 35p	BC149 10p	BC323 60p	BD263 65p	BF227 20p	BF428 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
AF239 45p	BC157 10p	BC328 13p	BD263 65p	BF258 26p	BF429 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
ASV26 40p	BC158 10p	BC338 12p	BD263 65p	BF259 26p	BF430 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
BA114 9p	BC159 10p	BC347 12p	BD263 65p	BF260 26p	BF431 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
BA121 9p	BC167A 12p	BC347B 12p	BD263 65p	BF274 15p	BF432 20p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p
		BC347B 12p	BD263 65p	BF324 30p	BF433 22p	OA81 6p	TIP30C 80p	TIP305 55p	2N3439 50p

**BZY88**  
400M.W.  
Zeners  
OV7 10p  
2V4 10p  
2V7 10p  
3V0 10p  
3V3 10p  
3V6 10p  
3V9 10p  
4V7 10p  
5V1 10p  
5V6 10p  
6V2 10p  
6V8 10p  
7V5 10p  
8V2 10p  
9V1 10p  
10V 10p  
11V 10p

**CA3090AQ** 400p  
TAA300 150p  
TAA350 190p  
TAA550 50p  
TAA570 220p  
TAA661B 140p  
TAA700 390p  
TAD100 250p  
TAD110 200p  
TBA120S 125p  
TBA120T 125p  
TBA540 300p  
TBA540Q 400p  
TBA550Q 400p  
TBA560 400p  
TBA641A12 250p  
TBA720 230p  
TBA800 100p  
TBA820 100p  
TBA990 250p  
TCA270Q 250p  
TCA270S 250p

**ELECTROLYTIC CAPACITORS**  
µF/V  
-47/25 5p  
1/16 5p  
1/25 5p  
1/50 5p  
2-2/25 5p  
3-3/25 5p  
4-7/10 5p  
4-7/16 5p  
4-7/25 5p  
4-7/50 5p  
6-8/25 5p  
10/10 5p  
10/16 5p  
10/25 5p  
10/35 5p  
10/50 5p  
22/6V3 5p  
22/10 5p  
22/16 5p  
22/25 5p  
22/35 5p  
22/50 5p  
33/6V3 5p  
33/16 6p  
33/25 6p  
33/40 6p  
33/50 7p  
47/10 6p  
47/16 6p  
47/25 6p  
47/35 6p  
10/50 7p  
100/16 6p  
100/25 6p  
100/35 6p  
100/50 8p  
125/16 6p  
220/16 6p  
220/25 6p  
220/35 6p  
220/50 6p

**POLYMER CAPITORS**  
µF  
-001 5p  
-0022 5p  
-0033 5p  
-0047 5p  
-0068 5p  
01 5p  
022 5p  
033 5p  
047 5p  
1 6p  
22 7p  
33 9p  
47 12p  
100 20p  
200 25p  
470 35p  
1000 50p

**SPECIAL OFFERS**  
BC147 100 ASSOR-TED FOR £7.50p  
BC148  
BC149  
BC157  
BC158  
BC159  
BF184  
BF185  
BF186  
BF187  
BF188  
BF189  
BF190  
BF191  
BF192  
BF193  
BF194  
BF195  
BF196  
BF197  
BF198  
BF199  
BF200  
BF201  
BF202  
BF203  
BF204  
BF205  
BF206  
BF207  
BF208  
BF209  
BF210  
BF211  
BF212  
BF213  
BF214  
BF215  
BF216  
BF217  
BF218  
BF219  
BF220  
BF221  
BF222  
BF223  
BF224  
BF225  
BF226  
BF227  
BF228  
BF229  
BF230  
BF231  
BF232  
BF233  
BF234  
BF235  
BF236  
BF237  
BF238  
BF239  
BF240  
BF241  
BF242  
BF243  
BF244  
BF245  
BF246  
BF247  
BF248  
BF249  
BF250  
BF251  
BF252  
BF253  
BF254  
BF255  
BF256  
BF257  
BF258  
BF259  
BF260  
BF261  
BF262  
BF263  
BF264  
BF265  
BF266  
BF267  
BF268  
BF269  
BF270  
BF271  
BF272  
BF273  
BF274  
BF275  
BF276  
BF277  
BF278  
BF279  
BF280  
BF281  
BF282  
BF283  
BF284  
BF285  
BF286  
BF287  
BF288  
BF289  
BF290  
BF291  
BF292  
BF293  
BF294  
BF295  
BF296  
BF297  
BF298  
BF299  
BF300  
BF301  
BF302  
BF303  
BF304  
BF305  
BF306  
BF307  
BF308  
BF309  
BF310  
BF311  
BF312  
BF313  
BF314  
BF315  
BF316  
BF317  
BF318  
BF319  
BF320  
BF321  
BF322  
BF323  
BF324  
BF325  
BF326  
BF327  
BF328  
BF329  
BF330  
BF331  
BF332  
BF333  
BF334  
BF335  
BF336  
BF337  
BF338  
BF339  
BF340  
BF341  
BF342  
BF343  
BF344  
BF345  
BF346  
BF347  
BF348  
BF349  
BF350  
BF351  
BF352  
BF353  
BF354  
BF355  
BF356  
BF357  
BF358  
BF359  
BF360  
BF361  
BF362  
BF363  
BF364  
BF365  
BF366  
BF367  
BF368  
BF369  
BF370  
BF371  
BF372  
BF373  
BF374  
BF375  
BF376  
BF377  
BF378  
BF379  
BF380  
BF381  
BF382  
BF383  
BF384  
BF385  
BF386  
BF387  
BF388  
BF389  
BF390  
BF391  
BF392  
BF393  
BF394  
BF395  
BF396  
BF397  
BF398  
BF399  
BF400  
BF401  
BF402  
BF403  
BF404  
BF405  
BF406  
BF407  
BF408  
BF409  
BF410  
BF411  
BF412  
BF413  
BF414  
BF415  
BF416  
BF417  
BF418  
BF419  
BF420  
BF421  
BF422  
BF423  
BF424  
BF425  
BF426  
BF427  
BF428  
BF429  
BF430  
BF431  
BF432  
BF433  
BF434  
BF435  
BF436  
BF437  
BF438  
BF439  
BF440  
BF441  
BF442  
BF443  
BF444  
BF445  
BF446  
BF447  
BF448  
BF449  
BF450  
BF451  
BF452  
BF453  
BF454  
BF455  
BF456  
BF457  
BF458  
BF459  
BF460  
BF461  
BF462  
BF463  
BF464  
BF465  
BF466  
BF467  
BF468  
BF469  
BF470  
BF471  
BF472  
BF473  
BF474  
BF475  
BF476  
BF477  
BF478  
BF479  
BF480  
BF481  
BF482  
BF483  
BF484  
BF485  
BF486  
BF487  
BF488  
BF489  
BF490  
BF491  
BF492  
BF493  
BF494  
BF495  
BF496  
BF497  
BF498  
BF499  
BF500  
BF501  
BF502  
BF503  
BF504  
BF505  
BF506  
BF507  
BF508  
BF509  
BF510  
BF511  
BF512  
BF513  
BF514  
BF515  
BF516  
BF517  
BF518  
BF519  
BF520  
BF521  
BF522  
BF523  
BF524  
BF525  
BF526  
BF527  
BF528  
BF529  
BF530  
BF531  
BF532  
BF533  
BF534  
BF535  
BF536  
BF537  
BF538  
BF539  
BF540  
BF541  
BF542  
BF543  
BF544  
BF545  
BF546  
BF547  
BF548  
BF549  
BF550  
BF551  
BF552  
BF553  
BF554  
BF555  
BF556  
BF557  
BF558  
BF559  
BF560  
BF561  
BF562  
BF563  
BF564  
BF565  
BF566  
BF567  
BF568  
BF569  
BF570  
BF571  
BF572  
BF573  
BF574  
BF575  
BF576  
BF577  
BF578  
BF579  
BF580  
BF581  
BF582  
BF583  
BF584  
BF585  
BF586  
BF587  
BF588  
BF589  
BF590  
BF591  
BF592  
BF593  
BF594  
BF595  
BF596  
BF597  
BF598  
BF599  
BF600  
BF601  
BF602  
BF603  
BF604  
BF605  
BF606  
BF607  
BF608  
BF609  
BF610  
BF611  
BF612  
BF613  
BF614  
BF615  
BF616  
BF617  
BF618  
BF619  
BF620  
BF621  
BF622  
BF623  
BF624  
BF625  
BF626  
BF627  
BF628  
BF629  
BF630  
BF631  
BF632  
BF633  
BF634  
BF635  
BF636  
BF637  
BF638  
BF639  
BF640  
BF641  
BF642  
BF643  
BF644  
BF645  
BF646  
BF647  
BF648  
BF649  
BF650  
BF651  
BF652  
BF653  
BF654  
BF655  
BF656  
BF657  
BF658  
BF659  
BF660  
BF661  
BF662  
BF663  
BF664  
BF665  
BF666  
BF667  
BF668  
BF669  
BF670  
BF671  
BF672  
BF673  
BF674  
BF675  
BF676  
BF677  
BF678  
BF679  
BF680  
BF681  
BF682  
BF683  
BF684  
BF685  
BF686  
BF687  
BF688  
BF689  
BF690  
BF691  
BF692  
BF693  
BF694  
BF695  
BF696  
BF697  
BF698  
BF699  
BF700  
BF701  
BF702  
BF703  
BF704  
BF705  
BF706  
BF707  
BF708  
BF709  
BF710  
BF711  
BF712  
BF713  
BF714  
BF715  
BF716  
BF717  
BF718  
BF719  
BF720  
BF721  
BF722  
BF723  
BF724  
BF725  
BF726  
BF727  
BF728  
BF729  
BF730  
BF731  
BF732  
BF733  
BF734  
BF735  
BF736  
BF737  
BF738  
BF739  
BF740  
BF741  
BF742  
BF743  
BF744  
BF745  
BF746  
BF747  
BF748  
BF749  
BF750  
BF751  
BF752  
BF753  
BF754  
BF755  
BF756  
BF757  
BF758  
BF759  
BF760  
BF761  
BF762  
BF763  
BF764  
BF765  
BF766  
BF767  
BF768  
BF769  
BF770  
BF771  
BF772  
BF773  
BF774  
BF775  
BF776  
BF777  
BF778  
BF779  
BF780  
BF781  
BF782  
BF783  
BF784  
BF785  
BF786  
BF787  
BF788  
BF789  
BF790  
BF791  
BF792  
BF793  
BF794  
BF795  
BF796  
BF797  
BF798  
BF799  
BF800  
BF801  
BF802  
BF803  
BF804  
BF805  
BF806  
BF807  
BF808  
BF809  
BF810  
BF811  
BF812  
BF813  
BF814  
BF815  
BF816  
BF817  
BF818  
BF819  
BF820  
BF821  
BF822  
BF823  
BF824  
BF825  
BF826  
BF827  
BF828  
BF829  
BF830  
BF831  
BF832  
BF833  
BF834  
BF835  
BF836  
BF837  
BF838  
BF839  
BF840  
BF841  
BF842  
BF843  
BF844  
BF845  
BF846  
BF847  
BF848  
BF849  
BF850  
BF851  
BF852  
BF853  
BF854  
BF855  
BF856  
BF857  
BF858  
BF859  
BF860  
BF861  
BF862  
BF863  
BF864  
BF865  
BF866  
BF867  
BF868  
BF869  
BF870  
BF871  
BF872  
BF873  
BF874  
BF875  
BF876  
BF877  
BF878  
BF879  
BF880  
BF881  
BF882  
BF883  
BF884  
BF885  
BF886  
BF887  
BF888  
BF889  
BF890  
BF891  
BF892  
BF893  
BF894  
BF895  
BF896  
BF897  
BF898  
BF899  
BF900  
BF901  
BF902  
BF903  
BF904  
BF905  
BF906  
BF907  
BF908  
BF909  
BF910  
BF911  
BF912  
BF913  
BF914  
BF915  
BF916  
BF917  
BF918  
BF919  
BF920  
BF921  
BF922  
BF923  
BF924  
BF925  
BF926  
BF927  
BF928  
BF929  
BF930  
BF931  
BF932  
BF933  
BF934  
BF935  
BF936  
BF937  
BF938  
BF939  
BF940  
BF941  
BF942  
BF943  
BF944  
BF945  
BF946  
BF947  
BF948  
BF949  
BF950  
BF951  
BF952  
BF953  
BF954  
BF955  
BF956  
BF957  
BF958  
BF959  
BF960  
BF961  
BF962  
BF963  
BF964  
BF965  
BF966  
BF967  
BF96



# EXPANDING OFFER!

To celebrate the increased size of P.W. we are giving you a:— PAPER-MATE CHROME PLATED PEN WORTH £3.95 with any watch under £20. PAPERMATE GOLD PLATED PEN WORTH £5.70 if you spend over £20. CHROME PEN & PENCIL SET (or two pens) WORTH £7.90 if you spend over £28. GOLD PLATED SET (or two pens) WORTH £11.40 if you spend over £50. Items may be combined. Offer closes 30th Sept. 1977. Subject to availability.



**SPECIAL PURCHASE. CASIO CASIO-TRON \$158.** Now you can afford probably the best watch in the world! 8 functions LCD with backlight. STOPWATCH. DUAL TIME ZONES. All stainless steel. Mineral glass Battery hatch. Water resistant to 130 feet. £49.95 (R.R.P. £89.95) Black or blue face.

R16B (Not illust) £34.95 Bk or Bl.

ST-1. Hand-held ELECTRONIC STOPWATCH/Calculator. Four stopwatch functions: Standard, Time Out, Two kinds of Lap Time. TOTAL Time button. Rollover after 9 hrs, 59 mins, 59.9 secs. Converts Time to Decimal Hours & back again. Full access memory, constants, sq. roots, % etc. £27.50 (£24.95 without pen).



MQ-1. Miniature pocket version of CQ-1. 12 or 24 hour clock, stopwatch and basic calculator £37.95 (£34.95 without pen & pencil set).



TC410  
TC411



TC440  
TC441



TC412  
TC413

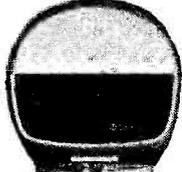
FAIRCHILD TIMEBAND LCD Watches. Latest models with BATTERY HATCH & VOUCHER FOR FREE REPLACEMENT BATTERY. Constant display of Hours & minutes. Push button once for Month & Date, twice for Seconds. Backlight, automatic calendar, AM/PM setting indicator, easily selected alternating time/date display. Beautifully styled Swiss/W. German cases. TC441 chrome £19.95, TC440 Gold Plated £21.95, TC411 chrome £24.95, TC410 Gold Plated £27.95, TC413 St/Str bracelet £28.95, TC412 Gold Pl. £31.95.



C6110



C500



C590

**TIMEBAND MAINS DIGITAL ALARM CLOCKS.** Wake up to Timeband. Precise timekeeping, can be synchronised to the exact second. Alarm accuracy to the exact minute. Will display last minute digit and seconds. Solid state reliability, silent running, 9 minute snooze, Alarm on, Mains Failure Indicators. C500 (left) 3 1/2" x 3 1/2" x 3 1/2". Black or white £14.35. C6110 (centre). As C500 but more sophisticated controls £15.90. C590 (right). With built-in High/Low Intensity elevating reading lamp £23.35.



From NATIONAL SEMICONDUCTOR 5+3 functions. As Timeband but without alternating Time/Date facility. DACS series (left).

DACS WS Chrome on Strap £22.90  
DACS YS Gold Plate Strap £25.90  
DACS WB Chrome Bracelet £24.50  
DACS YB G.P. Bracelet £28.50  
DABS Series (Right)  
DABS WB All stainless £33.50  
DABS YB Heavy G.P. £39.50



402 ES



405 ILB

700

IBICO. Traditional Swiss craftsmanship. 5+4 functions LCD. Mineral Glass face. 405 ILB strap £33.90. 405 IS St/Str bracelet £35.50. 402 ELB Stainless steel on strap £38.90. 402 ES All stainless £39.90. 700 "1000 day" Quartz Analogue. Stepping Motor. High speed adjustment. Seconds synchronisation. £33.50. Not illustrated 450 HS £69.75. 403 NS £42.50. IBICO watches are water resistant to 100 feet or more. (Waterproof straps).

W/T 6F. 6+3 function LED. Metal case, S/S bracelet. Superb styling £11.95. INSTAL 2 1/2 function LCD. Gold plated & matching bracelet £9.95.

CALCULATORS. FX-21 £13.95, FX-29 £14.95, FX-105 £16.95, FX-110 £17.95 (Rechargeable batteries £3 pair. AC adaptor/charger £3). FX-2000 £24.95, FX-201P £44.95, FX-202P £89.95, PRO-FX1 £124.95.

Send 15p for our illustrated mail order catalogue of over 50 watches (Accurist, Timex etc) clocks, car clocks. The BEST TV, games at LOWEST prices. Prices include VAT P & P. Credit cards welcome or send cheque, P.O. to:—

Dept P.W.  
19-21 Fitzroy Street  
Cambridge CB1 1EH  
Telephone (0223) 312866

## TEMPUS



# Wilmslow Audio

## THE firm for speakers!

SEND 10P STAMP FOR THE WORLD'S BEST CATALOGUE OF SPEAKERS, DRIVE UNITS, KITS, CROSSOVERS ETC. AND DISCOUNT PRICE LIST.

ATC ● AUDAX ● BAKER ● BOWERS & WILKINS ● CASTLE ● CELESTION ● CHARTWELL ● COLES ● DALESFORD ● DECCA ● EMI ● EAGLE ● ELAC ● FANE ● GAUSS ● GOODMANS ● HELME ● I.M.F. ● ISOPHON ● JR ● JORDAN WATTS ● KEF ● LEAK ● LOWTHER ● MCKENZIE ● MONITOR AUDIO ● PEERLESS ● RADFORD ● RAM ● RICHARD ALLAN ● SEAS ● TANNOY ● VIDEOTONE ● WHARFEDALE

## WILMSLOW AUDIO (Dept. P.W.)

SWAN WORKS, BANK SQUARE, WILMSLOW, CHESHIRE SK9 1HF

Discount HiFi Etc. at 5 Swan Street and 10 Swan Street

TEL: WILMSLOW 29599 FOR SPEAKERS  
WILMSLOW 26213 FOR HI-FI

# TRAMPUS ELECTRONICS LTD



A SEMICONDUCTOR POWERHOUSE (Trade & Export Welcome). TRAMPUS ELECTRONICS LTD. 53-60 GROVE RD., WINDSOR, BERKS. SL4 1HS. Tel: Windsor (07535) 54525. Callers welcome Mon-Sat 9am-5pm. Fast service. Same day despatch on ex stock product. Quality devices, all full spec. Same Trampus low prices. Barclaycard and Access by post or telephone £5 minimum. VAT: Add 8% to prices marked\*. Add 12% VAT to all other prices. Post and packing 20p U.K. Send C.W.O. except Gov Depts etc. Free catalogue list with sale bargains & micro processors (send S.A.E.).

**IC's All price each**  
555 DIL 8 pin timer 39p\*  
723 TO99 regulator 49p\*  
723 DIL 14 pin reg. 69p\*  
741 DIL 8 pin op amp 28p\*  
741 DIL 14 or TO98 39p\*  
747 Dual 741 89p\*  
748 DIL 14 pin 33p\*  
748 DIL 8 pin 49p\*  
7805 TO35V reg. £1.00\*  
7805 Plastic 5V Reg. £1.35\*  
7812 or 7815 £1.50\*  
78013 or 78023 AF £1.89  
8038 Signal Gen. £1.00\*  
LM300 £21.00\*  
LM301 DIL 14 pin OPA 39p\*  
LM301 DIL 8 pin 59p\*  
LM339K TO3 5V Reg. £1.00\*  
LM315 70V US OPA £2.25\*  
LM390N 2W AF 12V £1.00\*  
LM381 2 x Pre amp £2.00\*  
LM3900 Quad op amp 75p\*  
NE536 FET OPA £4.00\*  
NE555 Timur 39p\*  
NE556 2 x 555 timer £1.00\*  
SN766 11 & 60 IE £1.25  
TBA 910 7W AF £1.00

**DISPLAYS (Red Led)**  
0.3" DL704/ 15p\*  
DL707 £1.00\*  
0.6" DL747 15p\*  
Jumbo £1.69\*  
Dato PCB Pen. 2 Taps 74p\*  
Decon Desolder Braid Reel 74p\*  
SRBP 6" x 4" 60P. FEC Tub £1.00\*

2N3053 24p\*  
2N3055 45p\*  
2N3702/3/56 19p\*  
2N3704 10p\*  
2N3810 & FET 15p\*  
2N3880 FET 38p\*  
2N3904/5/6 29p\*  
2N5457 FET 59p\*  
2N5777 OPTO 59p\*

**SILICON GREASE**  
Mini satchet 25p\*  
Ins. Bush sets 19p\*  
Matching 29p\*

**TRANSISTORS**  
AD161, 162 ea 50p\*  
BC107 15p\*  
BC107B 15p\*  
BC108 19p\*  
BC108 B or C 15p\*  
BC109 19p\*  
BC109 B or C 15p\*  
BC147/8/9 12p\*  
BC167/8/9 19p\*  
BC177/8/9 29p\*  
BC182/3/4 A or L 30. 29p\*  
7440 29p\*  
7441 141 79p\*  
BD131 or 132 ea 50p\*  
BFY50 or 51 20p\*  
MJ2955 (PNP 3055) 72 23p\*  
7473, 74 35p\*  
MJE3055 85p\*  
7475 65p\*  
ORP12 80p\*  
TIP41 or 42A 7490 49p\*  
TIP2655 65p\*  
7491, 92 75p\*  
TIP3055 55p\*  
TIS43 30p\*  
ZTX107/8/9 29p\*  
2N2645 59p\*  
3N2904/5 39p\*  
2N2928 rbo 19p\*  
2N2926YG 15p\*

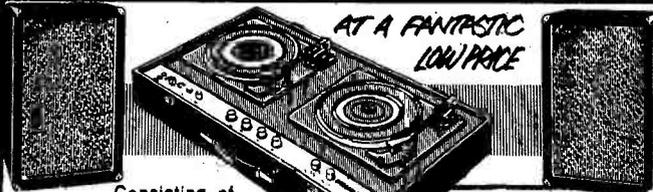
**TTL**  
7400 14p\*  
7401 18p\*  
7402 18p\*  
7404 29p\*  
7410 29p\*  
7413 16 69p\*  
7420/ 4017\*  
30. 20 £1.23\*  
7440 4024 89p\*  
7441 4028 £1.00\*  
7411 4029 £1.25\*  
7447 4030 69p\*  
7470, 4048/  
72 47 £1.48\*  
7473, 4040 £1.11\*  
74 4049/  
7475 89 23p\*  
7476 39p\*  
7490 4510 £1.48\*  
7491, 4511 £1.72\*  
92 4528 £1.58\*  
74121 33p\*  
74123 46p\*  
74196/21 27\*  
4553 £3.00\*  
CMOS data book £3.50

**DISCO TRIAC 10A**  
400v £1.00\*

**LEDS 1/2" & 2" DIA.**  
Red no clip 12p\*  
TIL209 & clip 15p\*  
2" Red & clip 17p\*  
Coloured LEDES 29p\*

# RSC 100 WATT DISCO SYSTEM

ALL RSC PRICES INCLUDE VAT



AT A FANTASTIC LOW PRICE

- Consisting of
- (1) TWIN T/TABLE CONSOLE with PRE-AMP, and POWER OUTPUT STAGES
  - (2) & (3) PAIR. 100 WATT LOUD-SPEAKERS including 12" UNITS

Rec. Mic. UD 150 Cardiod £9.95 extra with system only

Terms: Deposit £40.00 and 12 monthly payments £15.60 (Total £227.20) Carr. £7.50  
 Also available 100 WATT SYSTEM £169.95 with Dynamic Stick MICROPHONE

**£199.95**

## TD1 DISCO CONSOLE

Incorporating twin BSR type turntables and Sonotone or Acos Cartridges with diamond styl. Separate Vol. controls for each turntable. Also MONITORING FACILITIES, plus Treble and Bass Controls. Separate Input for 'mike' with vol. control. Black Vynide covered Cabinet with lid Or Dep £16.49 & 18 f'tnly pymts. £26.11 (Total £126.47) Carr. £3.  
**TD2S STEREO VERSION OF ABOVE** £125.00  
 Terms DEPOSIT £20 and 18 fortnightly payments £6.89  
 Total £144.02 Carr. £3

## 40W SYSTEM £99.95. 100W SYSTEM £169.95

OTHERS UP TO 300 WATTS at UNBEATABLE PRICES for Free Catalogue

## DISCOMAJOR/100 TWIN TURNTABLE POWER CONSOLE £129.95

Twin Full size BSR turntables. Sonotone or Acos Carr. £3.00 Cartridges with Diamond Styl. Facilities as TD1 Console but with built-in 100 watt Power Amplifier complete with lid. Terms: Deposit £19.95 and 18 fortnightly payments £7.03 (Total £146.49).  
**DISCOMAJOR/200** £149.95  
 200 watt version of above. Terms: Dep. £29.95 and 18 fortnightly payments £7.87 (Total £171.61)

## RSC PHANTOM 50 COMBO AMP. £69.95

Rating 50 watts. 3 inputs, 2 vol controls— Carr. £1.50. Bass, Treble Presence. Suitable for Lead or Rhythm Guitar, mic., Radio, Tape, etc. Inc. High Flux 12" 50w Speaker. Dep. £10.95 & 8 mthly payments £8.71 (Total £80.63).

## 100W POWER (SLAVE) AMPLIFIER

Suitable for use with DISCO-Consoles. Also for increasing output of lower-powered Amp. Dep. £9.00 and 8 mthly pymts of £6.05 (Total £57.40) Carr. £1.50  
**100 + 100W MODEL £69.95** Carr. £1.50

## TITAN TA/50A 50W AMPLIFIER

Solid state, 3 sep. controlled inputs plus Master control. Bass, Treble & Presence Controls. Vynide covered cab. with corner protectives. List price £60. Terms: Dep. £9 & 8 monthly payments £6.05. (Total £57.40) Carr. £1.  
 Matching Cabinets 1 x 12" £29.95 & 12" £49.95

## TITAN TA/100A 100W AMPLIFIER

TWIN CHANNEL—4 INPUTS £69.95 (NORMAL OR BRIGHT)  
 A De-luxe professional unit with Carr. £1.50 many facilities. R.M.S. Rating. Matching 2 x 12" 120w Cabinet speaker £49.95 with above only. Carr. £1.50

## INTEREST REFUNDED on Credit Purchases settled in 3 mths

## TITAN 'ADD-ON' HIGH FREQUENCY HORN UNITS



**MODEL TS2H**  
 Inc. Pair of highly sensitive Horns. Range 3-15 kHz Imp 16Ω. Use with 8 or 15Ω 2 x 12" or 1 x 15" or 18" Drive Unit for increased sound clarity and projection. Rating 100 watts. £27.95 Carr. 75p  
 Terms: Dep £6.95 & 8 mthly pymts £3.12 (Total £31.91)

**MODEL T1H**  
 With single super efficient Horn. Range 3-15 kHz. Imp 8Ω. Use with max 8Ω 2 x 12" or single 15" or 18" 8Ω Drive Units. Maximum amplifier power output to be 100 watts. Comparable with units at twice the cost.

## RSC MAINS TRANSFORMERS

TYPES FOR VALVE RADIOS & AMPLIFIERS (Inc. L.F. CHOKES & OUTPUT TRANSFORMERS. As previously advertised still available.  
**FILAMENT OR TRANSFORMER POWER PACK**  
 12v. 1a. £1.10. 6.3v. 1.5a. £1.06. 6.3v. 2a. £1.10. 6.3v. 3a. £1.70. 6.3v. 5a. £2.60. 18v. 3a. or 24v. 1.5a. £2.80. 0.9-18v. 1.1a. £2.88. 0.15-20-42v. 2a. £2.18.  
**CHARGER TRANS** 0.9-15v. 1.4a. £2.08. 2.4a. £2.88. 3a. £2.82. 5a. £2.84. 6a. £3.19. 6a. £3.48.

## New Branches at HANLEY WOLVERHAMPTON and LIVERPOOL

OPEN ALL DAY SATURDAYS (5 Day Week)  
**BRADFORD** 10 North Parade (Closed Wed.). Tel. 25349  
**BOLTON** 23 Deansgate. (Closed Wed.). Tel. 33512  
**BIRMINGHAM** 30/31 Great Western Arcade. Tel. 021-236 1279 (Closed Wed.)  
**CARLISLE** 8 English Street (Closed Thurs.). Tel. 38744  
**COVENTRY** 17 Shelton Sq. The Precinct. Tel. 25983  
**DERBY** 97 St. Peter's Street (Closed Wed.). Tel. 41361  
**DARLINGTON** 19 Northgate (Cl. Wed.). Tel. 68043  
**DEWBURY** 9/11 Kingsway (Closed Tues.). Tel. 468058  
**DONCASTER** 3 Queensgate, Waterdale Centre. (Closed Thurs.). Tel. 63089  
**EDINBURGH** 101 Lothian Rd. (Cl. Wed.). Tel. 229 9501  
**GLASGOW** 326 Argyle St. (Cl. Tuess.). Tel. 248 4158



All items subject to availability. Prices correct at 18.7.77 E. & O.E.  
**HANLEY** Stoke-on-Trent, 44 Piccadilly  
**HULL** 7 Whitefriargate (Closed Thurs.). Tel. 20555  
**LEICESTER** 32 High Street (Closed Thurs.). Tel. 56420  
**LIVERS** 5-7 County (Mecca) Arcade, Briggate (Closed Wed.). Tel. 458252-  
**LIVERPOOL** 35 Dawson's Way, St. John's Shopping Centre Tel: 708 9380 (Cl. Wed.). Tel. 723 1829  
**LONDON** 238 Edgware Road, W.2. (Closed Thurs.). Tel. 723 1829  
**MANCHESTER** 60A Oldham Street (Closed Wed.). Tel. 236 2778

- ★ DISCOMAJOR 200 POWER DISCO CONSOLE with integral Power Amplifier.
- ★ TWIN FULL SIZE GARRARD turntable with cueing device.
- ★ CARTRIDGES with Diamond Styl
- ★ 3 SEPARATE VOLUME CONTROLS for each turntable and Mic.
- FULL HEADPHONE MONITORING FACILITIES CONSOLE COMPLETE WITH LID

## TITAN 100W BASS BINS £99.95

High quality 15" high flux Bass Unit and J104 Horn Tweeter in folded horn enclosure providing amazing level of sound output. Terms Dep. £14.95 and 18 fortnightly payments. £5.58 (Total £115.39) Carr. £3.

## FANE HIGH POWER SPEAKERS

Power ratings R.M.S. Cont. 2 YRS GUARANTEE \*Gauss 14000 Imp 8-15 ohms. CARR FREE.  
**POP 33T 12" 33w £13.95** Dual cone.  
**\*POP 50/2 12" 50w £15.99** Dep for Pair £8.00 and 8 monthly pymts £3.54 (Total £36.32)  
**\*POP 75 12" 70w £19.99** Gauss 17,000 lines. Dep £5.00 and 8 mthly pymts £2.38 (Total £24.04)  
**\*POP 60 15" 60w £25.95** Dep £7.00 & 8 monthly pymts £2.87 (Total £29.96)  
**\*POP 100 18" 100w £44.95** Dep £10.00 & 8 monthly pymts £5.17 (Total £51.36)

## TITAN GROUP/DISCO SPEAKERS

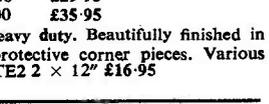
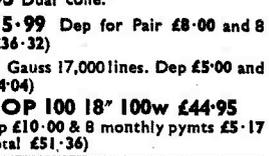
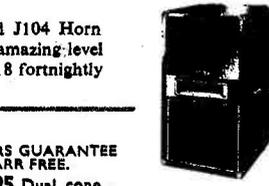
Carr. £1, under £18, over this add 5p per £1.

GUARANTEED FOR 5 YEARS	List	RSC Price
T12/45 12" 45w	£15.80	£11.95
T12/60A 12" 60w	£21.00	£13.95
T12/100 12" 100w	£36.00	£24.95
T15/60 15" 60w	£26.00	£18.99
T15/70 15" 70w	£28.00	£19.95
T15/100 15" 100w	£41.00	£29.95
T18/100 18" 100w	£47.00	£35.95

**CABINETS FOR ABOVE SPEAKERS** Heavy duty. Beautifully finished in black Vynide with Vynair fronts fitted protective corner pieces. Various sizes and cut-outs. TE1 1 x 12" £10.95. TE2 2 x 12" £16.95  
 Low Deposit Terms on orders over £20

## Stockist of Lighting by PULSAR Group

Equipment by CARLSBRO  
 Full range of speakers by FANE



**TITAN TA/100C COMBO**  
 100w R.M.S. Amp. incorporating a fabulous Fane Crescendo 12" 100 watt spkr for really superlative results with Lead Guitar Carr. £5  
**£119.95**  
 Or Dep £17.95 & 18 f'tnly pays £6.69 (Total £138.37)

## FANE HIGH FREQUENCY HORNS 'J' SERIES All Carr Free

**MODEL J44 Imp 8Ω**  
 Size approx. 3 1/2" x 3 1/2" x 3"  
 Rating 30-50 watts Range 3-15 kHz  
**£7.95**

**MODEL J73 Imp 8Ω**  
 Size approx 7 1/2" x 3" x 6 1/2" Rating 50 watts Range 2-20 kHz  
**£11.75**

**MODEL J104 Imp 8Ω**  
 Size approx 10 1/2" x 3 1/2" x 7 1/2" Rating 50-70 watts Range 2-15 kHz  
**£15.50**

## FAL DISCO LIGHTING SYSTEMS from £58.95

Incl 2 Spotbanks and bulbs  
**JINGLE MACHINES** from £37.95  
**ECHO CHAMBERS** from £53.95  
**COLUMN SPEAKERS** from £29.95  
**GROUP DISCO SPKRS** in CABINETS from £11.95

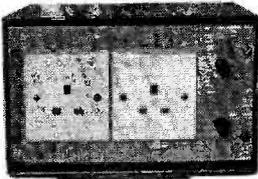
**FREE FANE HIGH POWER - CROSS-OVER** WITH ANY OF ABOVE  
 Impedance or total impedance of 12", 15" or 18" Drive units must not exceed impedance of single horn or pair in series. Pair J44, single J73 or J104 suitable for amplifier power up to 100 watts subject to above and with HPX2 'Cross-over'

MAIL ORDERS & EXPORT ENQUIRIES TO:—  
**AUDIO HOUSE, HENCOFFER LANE, LEEDS, 18.**  
 Tel: 0638 577681.  
**TERMS C.W.O. or C.O.D. No. C.O.D. under 88. POSTAGE 50p PER ORDER OR AS QUOTED. Phone or Write for FREE CATALOGUE.**

**MIDDLESBROUGH** 103 Linthorpe Rd. Tel. 247096 (Closed Wed.)  
**NEWCASTLE UPON TYNE** 59 Greiner St. (Closed Wed.). Tel. 21469  
**NOTTINGHAM** 19/19A Market Street (Closed Thurs.). Tel. 48068  
**PRESTON** 41 Friargate Walk, St. Georges Shopping Prec. Tel. 51979  
**SHEFFIELD** 13 Exchange Street (Castle Mkt. Bldg.) (Closed Thurs.). Tel. 50716  
**STOCKPORT** 8 Little Underbank (Closed Thurs.). Tel. 480-0777  
**SUNDERLAND** 5 Market Sq. (Closed Wed.). Tel. 70573  
**WOLVERHAMPTON** 6, Wulfrun Way (Cl'd Thurs.). Tel. 26612

### INVERTORS

KIT FORM or BUILT UP.



240v-50Hz from your 12v car battery.

O/P Powers available. 25W-40W-75W-150W-300W-400W-500W-1kW-1.5kW. Various battery I/P voltages available.

### AUTOMATIC INVERTORS

These units have built-in battery charger which functions whilst mains are healthy. Upon mains failure unit automatically switches to inverter operation ensuring no interruption of supply. Send S.A.E. for price lists.

### RHYTHM GENERATOR



15 different rhythms, 9 percussion instruments. Tempo range 15 to 100 bars/min. Full kit of parts available at £39.50 + £1.20 P. & P. + VAT at 8%. Price assembled and tested add £12. Parts available separately, send S.A.E.

We reserve the right to alter published prices in the event of component or postal increases.

### P.E. ORION STEREO AMPLIFIER & TUNER



May be mounted slim line or stacked as above. Parts available separately for both units.

20 + 20 Watts r.m.s. into 8 ohm load. Distortion less than 0.1% 100Hz-10kHz. Frequency response  $\pm$  1dB 20 Hz to 20kHz. Hum level virtually nil with volume full on. This is a power amplifier of superb quality incorporating the very latest design features. Professional hi-fi enthusiasts have classed it as fantastic and real value for money. The CCT incorporates a low flux transformer and inputs for disc, tape, tuner, etc.

### TUNER UNIT

May be purchased separately in matching slim line case. As full kit or individual parts. Send S.A.E. for price list and specification sheets.



### LOUDSPEAKERS

8 inch system

This system is designed for use with above amplifiers rated up to 25W r.m.s. per channel at 8  $\Omega$ . May be incorporated in an enclosure 295 x 490 x 295mm (11.5 x 19.3 x 11.5in) approx. external, constructional details of which are given with each bass unit, to provide an overall frequency response of 50Hz to 22kHz. Four-element cross-over, ready constructed on p.c.b. Output leads have push-on receptacles to suit speaker tags. Cross-over frequency is 2-kHz approx.

### POWER UNIT

Regulated



Voltage adjustable from 1-35v at 2 amps. Short circuit protected. Voltage and current meters incorporated. Full Kit of parts £48 + 8% VAT or assembled and tested £58 + 8% VAT.

### ASTRO IGNITION



SAVE FUEL

Complete kit of parts for this proven and tested system. (£11.90 + 60p P. & P.) + 8% VAT or ready built with only two connections to alter. (£14.90 + 60p P. & P.) + 8% VAT.

Consider the advantages:

Fuel economy. Faster acceleration. More power. Excellent cold starting. Smoother running. No contact breaker burning. Less exhaust gases.

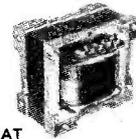
### TRANSFORMERS

SPECIAL OFFER

Miniature Mains Trans. 6-0-6v-6VA. 12-0-12v-6VA.

(£1.29 + 25p P. & P.) + 8% VAT

Transformer and coils manufactured to customer specifications both in High Volume and Small Order capacity.



TRADE AND EXPORT ENQUIRIES WELCOMED ON ALL PRODUCTS:

### ASTRO ELECTRONICS

Springbank Road  
Chesterfield (S14 7JY)  
Derbyshire

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

## LEKTROPAKS

17 TURNHAM GREEN TERRACE, CHISWICK, LONDON W.4. Tel. 01-994 2784

★ LARGE RANGE OF COMPONENTS NOW STOCKED. SEND LARGE S.A.E. FOR FREE LISTS.

\*\*\*\*\* SPECIAL OFFERS \*\*\*\*\*

QTY.	DESCRIPTION	PRICE
12	4.7 $\mu$ F, 25V, BEAD TANT	£1.00
50	0.01 $\mu$ F, 50V, MIN DISC CERAMIC	£1.00
1	TGS 105 GAS SENSOR	£2.25
Any 10	BC 107, 147, 148, 182, 183	£1.00
Any 10	BCY 70, 71, 72	£1.50
8	SN 7400	£1.00
15	1 $\mu$ F, 250V, C280 CAPACITOR	£1.00

ALL PRICES INC. VAT. PLEASE ADD 20p P.P.

\*\*\*\*\*

★ WALK-ROUND SELF-SERVICE SHOP NOW OPEN MON-SAT 9.30-5.30.

★ MANY SURPLUS COMPONENT BARGAINS FOR PERSONAL CALLERS.

★ RESISTORS, CAPACITORS, TRANSISTORS, DIODES, TRIACS, DIACS, IC's, POTS, ALI BOXES, VERO, COPPER CLAD BOARD, CABLE, AUDIO CONNECTORS, SPEAKERS, MICROPHONES, P.A. TRANSFORMERS, KNOBS, ETC, ETC.

**Random FLASHER UNIT**

Wired ready for use  
Complete with three  
100 watt colourpendent lamps  
that flash independently  
at random.

£18.95

**TWIN BANK 6 LIGHT UNIT**  
(less lamps) LENGTH 14 1/2 inches

B.C. Fitting £9.55 EACH  
E.S. Fitting £10.35 EACH

**Sound to Light MASTER UNIT**

600 WATTS PER CHANNEL

£30.95

INCLUDING CHANNEL OUTPUT PLUGS AND MAINS INPUT SOCKET

**TYPE A SPOT**  
(less lamp)

B.C. Fitting £1.95 EACH | E.S. Fitting £2.12 EACH

**TYPE B 3 BANK UNIT**  
(Less Lamps)

B.C. Fitting £6.90 EACH | E.S. Fitting £7.26 EACH

**TWIN BANK 12 LIGHT UNIT**  
Length 31 1/2 inches

(less lamps)

B.C. Fitting £15.60 EACH | E.S. Fitting £17.00 EACH

**100 WATT SPOT LAMPS**  
RED, YELLOW, GREEN  
BLUE, CLEAR

Maximum 3 lamps

£1.40 each | £4.20

B.C. or E.S. Fitting

ALL PRICES INCLUDE V.A.T. and POST & PACKING (where applicable)

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

(Send 20p for illustrated list & price list)

## DIY SPEAKER KITS

### 15-WATT KIT IN CHASSIS FORM

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

**£17.00 PER STEREO PAIR**  
+ P & P £3.40

### EASY-TO-BUILD WITH ENCLOSURE

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

**£25.50 PER STEREO PAIR**  
(approx.)  
+ P & P £5.50

### COMPACT FOR TOP VALUE

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

**£7.50 per stereo pair**  
+ P & P £1.70

**SPEAKERS** Two models - Duo III, teak veneer. 12 watts rms. 24 watts peak, 18 1/2" x 13 1/2" x 7 1/2" (approx.).

**★ £34 PER PAIR**  
+ P & P £6.50

**★ £52 PER PAIR**  
+ P & P £7.50

### EASY TO BUILD RECORD PLAYER KIT

Ideally suited for the constructor who requires a complete stereo unit at a budget price, comprising ready assembled stereo amp. module, Garrard auto/manual deck with cueing device, pre-cut and finished cabinet work. Output 4 watts per channel, phones socket and record/replay socket

**£26.95**  
+ P & P £4.05

### CAR RADIO KIT

Complete with speaker, baffle and fixing strip. The Tourist IV for the experienced constructor only. The Tourist IV has five push buttons, four medium band and one for long wave band. The tuning scale is illuminated and attractive small aluminium control knobs are used for manual tuning and volume control. The modern style fascia has been designed to blend with most car interiors and the finished radio will slot into a standard car radio aperture.

**MOTOR TOP 10 AWARD**

Size approx. 7" x 2" x 4 1/2".  
Power Supply Nominal 12 volts positive or negative earth (altered internally) Power Output 4 watts into 4 ohms.

**£12.50**  
+ P & P £1.50

### PERSONAL SHOPPERS ONLY

Viscount IV 20 x 20 Amplifier as illustrated, plus 1 pair of speakers finished in teak with melamine panels 8" drive unit and 3 1/2" approx tweeter.

22" x 13" x 10 1/2" size approx.

**£45.00**

### SPECIAL OFFER

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

**★ £29.90**  
+ P & P £2.10

**FREE** Limited Period! A Free 4 Channel Stereo Adaptor to all purchasers of the Viscount Amplifier. Available separately. **£3.95** + P & P £1.00

### SPECIAL OFFER

For example - Duo speaker system II or III Viscount Amplifier, MP60 type turntable complete

**DEDUCT 10% OR DEDUCT 15%**

on complete stereo systems using starred Products

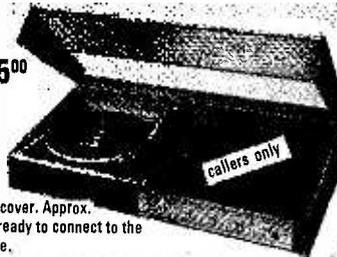
### PERSONAL SHOPPERS ONLY

PLINTH & COVER BSR OR GARRARD TEAK FINISH **£4.00**  
GOODMAN 5" approx., 7 watt bass speaker **£7.70**  
AM. FM. TUNER P.C.B. with Mullard L.P. 1186, 1185, 1181 modules **£6.50**  
CROWN 5 push button car radio, LW, MW, 12v Pos, neg, earth 5 watts output, tone control complete with speaker and fixing kit. In dash type **£15.95**  
STEREO CASSETTE TAPE PLAYER Negative earth only, 3 watts per channel output **£16.50**  
AM. FM. STEREO MULTIPLEX CAR RADIO/cassette player in dash fixing Negative earth 5 watts output **£36.00**  
I.G. Stereo 8 Track to Cassette adaptor converts any 8 track player to cassette player. **£18.95**  
GLOBAL Spherical speaker 8 ohms, 5 watts **£3.50**  
100K Multiturn Vericap tuning pots 6 for **£1.00**  
HEAVY DUTY FIBRE GLASS COPPER CLAD BOARD **£1.90**  
27" x 17" x 1/8" approx. per sheet only  
DECCA DC1000 Stereo Cassette Record deck P.C.B. complete with switch oscillator coils and tape-heads and circuit diagrams. **£2.95**

## VISCOUNT COMBI

**£65.00**

For personal shoppers only, this unit comprises: The 20 x 20 Viscount amplifier BSR MP60 Type turntable housed in an attractive teak finished console with smoked acrylic cover. Approx. 30 1/2" x 14 1/2" x 7 1/2" complete ready to connect to the speaker system of your choice.



### BSR TURNTABLES

BSR MP60 TYPE Single play record player (Chassis form) **£15.95** less cartridge. P & P £2.00  
Cartridges to suit above  
ACOS MAGNETIC STEREO ..... **£4.95**  
CERAMIC STEREO **£1.95**

BSR automatic record player deck (Chassis form) with cueing device and stereo ceramic head. **£9.95**  
P & P £2.00

TURNTABLE illus. diamond styus, and Popular BSR MP 60 type, complete with magnetic cartridge, Ready wired **£29**  
+ P & P £4.50

### 30 x 30 WATT AMPLIFIER KIT

Specially designed by RT-VC for the experienced constructor, this kit comes complete in every detail. Same facilities as Viscount IV amplifier. Chassis is ready punched, drilled and formed Cabinet is finished in teak veneer. Silver fascia and easy-to-handle aluminium knobs.

Output 30 + 30 watts rms, 60 + 60 peak.

**£29.00**  
+ P & P £2.10



### DECCA 20 WATTS STEREO SPEAKER

This matching loudspeaker system is hand made, kit comprises of two 8" diameter approx. base drive unit, with heavy die cast chassis laminated cones with rolled P.V.C. surrounds, two 3 1/2" diameter approx. domed tweeters comp with crossover networks

**£20.00**  
+ £4.00 p & p stereo pair



### PORTABLE MONO DISCO

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

**£64.00**

### 35-WATT MONO DISCO AMP

**£27.50**

+ P & P £2.50

Size approx 13 1/2" x 6 1/2" x 6 1/2" Here's the mono unit you need to start off with. Gives you a good solid 35 watts rms, 70 watts peak output. Big features include two disc inputs, both for ceramic cartridges, tape input and microphone input. Level mixing controls fitted with integral push-pull switches. Independent bass and treble controls and master volume.

### 100 WATT MONO DISCO AMP

Size approx. 14" x 4" x 10 1/2"

Sloping face, you can use the controls without fuss or bother. Brushed aluminium fascia and rotary controls. Five smooth acting, vertically mounted slide controls - master volume, tape level, mic level, deck level, PLUS INTER-DECK FADER for perfect graduated change from record deck No. 1 to No. 2, or vice versa. Pre-fade level control (PFL) lets YOU hear next disc before fading in. VU meter monitors output level!

**£65.00**  
Output 100 watts RMS 200 watts peak. | P & P £4.00

### PRACTICE GUITAR AMPLIFIER WITH BUILT-IN SPEAKER

This budget practice amplifier, has been specially designed for the amateur, who requires a quality self-contained unit with all facilities. 2 inputs - 1 for mic or guitar, the 2nd for record player or cassette deck. It also can be used for cine-sound amplification. 2 volume controls, 1 for each input, also base and treble controls. Power output with internal speaker, 10 watts RMS, with remote speaker (not supplied) 20 watts RMS. Size approx. 17" x 9" x 11".

**£32.50**  
+ P & P £3.00

### HOME 8 TRACK CARTRIDGE PLAYER

Automatically switches programmes monitored by indicators, with manual override track selection. This unit will match with the Unisound modules and is compatible with the Viscount IV amplifier with Sim teak cabinet, approx. 9" x 8" x 3 1/2".

**£14.60**

### 4 x 4 STEREO AMP KIT

For the experienced constructor who wants to design his own stereo. Kit includes all necessary components including constructors manual. Plus Pair of easy to build 4 watt speakers in kit form, with teak simulate finish cabinets 12" x 9" x 5" approx.

### PYE STEREO GRAM CHASSIS

(Complete with circuit-diagrams) Complete ready to install - Wave bands LM, VHF STEREO, VHF MONO. Controls for tuning volume, balance, bass and treble. Power output 7 watts R.M.S. per channel 14 watts peak 8 ohms. 2" x 8" approx chassis speakers and BSR auto record player deck.

**£35.00**  
PERSONAL SHOPPERS ONLY

Order giving your credit card number ONLY

ALL PRICES INC. VAT AT 12 1/2%  
GOODS NOT DESPATCHED OUTSIDE UK  
All items subject to availability. Price correct at 4/7/77 and subject to change without notice  
We are unable to show all our products, so Send stamped addressed envelope for our fully descriptive catalogue and any further information.



323 EDGWARE ROAD, LONDON W2  
Personal Shoppers EDGWARE ROAD 930am-5.30pm, Half day Thurs.  
21C HIGH STREET, ACTON, LONDON W3 6NG  
ACTON: Mail Order only No callers



# Newnes

## 2 new books

# Technical

LATEST TITLE in The Master Series

## Master Creative Tape Recording

by JOHN GARDNER

In this book the theory of recording and reproduction is covered, as well as the choice of your machine and microphone, improvising a studio, and setting up of equipment. Guidance is given on the general organisation of recording sessions, and on the problems of recording drama, features and music, and of tape editing.

**CONTENTS:** Recording and reproduction. Choosing a suitable machine. Choice and use of microphones. Mixers, monitoring and installation. Improvising a studio. Organisation and method. Drama and features. Music. Editing. Appendix. Index.

May 1977                      140 pages                      £2.50

Other titles in the Master series : Master In-Car Entertainment — Capel. Master Electronics in Music-Towers. Master Hi-Fi Installation — King. Master Stereo Cassette Recording — Sinclair.

LATEST TITLE in The Beginner's Guide Series

## Beginner's Guide to Audio

by IAN R. SINCLAIR

Covers the working principles of devices ranging from the microphone to the loudspeaker and examples of the electronic circuits which are used. Starting with the behaviour of sound waves the text continues with chapters on microphones, pickups, preamplifiers and amplifiers and loudspeakers.

**CONTENTS :** Sound and recording. Replay and Reception. Voltage amplifiers. Equalisation, filtering and tone controls. Output stages. Loudspeakers. Recording and reproduction systems. Index.

April 1977                      192 pages                      £2.75

Other Beginner's Guides in Electronics : Beginner's Guide to Electronics —Squires & Deason. Beginner's Guide to Radio — King. Beginner's Guide to Transistors — Reddihough & Sinclair.

### ORDER NOW

ORDER NOW from your bookseller or in case of difficulty from BUTTERWORTHS, Borough Green, Sevenoaks, Kent TN15 8PH

## Your career in Electronics?

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

BRITISH NATIONAL RADIO & ELECTRONICS  
SCHOOL, WD9/7

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

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

(Block caps please)

### VALVE BARGAINS

Any 5-64p, 10-£1.20, 50-£5.00.  
Your choice from the list below.

ECC82, EF80, EF183, EF184, EH90,  
PCF80, PCF802, PCL82, PCL84,  
PCL85, PCL86, PCL805, PL504,  
PY81/800, PY88, 30PL14, 6F28,  
PFL200.

Colour Valves—PL508, PL509,  
PL519, PY500/A. All tested. 35p  
each.

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

### AERIAL BOOSTERS

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

B11 For THE stereo and standard VHF/FM radio.

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

B45—For Mono or colour this covers the complete UHF Television band.

All boosters are complete with battery with Co-ax plugs & sockets. Next to the set fitting. £4.20

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

250,000

### CAPACITOR CLEARANCE SALE

All Mullard C280 and C281 range of Polyester film capacitors 250 and 400 volts working. Very good mixed selection of values from .01µf to 1.5µf.

PRICE 100-£1.50, 500-£7.00,  
1,000-£12.00.

All prices include VAT. P&P 30p per order. Please send uncrossed P.O. or cheques for returning if we are out of stock of capacitor bargain packs. Exports welcome at cost.

### ELECTRONIC MAILORDER LTD.

62 BRIDGE STREET, RAMSBOTTOM, BURY, LANCS.

TEL: RAMS (070 682) 3036.

# SAXON ENTERTAINMENTS LTD

## SYSTEM 7000—GUARANTEED MODULES FOR ALL DISCO/PA APPLICATIONS

### POWER AMPLIFIER MODULES 30—240 WATTS



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

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

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

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

### SYSTEM 7000 COMPLETE DISCO MIXERS (with Autofade)

Mono or Stereo



- Ready to plug in & use
- Automatic Mic override
- Two tone panel
- Twin deck & mic & tape inputs
- Left/Right deck fader
- 20Hz-20kHz Noise —77dB

The choice of the professional D.J.

Controls: Mic volume, Bass, Treble, A/Fade Depth, Tape, L/Deck, R/Deck volumes, Bass, Treble, Master, Headphone volume, Selector & On/Off.

Mono 18v £37.50 Mains £43.50 Stereo 16v £53.50 Mains £59.50

**IN MODULAR FORM**—All you require is front panel (see below) knobs & sockets etc. All electronics are assembled & tested.

- Specification as for complete mixer
- All Potentiometers supplied & fitted
- Low cost do it yourself with step by step easy to follow instructions.

Mono £19.50 Stereo £29.50 Panel £3.50 Supply unit £8.50

### SYSTEM 7000 LIGHTING CONTROL UNIT MK II (Four channel)



Has your light unit got?

- 4,000 W handling
- Sequence facility
- Smart 2 tone panel
- Advanced IC circuitry
- Top grade components
- All your needs in one superbly designed unit

- Integral dimmers
- Automatic audio level
- OURS HAS!

ONLY £42.50

### IN MODULAR FORM—THE QUADRAFACT

£29.50

As with the mixers the MK II L.C. unit may be purchased in module form with all controls, requiring only a panel, case & knobs etc. There are 13 simple connections.

- 1-240w Audio
- 8A RCA triacs
- 0.5-20Hz Sequence
- Fully suppressed

### CUSTOM MIXER MODULES (Complete or in printed circuit form only)

Make your own mixer, mono or stereo, up to 2 channels, with full monitoring facilities, and provision for echos end/return etc.

- Inputs for low and high 2 mic, ceramic & magnetic cartridge etc.
- Up to 20 input modules per single mixing module
- Feed most types of amplifier—accepts all inputs
- Professional low noise circuitry 20Hz-30kHz
- Infinitely adaptable—Extremely economical



### COMPLETE MODULES With facia panel, Knobs & sockets, Monitor buttons, Ready wired & tested

Mono input £8.50 Mono mixing stage £8.50  
Stereo input £12.00 Stereo mixing stage £12.00

- 0.5W headphone circuit
- Full range bass/ treble controls
- Noise—80dB

### PRINTED CIRCUIT MODULES With controls fitted, requires only sockets, facia & knobs

Mono Input £5.50 Mono mixing stage £5.50  
Stereo Input £9.00 Stereo mixing stage £9.00

Power supply for up to 20 channels—PPM18—£8.50.

### SYSTEM 7000 SOUND—LITE (3-CHANNEL)

IN COMPLETE OR MODULAR FORM (Modular form illustrated)

- Complete unit similar to Mk II unit above
- Long established & proven design
- 3 Channels—100W per channel
- RCA BA Triacs—individual channel fuses
- 1-240 W Input—master audio level plus Bass/Middle/Treble

**COMPLETE UNIT**—Fully cased with rear terminations—just plug in and go! £24.75  
**MODULAR FORM**—Facia & knobs etc. Needs only 11 simple connections £16.50 (Panel £2.50)

### COMPLETE DISCO SYSTEMS FROM ONLY £16.06 WITH TWO YEAR GUARANTEE—LOW INTEREST CREDIT DEPOSIT

#### CENTAUR 100W **STEREO**

with TWIN LOUDSPEAKER, SOUND to LIGHT SEQUENCER PLUS DISPLAY. £225 + £10 carr. (Dep. £28.80, 12 months at £21.33 or 24 months at £12.01)

#### SUPER CENTAUR 200W **STEREO**

As above but with 200 WATTS OUTPUT and larger TWIN CABINETS. £275 + £10 carr. (Deposit £32.80, 12 months at £29.39 or 24 months at £15.21).

#### GXL CENTAUR 200W **STEREO**

As the SUPER CENTAUR but with extra large twin 200 WATT CABINETS, DECK LIGHTS, DECK STARTS & SUPERIOR DECKS.

£349 + £10 carr. (Deposit £42.72, 12 months at £36.58 or 24 months at £20.54)

- Cue Light + Head Phone monitoring
- Mic & Tape Inputs
- Crossfade & Override
- Logic Circuitry
- Lights show
- Complete and ready to use
- Extremely Rugged construction
- Twin BSR Decks



Send today for Free Illustrated Leaflet on Saxon Complete Discos & Package PA Systems.

All Equipment subject to a Two Year Guarantee.

Deliveries in the UK by our own vans.

50W MINI DISCO £139.50 + £5 carr. (Dep. £16.05, 12 months at £13.30 or 24 months at £7.46)

100W MINI DISCO £159.50 + £5 carr. (Dep. £22.66, 12 months at £14.73 or 24 months at £8.27)

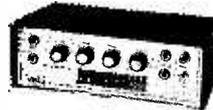
Two extremely compact mono systems complete with loudspeakers and leads.

- TWIN BSR DECKS
  - HEADPHONE MONITORING
  - MIC INPUT
- 100W PACKAGE P.A. £145 + £7.50 carr. with twin loudspeakers and PIEZO HORNS Dep. £19.70, 12 months at £13.70 or 24 months at £7.73)

SEND YOUR SPECIAL REQUIREMENTS FOR A CUSTOM DISCO QUOTATION

### SYSTEM 7000

#### MINOTAUR 100—All Purpose Wide Range Amplifier



- 100W rms ± 1dB
- Standard 8 ohm output
- Twin mixed inputs accept a wide range of signals
- 30HZ-30KHZ ± 2dB
- 23dB base/treble

A four input, high power amplifier which will deliver up to 150 watts output. An absolute must where multiple mixing & power are required

- Four individually mixed inputs
- Wide range bass/treble + master

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

£49.50

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



#### SAXON 150 HEAVY DUTY AMPLIFIER £59.00

### STROBES & PROJECTORS (We stock the full Pluto range)

Send for details

#### SUPERSTROBE £19.75

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

#### 150 WATT LIQUID WHEEL PROJECTOR

- Accepts all accessories
- C/w with wheel & motor plate
- Sturdy steel construction
- Remarkable value—Sold elsewhere at £39.50. Our price is only: £33.00



#### PRO-STROBE £32.50

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

**ACCESSORIES** Condenser mics ECM77 600 ohms £13.50  
ECM81 Dual Impedance £14.95 Crown headphones £6.75  
Heavy duty boomstand £14.50

All prices subject to VAT @ 8% except SA308/PM301, mics, and headphones (12½% Add 50p post & packing on all orders except where already shown.)

Ordering: By Telephone —Access, Barclay Card or COD Ring (01) 684 6385/0098  
By post —Send cheque or crossed P.O.'s or 60p for COD or send in your Access/Barclay card NUMBER ONLY

327-333 Whitehorse Road, Croydon, Surrey CR0 2HS

24 Hour Ansafone service (01) 684 6385

**PIEZO HORNS!!** UP TO 150 WATTS HANDLING. NO X-OVER REQUIRED £7.50 ea.

Exporters to 17 countries—enquiries welcomed  
Ring Sue Abegg on (01) 684 6385 for U.K. trade enquiries

# CRESCENT RADIO LTD.

164-166 HIGH ROAD, LONDON N22 6EJ 888-3206  
(also) 13 SOUTH MALL, EDMONTON, N.9 803-1685  
MAIL ORDER DEPT.  
1 ST. MICHAELS TERRACE, WOOD GREEN,  
LONDON N22 4SJ Phone 888 4474

## 3-WAY MULTIPLE AC ADAPTOR

This compact adaptor allows a large range of battery powered equipment to be operated from A.C. mains (230-240V A.C.). Switchable for 6, 7.5 or 9 volts, current rating is 800 mA max. A polarity reversing coupler is incorporated and the lead is terminated by a four way plug offering connections by 2.1 and 2.6mm sockets, 2.5 and 3.6mm plugs. The sealed moulded unit is fitted with a 9 pin 13A mains plug and measures 70 x 50 x 42mm approx. Only £8.50 + 8%.

## GOODMANS Sin. LOUDSPEAKER

Goodmans "Audion SPA" L/speaker, impedance 8 ohm, power handling 15W nominal. Our price £4.85 + 12 1/2% VAT.

## "C100" 100 WATT AMPLIFIER

All built and tested, mounted on a plain aluminium chassis which measures 18" x 9 1/2" x 4" and which you can mount into a cabinet of your choice. Four controlled inputs, master volume, treble, middle and bass controls, 8/0 protected output, 100 watts clean into 8ohm L/S. Ideal for disco, music groups, P.A. and clubs. A bargain at £45 + £1.50 carr. + 8% VAT.

## P.C. ETCHING KIT

This kit contains all that the constructor will need to etch the circuits of his own design. Contents—Plastic etching dish, Sample copper clad board, Laminated Cutter, 1 lb Ferric Chloride, Large Plastic Spoon, Etch Resist Pen, Full Etching Instructions.

Complete and Big Kit Value at £4.85 + 8% VAT.

## POWER SUPPLY UNITS

+8%

FPI Switched 8, 4 1/2, 0, 7 1/2, 9 and 12 volts at 500 mA, with on/off switch and pilot light. Size: 130mm x 65mm x 70mm.  
ONLY £5.50

## MS CONDENSER MICROPHONE

Cardioid and omni-directional 600 ohm and 50K ohm impedances. 20-18,000 Hz. On/off switch and wind shield. Complete with stand adaptor. Packed in presentation box.  
Price £14.50 + 12 1/2% VAT.

## HEAVY DUTY 12 VOLT POWER SUPPLY

1.5 amp at 12 volt power supply approx. size 8" x 4" x 3 1/2". Ideal for using your car entertainment in the home from domestic mains. Suitable for 8 track cartridge or 4 track cassette machines. Price £7.50 + VAT 8%.

## 2 WAY AND 3 WAY CROSSOVERS + 12 1/2%

NT206 2-way network for 8 ohm speakers up to 30 watts. Price £2.00.

NT206H 2-way, as above, 100 watts. Price £2.25.  
NT306 3-way network for 8 ohm speakers up to 30 watts. Price £3.25.  
NT306H 3-way, as above, 100 watts. Price £4.00.

## TIE-CLIP CONDENSER MICROPHONE

Omni-Directional 600 ohm 40-15,000Hz. Extra long lead. Ideal for stage work, conferences, etc. Price £9.50 + 12 1/2% VAT.

## LOW NOISE LOW PRICE CASSETTES + 8%

Good quality tape in well made screw type cassettes. Presented in single plastic cases.  
C90—45p C90—50p C120—45p  
10% Discount on ten or more cassettes of one type

## LOUDSPEAKERS + 12 1/2%

2 1/2" 8 ohm 90p  
2 1/2" 40 ohm 90p  
2 1/2" 80 ohm 90p  
5" 8 ohm ceramic £1.50

## MAINS KEYNECTOR

This connecting block connects any electrical equipment to the mains supply in seconds. Ideal for bench, garage, demonstrations, etc. Max. load 13A fused.  
Price: £5.50 + 8% VAT.

## MULTI-METER MM15

50,000 o.p.v.



If you need a good instrument for your work/hobby and you're not prepared to settle for a small scale and poor ranges, then read the specifications for the MM15 and send for one! AC volts: 0 to 1.5, to 0/500 in 10 ranges. DC volts: 0 to 0.5, to 0/500 in 12 ranges. DC current: 0 to 25 µA, to 0/10 amps in 10 ranges. Resistance: 0 to 100 ohms, to 0/15 meg ohms in 4 ranges. Decibels: -20 to +60 db in 10 ranges. Size: 6 1/2 x 4 1/2 x 2 1/2 inch.  
Price £21 + 8% VAT.

## BARGAIN PROJECT BOX

A plastic box with moulded extrusion rails for P.C. or Chassis panels with metal front plate fitted with four screws (all supplied). SIZE (Internal) 81mm x 51mm x 28mm.  
OUR PRICE 50p. + 8%

## PIEZO ELECTRIC HORN UNITS

New high quality high power tweeter, no form of crossover network is required as low frequency voltages simply have no effect on the tweeter.

Specification:—  
Frequency response: 2-20kHz to 25kHz ± sdb. (Input 4V rms pink noise—output 105db). Max. continuous rms input voltage: 25V  
Minimum series resistor: 10ohm at 1w  
Weight: 48 gms (2.3oz.)  
Panel Cut Out: 70mm dia. (9in).  
Size: 80mm x 80mm x 75mm  
Rating: Depending on connections up to 100W approx. Price: £9.00 + 8% VAT.

## 3 KILOWATT PSYCHEDELIC LIGHT CONTROL UNIT

Three Channel Bass, Middle, Treble, Each channel has its own sensitivity control. Just connect the input of this unit to the loudspeaker terminals of an amplifier and connect three 250V up to 1000W lamps to the output terminals of the unit, and you produce a fascinating sound-light display. (All guaranteed.)  
£18.50 plus 1.25 P. & P. + 8%

## BARGAIN TRANSFORMERS

12-0-12 volt 500mA  
240 volt primary transformer bargain, approx size 60mm x 40mm x 50mm fixing centres 75mm  
our price £1.20 + 8%

## EFFECTS PROJECTOR "150"

No Disco should be without our new effects projector, we believe that this is the most versatile machine for projecting coloured images to supplement your music. Spec:—Volts—220/240 AC 50Hz. Lamp—A1187 150 watts. Standard Lens—60 mm/m.

A sturdy metal construction and takes a range of lenses and accessories. Comes complete with 6" liquid wheel and ready to use. A bargain at £30 + £1.25 p. & p. + 8% VAT.

## ABS PLASTIC BOXES

Handy boxes for construction projects. Moulded extrusion rails for P.C. or chassis panels. Fitted with 1mm front panels.  
1005—105mm x 73mm x 45mm 65p  
1006—105mm x 74mm x 47mm 80p  
1007—185mm x 124mm x 60mm £1.80  
1022—107mm x 85mm x 45mm 65p  
(sloping front) Plus 8% VAT

## MAINS INTERFERENCE SUPPRESSOR

A mains suppressor designed to reduce unwanted mains interference caused by fridges, boilers etc. Best results are obtained by plugging the item causing the interference directly into the suppressor which is fitted with a 3 pin 13A mains socket. The suppressor is housed in a black plastic box with silver front panel and measures approx. 110mm x 77mm x 54mm. The unit comes fitted with 1.5m of 3 core cable and has a max. current loading of 3A. Price: £9.00 + 8%.

U.K. CARRIAGE 50p UNLESS OTHERWISE STATED

ACCESS AND BARCLAYCARD ACCEPTED  
VAT—All prices are excluding VAT. Please add to each item the VAT rate indicated.

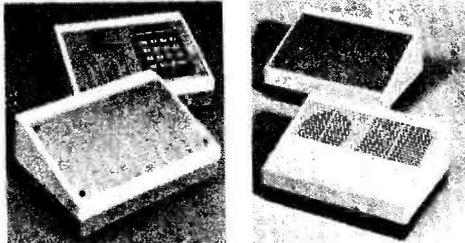
YOU CANNOT SKI  
DOWN  
OUR  
SLOPES



# VERO

But VERO SLOPING FRONT CASES do make attractive housings for many projects.

They are available in two sizes, made from high quality, two tone plastic, with anodised aluminium front panels. Both cases have integral circuit board fixing points in the base.



65—2523E and 75—1798K make ideal housings for test equipment, audio gear (faders, mixers, rhythm generators etc.) and control boxes. See them at your local electronics shop and judge for yourself.

Send for our booklet which describes Veroboard, Plain board, DIP board, Pins, Tools, Plastic boxes etc. S.A.E. 7" x 9" plus 10p to:-

VERO ELECTRONICS LTD. RETAIL DEPT.  
INDUSTRIAL ESTATE, CHANDLERS FORD, HANTS. SO5 3ZR.

**FANTASTIC GOLDRING G103 Belt Drive Turntable**  
**GOLDRING SAVINGS**  
Famous name turntable slashed to near half price. Complete with plinth, cover and leads. Accepts any standard cartridge (not included)  
FULL 12 MONTH GUARANTEE



OUR PRICE  
**£29.95**

R.R.P. £54 (+p/p & ins £2.25)

SAVE OVER £24

**Build your own GOLDRING CK2 Belt Drive Turntable**

Beautifully engineered unit from the famous Goldring company, comes complete with instructions and all necessary parts. Ready to incorporate into your design plinth and cover. The pleasure of assembling your own deck.

ONLY  
**£16.95**

(+ p.p & ins. £1.50)

(Plinth, cover and cartridge not included).  
Usually sold for £54.95 with plinth and cover.  
Call in or send cheque, P.O., M.O., Access, Barclaycard, Diners Club or American Express Number.

ALL PRICES  
INC. VAT

# Sonic Sound Audio

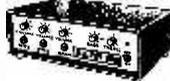
248/250 TOTTENHAM COURT ROAD, LONDON W1. TEL: 01-637 1908

## SUPERSOUND 13 HI-FI MONO AMPLIFIER



A superb solid state audio amplifier. Brand new components throughout. 5 silicon transistors plus 2 power output transistors in push-pull. Full wave rectification. Output approx. 13 watts r.m.s. into 8 ohms. Frequency response 12Hz-30KHz  $\pm$  3db. Fully integrated pre-amplifier stage with separate Volume, Bass boost and Treble cut controls. Suitable for 8-15 ohm speakers. Input for ceramic or crystal cartridge. Sensitivity approx. 40mV for full output. Supplied ready built and tested, with knobs, escutcheon panel, input and output plugs. Overall size 3" high  $\times$  6" wide  $\times$  7 1/2" deep. AC 200/250V. PRICE  $\pounds$ 13.75. P. & P.  $\pounds$ 1.20.

## HARVERSONIC MODEL P.A. TWO ZERO



An advanced solid state general purpose mono amplifier suitable for Public Address system. Disco, Guitar, Gram., etc. Features 3 individually controlled inputs (each input has a separate 2 stage pre-amp.). Input 1 5mv into 47k. Input 2 5mv into 47k. (suitable for use with mic. or guitar etc.). Input 3 100mv into 1 meg. suitable for gram. tuner, or tape etc. Full mixing facilities with full range bass & treble controls. All inputs plug into standard jack sockets on front panel. Output socket on rear of chassis for an 8 ohm or 16 ohm speaker. Output in excess of 20 watts R.M.S. Very attractively finished purpose built cabinet made from black vinyl covered steel, with a brushed anodised aluminium front escutcheon. For ac mains operation 200/240 volts. Size approx. 12 1/2" w.  $\times$  5" h.  $\times$  7 1/2" d. Special introductory Price  $\pounds$ 28.00 +  $\pounds$ 2.50 carriage & packing.

## HARVERSONIC STEREO 44



A solid state stereo amplifier chassis, with an output of 3-4 watts per channel into 8 ohm speakers. Using the latest high technology integrated circuit amplifiers with built in short term thermal overload protection. All components including rectifier smoothing capacitor, fuse, tone control, volume controls, 2 pin din speaker sockets & 5 pin din tape rec./play socket are mounted on the printed circuit panel, size approx. 9 1/2"  $\times$  2 1/2"  $\times$  1 1/2" max. depth. Supplied brand new & tested, with knobs, brushed anodised aluminium 2 way escutcheon (to allow the amplifier to be mounted horizontally or vertically) at only  $\pounds$ 9.00 plus 50p P. & P. Mains transformer with an output of 17v a/c at 500mA can be supplied at  $\pounds$ 1.50 + 40p P & P if required. Full connection details supplied.

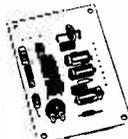
**VYNAIR & REXINE SPEAKERS & CABINET FABRICS** app. 54 in. wide. Our price  $\pounds$ 1.50 yd. length. P. & P. 50p per yd. (min. 1 yd.), S.A.E. for samples.

**BRAND NEW MULTI-RATIO MAINS TRANSFORMERS.** Giving 13 alternatives. Primary: 0-210-240v. Secondary combinations 0-5-10-15-20-25-30-35-40-50v. half wave at 1 amp, or 10-0-10, 20-0-20, 30-0-30v. at 2 amps full wave. Size 3in. long  $\times$  3 1/2in. wide  $\times$  3 in. deep. Price  $\pounds$ 2.90 P. & P.  $\pounds$ 1.00.

**MAINS TRANSFORMER.** For power supplies. Pri. 200/240v. Sec. 9-0-9 at 500mA.  $\pounds$ 1.50 P. & P. 65p. Pri. 200/240v. Sec. 12-0-12 at 1 amp.  $\pounds$ 1.65 P. & P. 65p. Pri. 200/240v. Sec. 10-0-10 at 2 amp.  $\pounds$ 2.35 P. & P. 95p. Pri. 200/240v. Sec. 23v at 1.5 amp. 6v at .6 amp. 8v at 50mA.  $\pounds$ 2.00 + 65p P. & P.

**ALL-PURPOSE POWER SUPPLY UNIT 200/240v. A.C. Input.** Four switched fully smoothed D.C. outputs giving 6v. and 7.4v. and 9v. and 12v. at 1 amp on load. Fitted insulated output terminals and pilot lamp indicator. Hammer finish metal case overall size 6"  $\times$  3 1/2"  $\times$  2 1/2". Ready built and tested. Price  $\pounds$ 6.75 P. & P. 95p.

**STEREO-DECODER** SIZE 2"  $\times$  3"  $\times$  1 1/2" ready built. Pre-aligned and tested. Sens. 20-560 mV for 9-16V neg. earth operation. Can be fitted to almost any FM VHF radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied.  $\pounds$ 5.62 plus 20p P. & P. Stereo beacon light if required 40p extra.



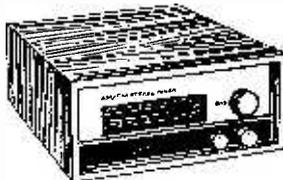
**QUALITY RECORD PLAYER AMPLIFIER MK. II** A top quality record player amplifier employing heavy duty double wound mains transformer, ECC83, EL84, and rectifier. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7in. wide  $\times$  3in. deep  $\times$  6in. high. Ready built and tested. PRICE  $\pounds$ 7.00. P. & P.  $\pounds$ 1.25. ALSO AVAILABLE mounted on board with output transformer and speaker. PRICE  $\pounds$ 8.00. P. & P.  $\pounds$ 1.30.

**STEREO-DECODER** SIZE 2"  $\times$  3"  $\times$  1 1/2" ready built. Pre-aligned and tested. Sens. 20-560 mV for 9-16V neg. earth operation. Can be fitted to almost any FM VHF radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied.  $\pounds$ 5.62 plus 20p P. & P. Stereo beacon light if required 40p extra.

**STEREO-DECODER** SIZE 2"  $\times$  3"  $\times$  1 1/2" ready built. Pre-aligned and tested. Sens. 20-560 mV for 9-16V neg. earth operation. Can be fitted to almost any FM VHF radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied.  $\pounds$ 5.62 plus 20p P. & P. Stereo beacon light if required 40p extra.

**STEREO-DECODER** SIZE 2"  $\times$  3"  $\times$  1 1/2" ready built. Pre-aligned and tested. Sens. 20-560 mV for 9-16V neg. earth operation. Can be fitted to almost any FM VHF radio or tuner. Stereo beacon light can be fitted if required. Full details and instructions (inclusive of hints and tips) supplied.  $\pounds$ 5.62 plus 20p P. & P. Stereo beacon light if required 40p extra.

## MAINS OPERATED SOLID STATE AM/FM STEREO TUNER



200/240V Mains operated Solid State F/M A/M Stereo Tuner. Covering M.W. A.M. 540-1605KHz VHF/FM 88-108MHz.

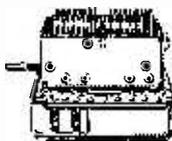
Built-in Ferrite rod aerial for M.W. Full AFC and AGC on AM and FM. Stereo Beacon Lamp Indicator. Built in Pre-amps with variable output voltage adjustable by Pre-set control. Max. o/p Voltage 600mV R.M.S into 20K. Simulated Teak finish cabinet. Will match almost any amplifier. Size 8 1/2"  $\times$  4"  $\times$  9 1/2" deep.

LIMITED NUMBER ONLY at  $\pounds$ 28.00 +  $\pounds$ 1.50 P. & P.

## SPECIAL OFFERS

Mullard LP1159 R.F.-I.F. Double Tuned Amplifier Module for nominal 470 KHz. Size approx. 2 1/2"  $\times$  1 1/2"  $\times$  7/8" 7.6 Volt  $\pm$  earth. Brand new pre-aligned. Full specification and connection details supplied.  $\pounds$ 2.25. P. & P. 20p.

Pye VHF/FM Tuner Head covering 88-108 M/Hz. 10.7 M/Hz I.F. output. 7.8 Volt  $\pm$  earth. Supplied pre-aligned, with full circuit diagram. Connection details supplied. Beautifully made with precision-gear FM gang and 323Pf + 323Pf A.M. Tuning gang only  $\pounds$ 3.15 + P. & P. 35p.



## PRECISION MADE

Push Button Switch bank. 8 Buttons giving 16 S/P C/O interlocked switches plus 1 Cancel Button Plus 3 d/p c/o. Overall size 5"  $\times$  2 1/2"  $\times$  1". Supplied complete with chrome finished switch buttons. 2 for  $\pounds$ 1.50 + 20p P & P.

## HI-FI LOUDSPEAKER SYSTEM MK II

Beautifully made, simulated teak finish enclosure with attractive slatted front. Size 16 1/2" high  $\times$  10 1/2" wide  $\times$  9" deep (approx.). Fitted with E.M.I. Ceramic Magnet 13"  $\times$  8" bass unit, H.F. tweeter unit and crossover. AVAILABLE IN NOMINAL 4 Ohm, 8 Ohm or 16 Ohm impedance (state which). Handling power 10 watts R.M.S.

**OUR PRICE  $\pounds$ 12.80** each. Carr.  $\pounds$ 2.20 ea. Cabinet Available Separately  $\pounds$ 7.60, Carr.  $\pounds$ 1.60 each. Also available in 8 ohms with EMI 13"  $\times$  8" bass speaker with parasitic tweeter  $\pounds$ 11.10, Carr.  $\pounds$ 2.20 each.

## LOUDSPEAKER BARGAINS

5in. 3 ohm  $\pounds$ 2.00. P. & P. 35p. 7  $\times$  4in. 3 ohm  $\pounds$ 2.35. P. & P. 48p. 10  $\times$  6in. 3 or 15 ohm  $\pounds$ 3.20. P. & P. 75p. 8  $\times$  5in. 3 ohm with high flux magnet  $\pounds$ 3.00. P. & P. 60p. Tweeter. Approx. 3 1/2". Available 3 or 8 or 15 ohms.  $\pounds$ 2.00 + 30p P. & P. 2" Plastic Cone HF Tweeter 4 ohm  $\pounds$ 3.50 per matched pair + 50p P. & P.

**HIGH POWER HI-FI 8 OHM DOME TWEETER.** 1" voice coil, magnet size 3" dia. suitable for use in up to 50 watt systems  $\pounds$ 4.50 ea + 60p P. & P.

**SPECIAL OFFER.** 6 1/2" long throw, roll surround, ceramic magnet 8 ohm 10 watt speaker chassis. Specially suitable for HiFi  $\pounds$ 3.95 + 75p P. & P.

## "POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER

Size 1 1/2"  $\times$  1 1/2"  $\times$  1 1/2" deep. Weight 19oz. Power handling 20W r.m.s. (40W peak). Impedance 8 ohm only. Response 40Hz-20KHz. Can be mounted on ceilings, walls, doors, under tables, etc., and used with or without baffle. Send S.A.E. for full details. Only  $\pounds$ 8.40 each + p. (one 90p, two  $\pounds$ 1.10). Now available in either 8" round version or 4 1/2"  $\times$  8 1/2" rectangular. 10 watts RMS 60Hz-20KHz  $\pounds$ 5.25 + P. & P. one (65p, two 75p).

## SPECIAL LINES OFFERED SUBJECT TO STOCK AVAILABILITY

Limited number of British manufacturer's surplus professional 100 watt RMS slave amplifiers. Special features, 2 separate power mules, 1 for Bass response and 1 for mid-range/tweeter, 5 stage LED display for power o/p indication, A/C mains i/p switchable for 110 or 240v. Can easily be converted to Stereo. AVAILABLE TO PERSONAL CALLERS ONLY, PLEASE PHONE TO CONFIRM AVAILABILITY. Brand new & tested only  $\pounds$ 33.75.

Prices include VAT at Current Rate

## HARVERSONIC SUPERSOUND 10 + 10 STEREO AMPLIFIER KIT



A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Silicon Transistors in the first five stages on each channel resulting in even lower noise level with improved sensitivity. Integral 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  $\pm$  3dB 12-30,000 Hz. Sensitivity: better than 80mV into 1M  $\Omega$ ; Full power bandwidth:  $\pm$  3dB 12-15,000 Hz. Bass boost approx. to  $\pm$  12dB. Treble cut approx. to  $\pm$  16dB. Negative feedback 18dB over main amp. Power requirements 35v. at 1.0 amp. Overall Size 12" w.  $\times$  8" d.  $\times$  2 1/2" h.

Fully detailed 7 page construction manual and parts list free with kit or send 25p plus large S.A.E.

AMPLIFIER KIT ...  $\pounds$ 13.50 P. & P. 80p (Magnetic input components 33p extra)

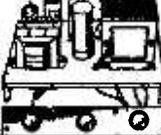
POWER PACK KIT ...  $\pounds$ 5.50 P. & P. 95p

CABINET ...  $\pounds$ 5.50 P. & P. 95p

**SPECIAL OFFER—only  $\pounds$ 23.75 if all 3 items ordered at one time plus  $\pounds$ 1.25 p. & p.**

Also available ready built and tested  $\pounds$ 31.25. P. & P.  $\pounds$ 1.50

## 3-VALVE AUDIO AMPLIFIER HA34 MK II

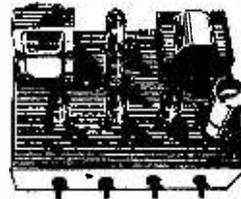


Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7 1/2" w.  $\times$  4" d.  $\times$  4 1/2" h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 4 1/2 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only  $\pounds$ 8.20. P. & P.  $\pounds$ 1.40.

**HSL "FOUR" AMPLIFIER KIT.** Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc.  $\pounds$ 7.60 P. & P.  $\pounds$ 1.40.

## 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 mics and gram allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15  $\Omega$  speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet 25p + S.A.E. (Free with parts). All parts sold separately. ONLY  $\pounds$ 12.00 P. & P.  $\pounds$ 1.40. Also available ready built and tested  $\pounds$ 16.50 P. & P.  $\pounds$ 1.40.



## GENERAL PURPOSE HIGH STABILITY TRANSISTOR PRE-AMPLIFIER

For P.U. Tape, Mike, Guitar, etc. and suitable for use with valve or transistor equipment. 9-18v. battery or from H.T. line 200/300v. Frequency response 15Hz-25KHz. Gain 26dB. Solid encapsulation size 1 1/2"  $\times$  1 1/2"  $\times$  1/2". Brand new complete with instructions. Price  $\pounds$ 1.80 P. & P. 15p.

(Please write clearly)

PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVER-SEAS ORDERS CHARGED EXTRA.

Open 9.30-5.30 Monday to Friday. 9.30-5 Saturday. Closed Wednesday.

All prices and specifications correct at time of press and subject to alteration without notice.

**HARVERSON SURPLUS CO. LTD.**  
(Dept. P.W.) 170 HIGH ST., MERTON, LONDON, S. W.19. Tel.: 01-540 3985

A few minutes from South Wimbledon Tube Station.

For personal callers only we can now offer a full repair service on all Hi-Fi Equipment, Disco, Cassettes, Car Radio etc. SEND S.A.E. WITH ALL ENQUIRIES



# 15-240 Watts!

## HY5 Preamplifier

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

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

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

**SPECIFICATIONS:**

**INPUTS:** Magnetic Pick-up 3mV; Ceramic Pick-up 30mV; Tuner 100mV; Microphone 10mV;

Auxiliary 3-100mV; Input Impedance 4-7kΩ at 1kHz.

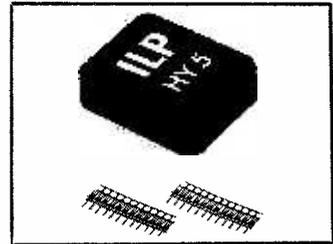
**OUTPUTS:** Tape 100mV; Main output 500mV R.M.S.

**ACTIVE TONE CONTROLS:** Treble ± 12dB at 10kHz; Bass ± at 100Hz.

**DISTORTION:** 0.1% at 1kHz. Signal/Noise Ratio 68dB.

**OVERLOAD:** 38dB on Magnetic Pick-up. **SUPPLY VOLTAGE** ± 16-50V.

**Price** £5.22 + 65p VAT P&P free.



## HY30 15 Watts into 8Ω

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

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

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

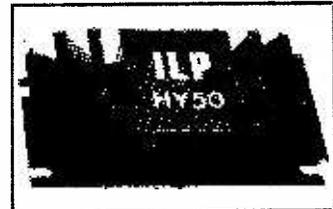
**SPECIFICATIONS:**

**OUTPUT POWER** 15W R.M.S. into 8Ω; **DISTORTION** 0.1% at 1.5W.

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

**SUPPLY VOLTAGE** ± 18V.

**Price** £5.22 + 65p VAT P&P free.



## HY50 25 Watts into 8Ω

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

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

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

**SPECIFICATIONS:** **INPUT SENSITIVITY** 500mV

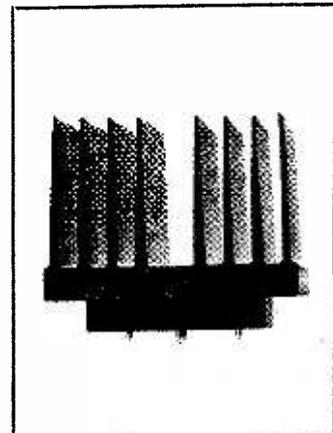
**OUTPUT POWER** 25W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0.04% at 25W

at 1kHz

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

**SUPPLY VOLTAGE** ± 25V **SIZE** 105 50 25mm

**Price** £5.82 + 85p VAT P&P free



## HY120 60 Watts into 8Ω

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

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

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

**SPECIFICATIONS:**

**INPUT SENSITIVITY** 500mV.

**OUTPUT POWER** 60W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0.04% at 60W

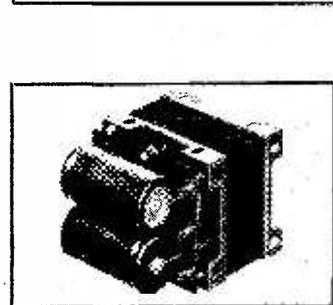
at 1kHz

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

± 35V

**SIZE** 114 50 85mm

**Price** £15.84 + £1.27 VAT P&P free.



## HY200 120 Watts into 8Ω

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

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

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

**SPECIFICATIONS:**

**INPUT SENSITIVITY** 500mV

**OUTPUT POWER** 120W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0.05% at 100W

at 1kHz

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

± 45V

**SIZE** 114 50 85mm

**Price** £23.32 + £1.87 VAT P&P free.

## HY400 240 Watts into 4Ω

The HY400 is I.L.P.'s "Big Daddy" of the range producing 240W into 4Ω! It has been designed for high power disco address applications. If the amplifier is to be used at continuous high power levels a cooling fan is recommended. The amplifier includes all the qualities of the rest of the family to lead the market as a true high power hi-fidelity power module.

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

**APPLICATIONS:** Public address—Disco—Power slave—Industrial

**SPECIFICATIONS:**

**OUTPUT POWER** 240W RMS into 4Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0.1% at 240W

at 1kHz

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

± 45V

**INPUT SENSITIVITY** 500mV **SIZE** 114 100 85mm

**Price** £32.17 + £2.57 VAT P&P free.

## POWER SUPPLIES

PSU36 suitable for two HY30's £5.22 plus 65p VAT. P/P free.

PSU50 suitable for two HY50's £6.82 plus 85p VAT. P/P free.

PSU70 suitable for two HY120's £13.75 plus £1.10 VAT. P/P free.

PSU90 suitable for one HY200 £12.65 plus £1.01 VAT. P/P free.

PSU180 £23.10 + £1.85 VAT.

B1 £0.48 + £0.06 VAT.

TWO YEARS' GUARANTEE ON ALL OUR PRODUCTS

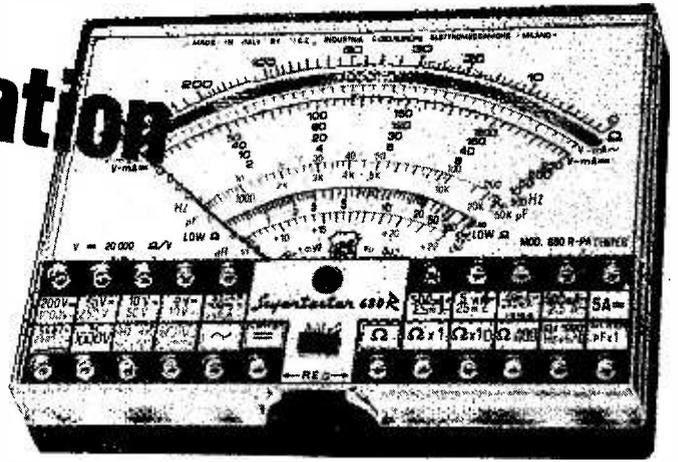
I.L.P. ELECTRONICS LTD., CROSSLAND HOUSE,  
NACKINGTON, CANTERBURY, KENT, CT4 7AD.

Please Supply \_\_\_\_\_  
 Total Purchase Price \_\_\_\_\_  
 I Enclose Cheque  Postal Orders  Money Order   
 Please debit my Access account  Barclaycard account   
 Account number \_\_\_\_\_  
 Name and Address \_\_\_\_\_  
 Signature \_\_\_\_\_

# I.C.E. MULTIMETERS

**TWICE the information  
in HALF the size**

The I.C.E. range of multimeters provide an unrivalled combination of maximum performance within minimum dimensions, at a truly low cost. Plus, a complete range of add-on accessories for more ranges, more functions.



## Supertester 680R (illustrated)

- \* 20kΩ/V, ±1% fsd on d.c.
- 4kΩ/V, ±2% fsd on a.c.
- \* 80 Ranges – 10 Functions
- \* 140 × 105 × 55mm

**£25.25 + VAT**

(For Mail Order add 80p P&P)

## Supertester 680G

- \* 20kΩ/V, ±2% fsd on d.c.
- 4kΩ/V, ±2% fsd on a.c.
- \* 48 Ranges – 10 Functions
- \* 109 × 113 × 37mm

**£19.95 + VAT**

(For Mail Order add 80p P&P)

## Microtest 80

- \* 20kΩ/V, ± 2% fsd on d.c.
- 4kΩ/V, ±2% fsd on a.c.
- \* 40 Ranges – 8 Functions
- \* Complete with case – only 93 × 95 × 23mm

**£14.95 + VAT**

(For Mail Order add 80p P&P)

All I.C.E. multimeters are supplied complete with unbreakable plastic carrying case, test leads, etc. and a 50-plus page, fully detailed and illustrated Operating and Maintenance Manual.

Now available from selected stockists. Write or phone for list, or for details of direct mail-order service.



Electronic Brokers Ltd.  
49-53 Pancras Road, London NW1 2QB  
Tel: 01-837 7781



**V.D.U.  
AND  
MICRO  
COMPUTER**



**Buy it with Access**

The Crofton V.D.U. is an expandable system built up on a modular basis. The system comprises Rack and P.S.U., Video Sync Generator, Character Generator Board, Memory Board, Memory Extension Board, Cursor Control, Write Control Board, Tape/Phone Interface Board, Microprocessor (SC/MP) Board. The whole system will be gradually extended to make this one of the most versatile on the market. Available in modular form or ready constructed.

Send s.a.e for information

**GROFTON ELECTRONICS LTD.**  
Dept. E, 35 Grosvenor Road, Twickenham  
Middx. Tel. 01-891 1923

*Secondhand cameras and monitors  
always available*

**INTRODUCING  
THE GROFTON  
EXPANDABLE  
V.D.U. SYSTEM**

## PRACTICAL WIRELESS T.V. SOUND TUNER

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

Copy of original article supplied on request

- IF Sub-Assembly (G8) **£6.80**. P & P 75p
  - Mullard ELC1043 V'cap UHF Tuner **£4.50**. P & P 35p.
  - 3-way Station Control Unit **£1.20**. P & P 25p.
  - 6-way Station Control Unit (Special Offer) **£1.00**.
  - Power Supply Prtd Circuit Board **£1.00**. P & P 30p.
  - Res, Caps, Semiconds, etc. for above **£5.80**
  - Mains Transformer for above **£2.50**. P & P 30p
- Add 12½% VAT to price of goods. P & P all items 85p.

Callers welcome at shop premises.

## MANOR SUPPLIES

172 WEST END LANE, LONDON NW6  
(Near W. Hampstead Tube Stn.) Tel. 01-794 8751

# THE OPEN DOOR TO QUALITY



Latest revised issue (4th Edition, Cat. 8). Includes new ranges of meters and switches as well as price adjustments together with items from advanced opto-electronic components to humble (but essential) washers. Many things listed are very difficult to obtain elsewhere. The Company's own computer expedites delivery and maintains customer satisfaction. Attractive discounts are allowed on many purchases. ACCESS AND BARCLAYCARD ORDERS ACCEPTED.

144 pages

**40p**

POST PAID  
inc. 40p Refund  
Voucher

+ FREE POSTAGE

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

All communications to Dept. PW 5  
28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY  
TW20 0HB. Tel Egham 3603. Telex 264475 Shop 9-5.30, 9-1 pm Sats  
NORTHERN BRANCH: 680 Burnage Lane, Burnage, Manchester  
M19 1NA. Tel: (061) 432 4945. Shop 9-5.30pm, 1 pm Sats.

**ELECTROVALUE LTD**



**SUPER SAVINGS FOR THE HOME CONSTRUCTOR**

## Goldring CK2 BELT DRIVE TURNTABLE CONSTRUCTION KIT

Complete with SAU2 arm, template and easy-to-follow instructions. Ready for operation in a short time.

### A FEW OF THE MANY BIG FEATURES

- Wow/Flutter 0.15% peak
- Rumble -60dB weighted
- Removeable headshell
- Viscouse damped cueing device
- Easily adjusted tracking force and bias setting
- Two speed, 16 pole synchronous motor
- Dimensions 37.8 x 28.3cms

**BRAND NEW IN SEALED CARTONS 12 MONTHS GUARANTEE**

**OUTSTANDING VALUE**  
R.R.P. £31.50

**OUR PRICE**  
**£16.95**  
(+ £1.50 p/p & ins)

Plinth, cover and cartridge available, P.O.A.

Call in or send a cheque, P.O., M.O., or Access, Barclaycard American Express or Diners Club number.

# Lion House

227 Tottenham Court Road, London W.1. Tel 01-580 7383

**SCOPES** general purpose 3" bench scope single beam Y amp 10c/s to 300Kc sensitivity 10 Mill/V to 100v per Cm, timebase 10c/s to 5Kc in 3 ranges, int or ext sync, provision for beam mod, controls focus, brill, X & Y shift, Y amp atten, T.B. coarse & fine, sync. sel, sync. amp & polarity, etc. Tube green trace 1.5Kv fitted Cm graticule approx. size 12 x 9½ front 23" deep, supplied tested with handbook for use on 200/250v mains £35.

**I.F.F. TRANSPONDERS** for use on the 1 KM/c band contains Tx & Rx tuning cavities, 60 Mc/s I.F. strip, blower, pulse trans & other H.V. parts, normal I/P 115v 400c/s Tx gives approx. 1 Kw peak 1 Usec pulses. Note these are less valves & ext. solled, with circ. £10.80. **TRANS H.T.** prla. 230v sec. 1125-0-1125v at 565 Ma new £10.80 also 525-0-525v at 800Ma. £7.50 **STANDARD CELLS** for cal dvm. 1.018 volts £4.50. **SWTS**, miniature toggle S.P.C.O. 3 for £1.20. **INFRA RED T.S.** used for testing image convertor tubes as mains p.u. giving 24v dc stab, 100Ua meter to read o/p of p.c. infra red light source, eht unit giving 12Kv d.c. from I/P of 24v d.c. complete in neat carrying case with cables, etc., recent manufacture £15. **BLOWERS** single ended outlet 2 x 1½" approx. 50 cfm for 240v new £6.40. **U.H.F.** ground stations 225 to 400Mc/s single channel 100 watt A.M. 230v I/P consists of Tx, Md & Rx with circs etc. £173.

**THE FOLLOWING FOR CALLERS ONLY.**

**X BRAND AIRCRAFT SCANNERS AND DRIVES £15.**

Above prices inc. carr./postage & Vat. carriage charges apply to U.K. mainland only, goods ex equipment unless stated new. SAE for list 1712 or enquiry. Shop open Tues. to Sat.

**A. H. SUPPLIES** 122 HANDSWORTH RD., SHEFFIELD S9 4AE Ph. 444278 (0742)

# ESSENTIAL BOOKS for RADIO AMATEURS

**VOLUME 2**

completes the

**RADIO COMMUNICATION HANDBOOK**  
(5th edition)

Volume 2 of this standard reference work has now been published. Its contents reflect the ever-expanding scope of amateur radio, with subjects such as fm repeaters and slow-scan television included for the first time in this edition; while a whole chapter is now given over to amateur satellites.

The major part of Volume 2, however, is devoted to the more fundamental aspects of radio communication. The 98-page chapter on hf antennas is a "book within a book", and such vital subjects as propagation, noise and interference are covered in detail in individual chapters.

Chapter titles are: Propagation; HF aeriels; VHF and uhf aeriels; Mobile and portable equipment; Noise; Power supplies; Interference; Measurements; Operating technique and station layout; Amateur satellite communication; Image communication; The RSGB and the radio amateur; and General data.

324 + xii pages

Price £8.12 post paid

**VHF-UHF MANUAL**  
(3rd edition)

by D. S. Evans, PhD, AIM, G3RPE,  
and G. R. Jessop, CEng, MIERE, G6JP

Over 400 large-format (190 x 245mm) pages packed with ideas, information and constructional details of tried and tested equipment, each specialist topic contributed by an acknowledged expert in the field.

The most comprehensive and up-to-date review of vhf and uhf techniques available today.

Chapters on receivers, transmitters, space communications, filters, aeriels, microwaves and much more. Simple amateur television is covered and a data section provides valuable facts and figures to help the constructor. Many of the designs make use of integrated circuits, and the microwaves chapter gives details of equipment for use up to 24GHz.

404 + xii pages

Price £6.82 post paid

**RSGB AMATEUR RADIO CALL BOOK 1977**

Incorporates all new call signs and amendments notified between August 1975 and August 1976.

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

176 pages

Price £2.35 post paid

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

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



**Radio Society of Great Britain**  
35 DOUGHTY STREET, LONDON, WCIN 2AE

**MINI CONSOLES**  
Ideal for small desk control panels and consoles. Moulded in orange, blue, black and grey ABS. Incorporates slots for holding 1.5mm thick pcb's. Aluminium panel sits recessed into front of console and held by screws running into integral brass bushes.

MC 161 x 96 x 58mm £1.53 (1-9) £1.50 (10+)  
MC 215 x 130 x 75mm £2.20 (1-9) £2.17 (10+)  
Add 25p per £1 order value for Post & Packing

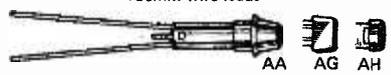
**ECONOMY QUALITY LED's**  
50 for only £5 - 100 for only £9  
Mixed bags, all sizes, various colours

**FULL SPECIFICATION LED's**



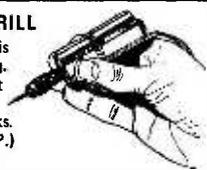
Red (specify size) 75p per pack  
Green, Yellow, Orange (specify size) £1.20 per pack  
(Each pack contains 5 LED's, Mounting Clips and Data)

**TYPE A NEON INDICATORS**  
Supplied with resistor for 240 Volts operation  
Held in 8mm hole by plastic bezel  
150mm wire leads

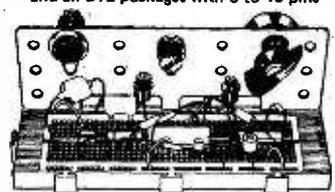


Red, Amber, Clear, Opal 19p each  
Green 28p each

**12 VOLTS MINI HAND DRILL**  
Ideal for drilling pcb, chassis etc as well as model making. Supplied with 2 collets that accept tools and drills with 3/32" and .050" dia. shanks. £7.56 (Includes VAT & P.P.)



Stop wasting time soldering  
**The NEW MW BREADBOARD** accepts Transistors, LED's, Diodes, Resistors, Capacitors and all DIL packages with 6 to 40 pins



Includes slot-in Component Support Bracket and has over 400 individual sockets, plus Vcc and Ground Bus Strips  
Price £9.72 (includes VAT & P.P.)

**TYPE MP NEON INDICATOR**  
Supplied with resistor for 240 Volts operation  
150mm leads, held in 6.4mm hole by nut



Red, Amber, Clear, Opal 20p each

**SEVEN SEGMENT DISPLAYS**

**Economy Quality**  
Common Anode - 0.3" - Left Decimal  
Red, Yellow and Green @ 45p each

**Full Specification**  
Common Anode - 0.3" - Left Decimal  
Red @ 98p each  
Green and Yellow @ £1.35 each  
(Data supplied with Full Spec. displays only)

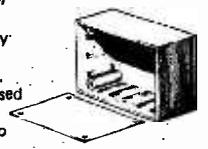


Quantity quotations on request

P.P. Note Unless included in price add 25p Post & Packing for orders totalling under £10. All prices include VAT and are valid in UK only for 2 months from journal issue date

**Michael Williams Electronics**  
47 Vicarage Av. Cheadle Hulme, Cheshire SK8 7JP

**SC BOXES (square corners)**  
Easily drilled or punched, orange, blue, black and grey ABS. Incorporate slots for holding 1.5mm thick pcb's. Aluminium panel sits recessed into front of the box and held by screws running into integral brass bushes.

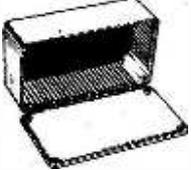


SC 85 x 56 x 35mm 80p (1-9) 77p (10+)  
SC 111 x 71 x 48mm £1.07 (1-9) £1.04 (10+)  
SC 161 x 96 x 59mm £1.49 (1-9) £1.46 (10+)  
Add 25p per £1 order value for Post & Packing

**240 VOLTS MINI HAND DRILLS**  
Ideal for drilling pcb's, chassis etc as well as model making. Supplied with 3 collets that accept tools and drills with 1mm, 2mm and 1/8" dia shanks. £9.72 (includes VAT & P.P.)  
Accessory tools... 5 Burrs, 1mm, 2mm, 1/8th Drills, 3/32" Collet Price £1.75 (Includes VAT & P.P.)



**RC BOXES (round corners)**  
Easily drilled or punched, orange, blue, black and grey ABS. Incorporate slots for holding 1.5mm thick pcb's. Close fitting flanged lids held by screws running into integral brass bushes.



RC 100 x 50 x 25mm 51p (1-9) 49p (10+)  
RC 112 x 62 x 31mm 59p (1-9) 52p (10+)  
RC 120 x 65 x 40mm 68p (1-9) 62p (10+)  
RC 150 x 80 x 50mm 77p (1-9) 74p (10+)  
RC 190 x 110 x 60mm £1.33 (1-9) £1.30 (10+)

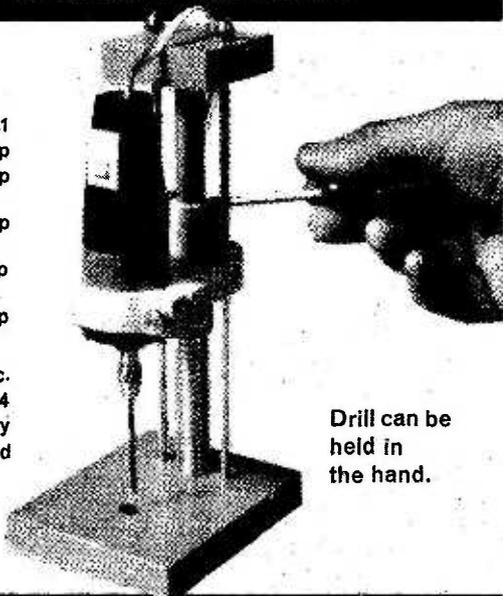
Polystyrene version,  
in grey only with no slots, no integral brass bushes  
RC(P) 112 x 61 x 31mm 35p (1-9) 32p (10+)  
Add 25p per £1 order value for Post & Packing

Speed up your precision work with

# MINIATURE POWER EQUIPMENT

**SUPER 30 KIT** - 30 tools incl. drill without stand £19.39 pp £1  
**PIS DRILL STAND** £5.13 pp 38p  
**PI DRILL** £9.67 pp 38p  
**FLEXIBLE DRIVE SHAFT** £5.94 pp 34p  
**TRANSFORMER** continuous ac/12v dc £7.56 pp 81p  
**VARIABLE SPEED TRANSFORMER** £9.50 pp 81p

Replacement drills, stones, burrs, etc. 40p each. Circular saw blades set of 4 with arbor £2.50. P. & P. any quantity 25p. 9" x 4" S.A.E. please for leaflet and order form



Drill can be held in the hand.



## PRECISION PETITE LTD

119a HIGH STREET TEDDINGTON MIDDLESEX TW11 8HG  
Tel. 01-977 0878 24 Hour recorded service

**MAINS INTERCOM** NO BATTERIES NO WIRES ONLY  
**£29.99**  
PER PAIR + VAT £3.76

The modern way of instant 2-way communications. Supplied with 8-core wire. Just plug into power socket. Ready for use. Crystal clear communications from room to room. Range 1/2 mile on the same mains phase. On/off switch. Volume control. Useful as inter-office intercom, between office and warehouse in surgery and in homes. P. & P. 97p.



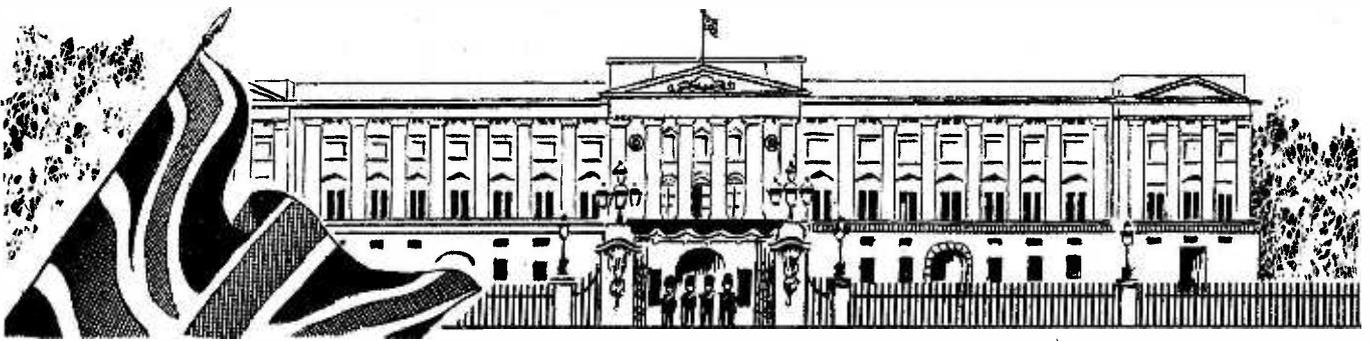
**4-STATION INTERCOM** £18.95 + V.A.T. £1.52  
Solve your communication problems with this 4-Station Transistor Intercom system (1 master and 3 Subs), in robust plastic cabinets for desk or wall mounting. Call/talk/listen from Master to Subs and Subs to Master. Ideally suitable for Business, Surgery, Schools, Hospitals and Office. Operates on one 9V battery. On/off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 97p.



**NEW! AMERICAN TYPE CRADLE TELEPHONE AMPLIFIER** ONLY £14.95 + VAT £1.20

Latest transistorised Telephone Amplifier with detached plug-in speaker. Placing the receiver on to the cradle activates a switch for immediate two-way conversation without holding the handset. Many people can listen at a time. Increase efficiency in office, shop, workshop. Perfect for "conference" calls: leaves the user's hands free to make notes, consult files. No long waiting, saves time with long-distance calls. On/off switch, volume. Direct tape recording model at £19.95 + VAT £1.96. P. & P. 87p.  
10-day price refund guarantee on all items.  
WEST LONDON DIRECT SUPPLIES (PW9)  
169 KENSINGTON HIGH STREET, LONDON, W8 01-987 5548





# JUBILEE SALE

## 74 SERIES TTL IC's

Type	Quantity	Type	Quantity	Type	Quantity			
	1 100		1 100		1 100			
	£ p	£ p	£ p	£ p	£ p			
7400	0.09	0.08	7448	0.70	0.68	74122	0.45	0.42
7401	0.11	0.10	7450	0.12	0.10	74123	0.65	0.62
7402	0.11	0.10	7451	0.12	0.10	74141	0.68	0.65
7403	0.11	0.10	7453	0.12	0.10	74145	0.75	0.72
7404	0.11	0.10	7454	0.12	0.10	74150	1.10	1.05
7405	0.11	0.10	7460	0.12	0.10	74151	0.65	0.60
7406	0.28	0.25	7470	0.24	0.23	74153	0.70	0.68
7407	0.28	0.25	7472	0.20	0.19	74154	1.20	1.10
7408	0.12	0.11	7473	0.26	0.22	74155	0.70	0.68
7409	0.12	0.11	7474	0.24	0.23	74156	0.70	0.68
7410	0.09	0.08	7475	0.44	0.40	74157	0.70	0.68
7411	0.22	0.20	7476	0.26	0.25	74160	0.95	0.85
7412	0.22	0.20	7480	0.45	0.42	74161	0.95	0.85
7413	0.26	0.25	7481	0.90	0.88	74162	0.95	0.85
7416	0.28	0.25	7482	0.75	0.73	74163	0.95	0.85
7417	0.26	0.25	7483	0.88	0.82	74164	1.20	1.10
7420	0.11	0.10	7484	0.85	0.80	74165	1.20	1.10
7422	0.19	0.18	7485	1.10	1.00	74166	1.20	1.10
7423	0.21	0.20	7486	0.28	0.26	74174	1.10	1.00
7425	0.25	0.23	7489	2.70	2.50	74175	0.85	0.82
7426	0.25	0.23	7490	0.38	0.32	74176	1.10	1.00
7427	0.25	0.23	7491	0.65	0.62	74177	1.10	1.00
7428	0.36	0.34	7492	0.43	0.35	74180	1.10	1.00
7430	0.12	0.10	7493	0.38	0.35	74181	1.90	1.80
7432	0.20	0.19	7494	0.70	0.68	74182	0.80	0.78
7433	0.38	0.36	7495	0.60	0.58	74184	1.50	1.40
7437	0.26	0.25	7496	0.70	0.68	74190	1.40	1.30
7438	0.26	0.25	74100	0.95	0.90	74191	1.40	1.30
7440	0.12	0.10	74104	0.40	0.35	74192	1.10	1.00
7441	0.60	0.57	74105	0.30	0.25	74193	1.05	1.00
7442	0.80	0.70	74107	0.30	0.25	74194	1.05	1.00
7443	0.95	0.90	74110	0.48	0.45	74195	0.80	0.75
7444	0.95	0.90	74111	0.75	0.72	74196	0.90	0.85
7445	0.80	0.75	74118	0.85	0.82	74197	0.90	0.85
7446	0.80	0.75	74119	1.30	1.20	74198	1.90	1.80
7447	0.70	0.68	74121	0.28	0.26	74199	1.80	1.70

Devices may be mixed to qualify for quantity price. Data is available for the above series of IC's in booklet form Price 35p

## CMOS ICs

CD4000	£0.18	CD4022	£0.80	CD4046	£0.95
CD4001	£0.18	CD4023	£0.18	CD4047	£0.75
CD4002	£0.18	CD4024	£0.64	CD4049	£0.46
CD4006	£0.80	CD4025	£0.18	CD4050	£0.46
CD4007	£0.18	CD4026	£1.85	CD4054	£0.95
CD4008	£0.80	CD4027	£0.48	CD4055	£1.60
CD4009	£0.50	CD4028	£0.80	CD4056	£1.15
CD4010	£0.50	CD4029	£0.95	CD4069	£0.32
CD4011	£0.18	CD4030	£0.46	CD4070	£0.32
CD4012	£0.18	CD4031	£1.80	CD4071	£0.20
CD4013	£0.42	CD4035	£1.40	CD4072	£0.20
CD4015	£0.80	CD4037	£0.78	CD4081	£0.20
CD4016	£0.42	CD4040	£0.78	CD4082	£0.20
CD4017	£0.80	CD4041	£0.68	CD4510	£1.10
CD4018	£0.85	CD4042	£0.68	CD4511	£1.25
CD4019	£0.45	CD4043	£0.78	CD4516	£1.10
CD4020	£0.95	CD4044	£0.78	CD4518	£1.10
CD4021	£0.95	CD4045	£1.15	CD4520	£1.10

## ORDERING

PLEASE WORD YOUR ORDERS EXACTLY AS PRINTED NOT FORGETTING TO INCLUDE OUR 'J' NUMBERS V.A.T.

ADD 12% TO PRICES MARKED \* ADD 8% TO ALL OTHERS

## POSTAGE AND PACKING

ADD 25p FOR POSTAGE AND PACKING UNLESS OTHERWISE SHOWN. ADD EXTRA FOR AIRMAIL MINIMUM ORDER £1.00

## TESTED TRANSISTOR PAKS

All devices brand new, tested and coded

11	3 x AC128/AC176 each	116	2 x BFY50/51/52 each
12	10 x BC107	117	6 x OC71
13	10 x BC108	118	4 x ZTX108/9 2 x ZTX107* each
14	10 x BC109	119	2 x ZTX301/2 4 x ZTX300* each
15	3 each BC148/149-2 BC147* each	120	2 x ZTX500/1/2* each
16	BC169/171/172-3 each*	121	4 x 2N706/2N708 each
17	2 each BC177/8/9 each	122	1 x 2N2218/19/21/22 each
18	2 each BC182/3/4* each	123	2 x 2N904/05 each
19	2 each BC212/213/214* each	124	3 x 2N2907 2 x 2N2906 each
20	2 x BC327 3 x BC328*	125	7 x 2N2926 G*
21	2 x BC337 3 x BC338*	126	4 x 2N3053
22	2 x BF115-BF167-BF173 each	127	2 x 2N3055
23	2 x BF194/5/6* each	128	3 x 2N3702/03/04* each
24	2 x BF258	129	3 x 2N3904/06* each
25	2 x BFX29 3 x BFX84		

PRICE 60p PER PACK

## TESTED DIODE PAKS

130	12 x OA81	135	20 x IN4001	139	5 x IN5400
131	12 x OA91	136	15 x IN4002	140	5 x IN5401
132	12 x OA200	137	10 x IN4004	141	4 x IN5404
133	12 x OA202	138	8 x IN4007	142	3 x IN5408
134	15 x IN4148				

PRICE 60p PER PACK

## OPTOELECTRONICS

143	4 x DL707 + Data	£2.80
144	5 x 125 Red LED	£0.50
145	5 x 2 Red LED	£0.50
146	5 x 2 and 125 LED's mixed colours	£0.50
147	3 x ORP12 equivalent	£1.20
148	5 x DCP71	£1.00

## THYRISTOR PAKS

149	2 x 1 amp 1 x 400 1 x 600	£1.00
150	5amp SCR 1 x 50 2 x 400 1 x 600	£1.50

## UNIJUNCTION F.E.T. PAKS

151	6 x TIS43/UT46	£1.00
152	4 x 2N3819	£0.60

## P.C.B. PRODUCTS

153	2x Etch resistant pens	£1.00
154	2 x etchant paks	£1.00

## D.I.Y. PRINTED CIRCUIT KIT

CONTAINS 6 Pieces copper laminate, box of etchant powder and measure, tweezers, marker pen, high quality pump drill, Stanley knife & blades, 6 inch metal rule. FULL Easy to follow Instructions.

J59 ONLY £5.50

## RESISTOR PAK

J55	240 first quality 1/4W resistors-mixed from 100ohm-820k	£1.60*
J56	160 first quality 1/4W resistors-mixed from 100ohm-820k	£1.60*

## ELECTROLYTIC PAK

J57	54 first quality miniature electrolytics from .47µF-1000µF	£1.20*
-----	--	--------

## CERAMIC PAK

J58	93 first quality ceramic capacitors-mixed from 22pF-.047µF	£1.60*
-----	--	--------

## I.C. SOCKET PAKS

160	11 x 8 pin D.I.L. Sockets	£1.00
161	10 x 14 pin D.I.L. Sockets	£1.00
162	9 x 16 pin D.I.L. Sockets	£1.00

## ZENER PAKS

163	20 mixed value 400mW zener diodes 3-10V	£1.00
164	20 mixed value 400mW zener diodes 11-33V	£1.00

# BI-PAK

Dept. P.W.9, P.O. Box 6, Ware, Herts





#### ASSISTANT EDITOR

Eric Dowdeswell G4 AR

#### ART EDITOR

Peter Metalli

#### TECHNICAL EDITOR

Ted Parratt, BA

#### NEWS & PRODUCTION EDITOR

Bill Tull

#### TECHNICAL ARTIST

Alan Martin

#### TECHNICAL SUB-EDITOR

Frank Ogden

#### SECRETARIAL

01-634 4292

Linda Walji  
Belinda Mould

#### ADVERTISING MANAGER

01-634 4612

Roy Smith

#### CLASSIFIED ADVERTISING

01-261 5762

Colin R. Brown

#### BINDERS

Binders, for either the old or the new format, are £2.10 and Indexes are 45p (Inc VAT) and can be obtained from the Post Sales Department, IPC Magazines Ltd., Lavington House, Lavington Street, London SE1 0PF. Remittances with overseas orders for binders should include 60p to cover despatch and postage.

#### BACK NUMBERS

We are very glad to announce the re-establishment of a PW Back Numbers Service for our readers. In future back numbers dated from June 1977 only will be available from our Post Sales Department for 65p, which includes postage and packing. Cheques and Postal Orders should be made payable to IPC Magazines Ltd.

Send your orders to:- Post Sales Department, IPC Magazines Ltd., Lavington House, Lavington Street, London SE1 0PF.

## Our Face~lift

**W**ell, here it is! The new and, we hope, more attractive, larger version of **Practical Wireless**, as promised last month. PW has gone through other changes of size in the 45 years that it has been around and when it was first published in 1932 the page size was just the same as our 'new' format! So we seem to have gone through the whole cycle! In the 60's PW was quite small, about 9 x 6in., with correspondingly more pages but it was quite popular since one could roll or fold it up to fit the coat pocket, and I would imagine that there are many readers who would still prefer it that way!

Those that know all about these things have now been able to produce a bigger page area from the same size reel of paper, although the printing costs are marginally higher. We trust that you will like the slightly larger type face, being easier to read. Anyway, if you do favour the new-look **Practical Wireless** do not hesitate to let us know. No doubt the disapprovers will also be in touch but their letters will be equally welcome.

As the compiler of the amateur bands section of our monthly feature "On the Air" I know something of the problems that can be encountered by the very keen listener to the amateur bands who wants to get on and obtain the amateur transmitting licence. Although many schools, colleges and radio clubs run classes for the Radio Amateur's Examination there are many potential candidates who just cannot reach such places and who must rely on their own studies at home.

This month sees the start of a new series aimed not only at the person who, perforce, has to be a loner, but all those who aspire to the RAE. Remember, it is unlikely that any two candidates will be starting from precisely the same level. There is the newcomer to electronics, who, by sheer enthusiasm, will spend every possible moment studying both the theoretical and practical side of our hobby, and there is the electronic engineer, with degrees after his name, who needs to swot up on certain aspects of the subject before sending in the rather exorbitant entrance fee. Today, it behoves every candidate for the RAE to be really sure that he is prepared for the exam. Whatever his capabilities may be on the technical side he must still swot up on the legislation governing the issue of an amateur licence. Part 1 of the exam is not in the least difficult but a failure in this part means a failure of the whole paper, even if you are a veritable genius at electronics!

So we hope that our RAE course will help readers of all technical abilities and, probably, many other readers too, who may never have heard of the RAE!

*Eric Dowdeswell Assistant Editor*

### PLEASE NOTE

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

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

**New catalogue**

Bi-Pak has announced the publication of its latest catalogue containing over 120 pages of electronic component listings. There are numerous, albeit rather small, pictures and line drawings. The semiconductor section generally includes pinout details and limited operational parameters. The cost is 50p + 15p postage.

*Bi-Pak Semiconductors, The Maltings, 63A High Street, Ware, Herts SG12 9AD.*

**Audio Fair '77**

Don't forget that the Audio Fair '77 is coming shortly and promises to be the most comprehensive ever staged. Displays will range from the most sophisticated BBC/IBA/GPO Data transmission modes to the more mundane HiFi equipment, TV games and home movie apparatus.

The show which is at London's Olympia will open from 2pm-9pm on September 13th, from 10am to 9pm on September 14th, 15th, 16th and 17th, and from 10am to 8pm on Sunday, September 18th. Admission will be 70p for adults, and children under 14, 30p.

**New distributor**

Plessey Aerospace has appointed Sasco as sole stockist for their complete range of Plessey miniature relays. Products covered by this agreement include half-crystal-can and full-crystal-can types (sealed and unsealed), hermetically sealed 10A crystal-can versions, and rotary armature Type II relays.

*Sasco, PO Box 2000, Crawley, Sussex.*

**New service**

Audio Workshops Ltd., have now opened their new showroom at 33 London Road, Southborough, Tunbridge Wells, Kent, where they will be stocking a wide variety of FM aerials, aerial accessories, cables, rotators and electronic car aerials.

The showroom also displays a wide variety of aerial amplifiers from simple low-cost single transistor amplifiers to high quality semi-professional low noise masthead amplifiers.

Full advice as to which aerial or accessory should be purchased to obtain optimum performance will be available from the founder of Audio Workshops, Mr Peter Dunkley. And as a small incentive to go along and see what's available, the firm is offering a high quality 8 element FM aerial at £12.75—for a limited period.

**A winner**

Marshall's have produced a brand new catalogue in a much larger format than before, a bit bigger than this issue of PW. Many new lines include micro-processors and supporting devices, a range of Digital Multi Testers and a pull-out Transistor Guide for the shack wall. Cost is 25p to callers or 35p by post.

*A Marshall (London) Ltd., 42 Cricklewood Broadway, London NW2 3ET.*

**Talking show**

An exhibition to commemorate Thomas Edison's invention in 1877 of the Talking Machine is to be held in conjunction with the British Institute of Recorded Sound during August. Comprising some 125 exhibits, the

theme of the displays will be the evolution of the phonograph and gramophone from the original hand turned models to today's HiFi. Early original records together with some interesting accessories complete the displays.

Spare parts manufactured by the organisers of the exhibition for collectors will also be available, as will reprints of early catalogues, posters and instruction manuals.

Called "100 years of Recorded Sound" the exhibition will be open to the public from Saturday 13th August to Saturday 27th August (excluding Mondays). Opening times will be 10am until 6pm.

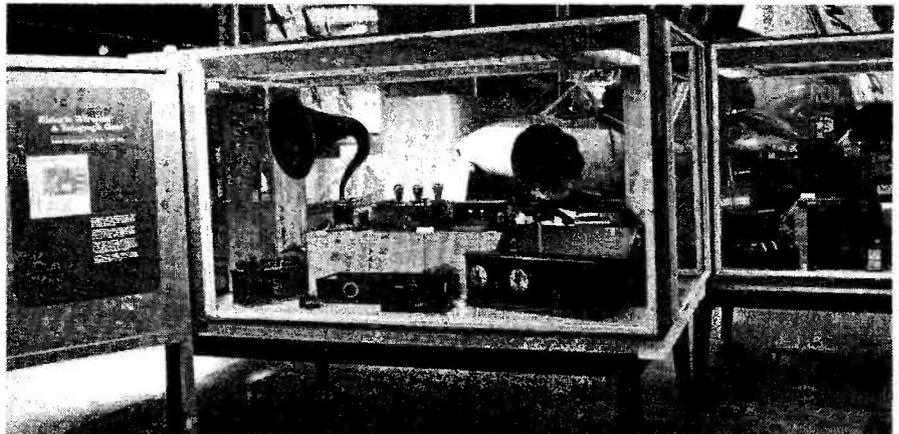
*Further information from Goodwin Eve, City of London Phonograph & Gramophone Society, Farm Cottage, High Road, Chipstead, Surrey. Tel: 07375 54827.*

**Jermyn gen**

Jermyn Distribution have now made available the new National Semiconductor MOS/LSI Databook. Containing 400 pages divided into 14 sections, this Databook lists details of electronic organ and TV circuits; A/D converters; communications/CB radio circuits; watches, calculators and keyboard encoders.

In each section, complete characteristics, connection details, function descriptions, and block diagrams are all covered, while the last chapter gives physical dimensions of all National Semiconductor products together with a definition of terms. Priced at £5.95, it can be obtained from *Jermyn Distribution, Sevenoaks, Kent.*

Part of Ron Ham's early wireless collection which is on display at The Cornwall Aircraft Park, Helston, Cornwall until October 31st. Some of the items on exhibition were featured in *Practical Wireless*, September 76. On the left hand side of the show case is a copy of the article which was published in *The Times* newspaper, September 26, 1975 about the collector and his historic pieces. Ron is a very fervent supporter of the new industrial museum that is to be built at Houghton in Sussex and which, he expects, will be the permanent home of his collection that dates back to 1900.



# So you want to pass the R.A.E. (Radio Amateurs' Examination)?

No. 1

John Thornton Lawrence GW3JGA & Ken McCoy GW8CMY

The passing of the Radio Amateurs' Examination, set by the City and Guilds, requires a certain level of theoretical technical knowledge. Whether one considers that this level is too high or too low is beside the point. The course that follows is intended, with the help of certain external aids, to prepare the reader to pass the examination. It will not teach him all about electronics!

The Radio Amateur is a privileged person indeed, he has access to various parts of the radio frequency spectrum which enable him to talk to other amateurs near to him or in any other part of the world. The Radio Amateur has his own international language, he belongs to a worldwide brotherhood of Radio Amateurs whose "Ham Spirit" takes no account of race, colour, political or social outlook. To ensure that these privileges are not abused, the Licensing Authority (the Home Office) require some test of the would-be amateur's technical competence and knowledge of the radio "Highway Code", before giving him a licence to drive on the frequency motorways of the world, in short, the Radio Amateurs' Examination.



... 'writing to the City and Guilds'

Maybe you are one of those whose interest in Amateur Radio has been building up steadily for some time and the point has now been reached where you have to decide whether or not to enter for the R.A.E. If you are dithering on the brink, you may be interested to know that this is the first of a series of articles concerned with preparing for and successfully taking the Radio Amateurs' Examination. It is not intended to be a complete course leading up to the R.A.E. but more of a progressive clarification of some of the problem areas which can be the undoing of many candidates.

The main core of information is best obtained from books specially written for the Radio Amateur and for the R.A.E. in particular and these will be referred to from time to time. Practical work is an important part of preparing for the R.A.E. and suggestions for this will be included where necessary. If by now you have decided to proceed, then please read on.

## Taking stock

We are very pleased to see that you have now made up your mind to have a go at the R.A.E. Before we do anything else, let's take stock of the situation. You say that you did the usual basic arithmetic in school (but that seems a while ago!) and you naturally feel a bit rusty in that area and with electrical theory, even more so. OK, so some work is definitely required to bring these up to scratch.

How about circuits? You're able to follow some of the simple circuits without much difficulty but find it quite a struggle to explain, in so many words, how they work. Well, perhaps this is just because you are not looking at them in the right way, so more about that later.

Now the practical side. You say that you have built up the odd electronic circuit from PW and have got it working OK, fine! By the way, do you go to the

### ABOUT THE AUTHORS

**John Thornton Lawrence, T.Eng. (C.E.I.), F.S.E.R.T.**, is a Senior Scientific Officer concerned mainly with electronic instrumentation, measurements and calibration. He obtained his licence GW3JGA in 1953 and his amateur TV licence GW3JGA/T (later GW6JGA/T) in 1958. He is a Committee member of the British Amateur Television Club and a Founder of the University College of North Wales ARS.

His hobbies include amateur VHF, UHF and TV equipment, collecting antique radio gear, particularly valves, wine and beer making and helping the local Scout Group. He is married with two sons, 19 and 9.

**Ken McCoy** holds an HNC in Electrical and Electronic Engineering and is concerned with instrumentation and electron microscopy. He is a part-time lecturer for the Radio Amateur's Examination course at the Gwynedd Technical College.

He obtained his licence GW8CMY in 1967 and his main interest is in building portable 2m equipment. His other hobbies include mountaineering in the UK and on the Continent, photography and DIY home improvements. He is a team leader in the Ogwen Valley Mountain Rescue Organisation. He is married with a son, 14, and two daughters, 12 and 6.

local Amateur Radio Club meetings? No? Pity! You see, it's very helpful if you can do some practical work in connection with the R.A.E. and membership of the local Radio Club is very useful in this respect as it will give you the chance to see amateur radio equipment being used and to obtain some guidance and help when you are building things for yourself. Write to the R.S.G.B. for details of your local club as many clubs are affiliated to the R.S.G.B.

## Preparations

You will need to get some books and information on the examination, past R.A.E. papers and so on. These take a little time to come so I suggest that you order these now. First write to: The City and Guilds of London Institute, 76 Portland Place, London W1N 4AA, for Pamphlet 765 Radio Amateur's Examination 1976-1978, including a set of Question Papers for the last three years. Remember to enclose a cheque or P.O. for 40p. This represents very good value, as usually each set of City and Guilds Question Papers is extra.

The Home Office publishes a useful document about becoming a Radio Amateur and this is available free of charge. Write to: The Home Office, Radio Regulatory Dept., Waterloo Bridge House, Waterloo Road, London SE1 8UA, for leaflet "How to become a Radio Amateur".

Now, moving on to textbooks and booklets, these can be roughly divided into two categories, the essential, and the desirable but not essential. The essentials, which are all published by the Radio Society of Great Britain, can be obtained from your local bookshop (if you want to use up that birthday book token from auntie!) or, cash with order, from: R.S.G.B. Publications (Sales), 35 Doughty Street, London WC1N 2AE.

They are:

"A Guide to Amateur Radio" by Pat Hawker G3VA. £1.35.

"The Radio Amateurs' Examination Manual" by G. L. Benbow G3HA. £1.35.

"Radio Amateurs' Revision Notes" by G. L. Benbow G3HA. 61p.

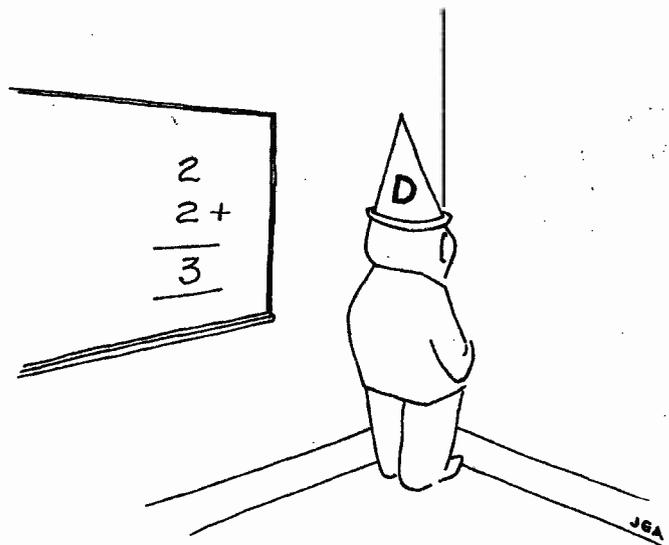
The books in the second category are much more comprehensive and naturally cost more. These are also available from R.S.G.B. Publications (Sales) but as an alternative to immediate purchase, they may be obtained from your local library. They are: Radio Communication Handbook (R.S.G.B.) 5th Edition Vols. 1 and 2, or Radio Amateurs' Handbook 1977 (A.R.R.L.).

## Getting down to it

The method of studying for the R.A.E. depends on your personal circumstances. The various ways are:

- (a) Evening classes.
- (b) Correspondence course.
- (c) Home study, with or without some tuition.

If you live near a technical college or school which runs evening classes, then this is probably the best way for you to study. A direct approach to the college or school will provide you with full details. Correspondence courses or home study for the R.A.E. require continuous and regular work sessions. Home study requires a lot more personal discipline to get through the more difficult items as you will find it a great temptation to leave them until the end, when it is usually too late!



... 'mathematics a bit rusty?'

It is always useful, and particularly so in the case of home study, if you can enlist the help of a local Radio Amateur or suitably qualified friend, who will talk-through any problems you may have.

Here we are then, you have registered at your local evening institute for the R.A.E. course, the books are ordered and you are ready and waiting to get down to the "nitty gritty".

## Arithmetic

Let's start with arithmetic (we always think that the word arithmetic is less daunting than mathematics). There are going to be some calculation questions in the R.A.E. and if you can do these correctly, you can gain full marks on each question in a matter of minutes. Even fairly straightforward electrical calculations can present very real difficulties if you have not seen the sharp end of a blackboard pointer since you left school, so the purpose of this section is to remind you of the basics involved in these sums and to suggest a few tricks to make them easier to execute and remember.

If you have read through the instruction book of a pocket calculator you will know that there are four "basic arithmetical functions", namely, addition, subtraction, multiplication and division.

**Addition and Subtraction**—So far as the problems that you will meet in the R.A.E. are concerned, addition and subtraction will take care of themselves, for example,  $3+7=10$  and  $4-2=2$ . Multiplication and division may be written down in several different ways, so here are a few alternatives.

**Multiplication**— $A \times B$  can also be written as  $A \cdot B$  or simply  $AB$ .

**Division**— $A \div B$  can also be written as  $\frac{A}{B}$ . Thus  $1 \div 2$  is the same as  $\frac{1}{2}$  ("one upon two" or "one over two").

Now for the not-so-basic arithmetic functions, reciprocals, squares and square roots.

**Reciprocals**—The reciprocal of  $A$  is  $\frac{1}{A}$  or from division  $1 \div A$  or "one upon  $A$ ", and to put it numerically, the reciprocal of 4 is  $\frac{1}{4}$  and of 100 is  $\frac{1}{100}$ .

This function, together with the squares and square roots, occurs often in resonance and frequency calculations.

**Squares**—If a number is multiplied by itself the answer is known as the square of the number. For example,  $A \times A$  is written as  $A^2$  or "A squared". Thus  $A^2$  is the square of A. And, to put it numerically, 9 is the square of 3, since  $3 \times 3 = 9$ .

**Square Roots**—The square root of a number is a figure which, when multiplied by itself, is equal to the original number. For example, the square root of 9 is 3 because when 3 is multiplied by itself, it equals 9, written  $\sqrt{9} = 3$  because  $3 \times 3 = 9$ . Similarly,  $\sqrt{25} = 5$  (because  $5 \times 5 = 25$ ) and  $\sqrt{4}$  or "Root 4" = 2 ( $2 \times 2 = 4$ ) and so on.

Incidentally, not all square roots are whole numbers. For instance,  $\sqrt{2}$  has been calculated to at least 50 decimal places, but is used most often as 1.41. Finally,  $\sqrt{2} \times \sqrt{2} = 2$  and  $\sqrt{5} \times \sqrt{5} = 5$  and  $\sqrt{25} \times \sqrt{25} = 25$ .

Problems in the actual R.A.E., which involve finding the square roots of numbers, can be dealt with by looking up the value in the square root tables which are provided.

## Multiples and sub-multiples

Some of the electrical units that are used in radio are inconveniently small for practical purposes and so a multiple of the unit is used. Some others, for example, the Henry and the Farad, are inconveniently large. A one Farad capacitor having a particular dielectric between its plates, might occupy a volume similar to that of a block of flats!

The capacitors and inductors used in radio work have values which are sub-multiples of the Farad and the Henry. You will, therefore, need to be able to recognise multiples and sub-multiples in words and in figures.

**Multiples**—Multiples are described by a prefix to the unit in question. For example, 1 Megohm = 1,000,000 ohms. A list of multiple prefixes is given below.

Prefix	Letter		Index Form
tera	T	one million million	1,000,000,000,000 $10^{12}$
giga	G	one thousand million	1,000,000,000 $10^9$
mega	M	one million	1,000,000 $10^6$
kilo	k	one thousand	1,000 $10^3$
hecto	h	one hundred	100 $10^2$

**Sub-multiples**—Sub-multiples are described by a letter prefix in a similar fashion. For example, 0.000,001 Farad = 1 microfarad =  $1 \mu\text{F}$ . A list of sub-multiple prefixes is given below.

Prefix	Letter		Index Form
deci	d	one tenth	0.1 $10^{-1}$
centi	c	one hundredth	0.01 $10^{-2}$
milli	m	one-thousandth	0.001 $10^{-3}$
micro	$\mu$	one millionth	0.000,001 $10^{-6}$
nano	n	one thousand millionth	0.000,000,001 $10^{-9}$
pico	p	one million millionth	0.000,000,000,001 $10^{-12}$

(or  $\mu\mu$ )

## Indices

You will notice from the previous sections that the multiplier and sub-multiplier are written as a figure followed by or preceded by a number of noughts.

This number, when expressed in what is known as "index form", uses a special notation which is best shown by example:

mega = 1,000,000      In index form  $10^6$   
giga = 1,000,000,000      In index form  $10^9$

In the case of multiples, the index number is equal to the number of noughts following the figure, so that, for example:

2.2 Megohms is written as  $2.2 \times 10^6$   
and 7.3 Gigahertz is written as  $7.3 \times 10^9$  Hertz.

Sub-multiples use the same notation but with a slight difference:

pico = 0.000,000,000,001 =  $10^{-12}$   
micro = 0.000,001 =  $10^{-6}$

You will notice that in the case of sub-multiples, the index number is minus and equivalent to the number of noughts plus one following the decimal point. For example:

2.2 picofarads =  $2.2 \times 10^{-12}$  Farads.  
7.3 microhenrys =  $7.3 \times 10^{-6}$  Henrys.

It is often desirable to convert from one multiple of an electrical unit to a different multiple and this can be done by moving the decimal point and at the same time changing the index number accordingly. For example:

2.2 Megohms = 2,200,000 ohms  
=  $220,000 \times 10$  ohms  
=  $22,000 \times 10^2$   
=  $2,200 \times 10^3$  ohms (kilohms)  
=  $220 \times 10^4$  ohms  
=  $22 \times 10^5$  ohms  
=  $2.2 \times 10^6$  ohms (Megohms)

Similarly,

0.000,000,002 Farads =  $0.002 \times 10^{-6}$  Farads  
= 0.002 microfarads ( $\mu\text{F}$ )  
=  $2 \times 10^{-9}$  Farads  
= 2 nanofarads (nF)  
=  $2,000 \times 10^{-12}$  Farads  
= 2,000 picofarads (pF)

**Multiplying**—When multiplying figures in index form it is only necessary to add the indices. For example:

$10^4 \times 10^6 = 10^{10}$   
 $10^4 \times 10^{-6} = 10^{-2}$   
 $10^{-4} \times 10^6 = 10^2$   
 $10^{-4} \times 10^{-6} = 10^{-10}$

**Dividing**—when dividing figures in index form it is only necessary to subtract the indices. For example:

$\frac{10^6}{10^4} = 10^6 \div 10^4 = 10^2$   
 $\frac{10^{-6}}{10^{-4}} = 10^{-6} \div 10^{-4} = 10^{-2}$   
 $\frac{10^{-6}}{10^4} = 10^{-6} \div 10^4 = 10^{-10}$

Also

$\frac{10^{-6}}{10^4} = 10^{-6} \times 10^{-4} = 10^{-10}$ \*

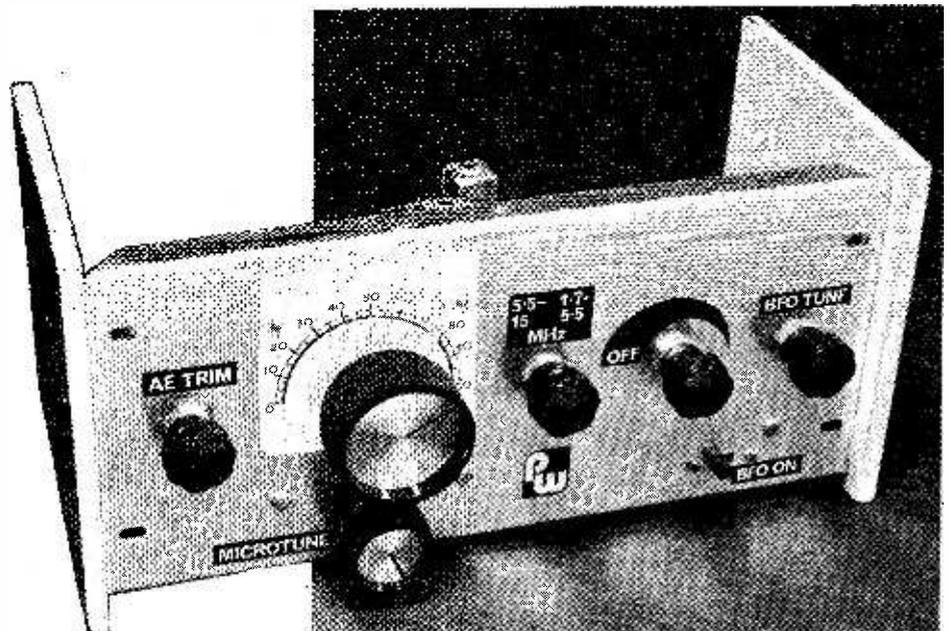
\* An alternative way to deal with an index quantity that you are dividing by is to change the sign of the index and multiply, by adding the indices.

continued on page 342

# GENERAL PURPOSE SW RECEIVER

Part 1

F.G.RAYER G3OGR



A frequency coverage of approximately 1.7MHz to 15MHz includes many useful bands and is obtained in this receiver by two switch-selected ranges. The tuned circuits comprise the four coils shown in Fig. 1, and a few points should be noted.

As an intermediate frequency of 1.6MHz is used, greater freedom from second channel interference is obtained than with a 470kHz IF. Despite this, it is not possible to avoid such interference with a single tuned circuit, especially at higher frequencies, so a matching tuned RF preselector unit is advisable and this can be added later if wished (Part 2). With the RF preselector connected the RF stage drain is supplied via R1, to make use of the primaries of the coils L1 and L2. C1 is external to the receiver. If it is not intended to add the RF unit, C2 and R1 can be omitted, and pins 9 of L1 and L2 connected to chassis.

## Circuit Description

The 4-pole switch S1a-d selects the appropriate pair of coils. These are tuned by the ganged capacitor VC1/2. Instead of having four pre-set trimmers, TC1 is provided across VC2, and VC3 is a panel control. This provides much more latitude in alignment. VC4 is the oscillator bandspread or fine tuning capacitor, which is useful for precise tuning or listening over a narrow band.

Data for the coils used specify a 960pF padder CP1

for L3, and 340pF padder CP2 for L4 using a 2 x 315pF gang. However, 1000pF and 330pF will be suitable and are more easily obtainable. The larger capacity gang is also a standard item and simply increases coverage slightly.

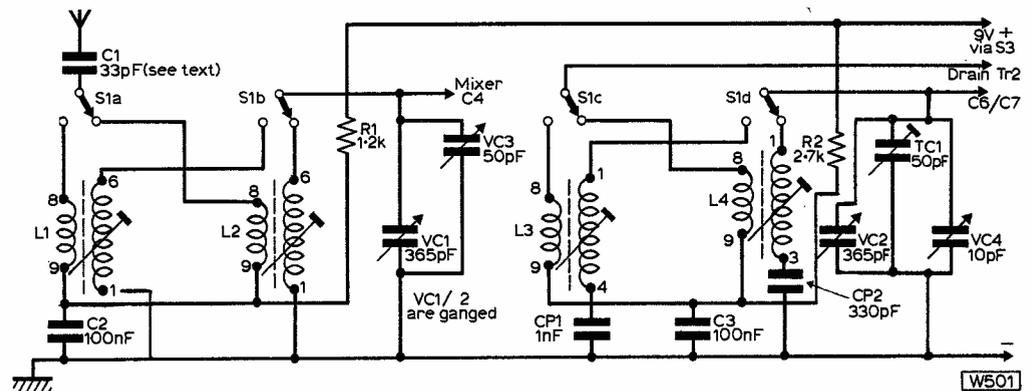
In Fig. 2, Tr1 is the mixer with L1/L2 switched to gate 1 and the oscillator coupled to gate 2 via C6. Tr2 is the oscillator with C7 going to L3/L4 and drain feedback via S1c. As Tr1 is a protected gate device no particular care is needed beyond that generally taken to avoid overheating while soldering.

IFT1 couples the mixer output to the first IF amplifier Tr3, which also receives AGC base bias through R8 and R10, from D1. Tr4 is the second IF stage. D1 provides AGC and the audio signal developed across the volume control VR1. When S5 is closed, the BFO oscillator Tr5 is on and it is coupled to D1 by C15. This allows reception of CW (Morse) and SSB (single sideband) signals. The panel control VC5 is for adjusting the BFO frequency. Should the receiver be required for ordinary SW broadcast reception only, then S5, R14, R15, C14, C15, C16 and Tr5 and the associated circuitry may be omitted as this stage is not used for AM reception, but this is not recommended.

This circuit is assembled on a single board, with the exception of controls VR1 and VC5.

The audio amplifier consists of a TBA800 IC, Fig. 3, and provides useful gain and output without too much

Fig. 1: The circuit diagram is shown in three parts. This circuit is of the four-coil switched aerial and mixer input section. Two bands, 1.7 to 5.5 and 5.5 to 15MHz are provided.



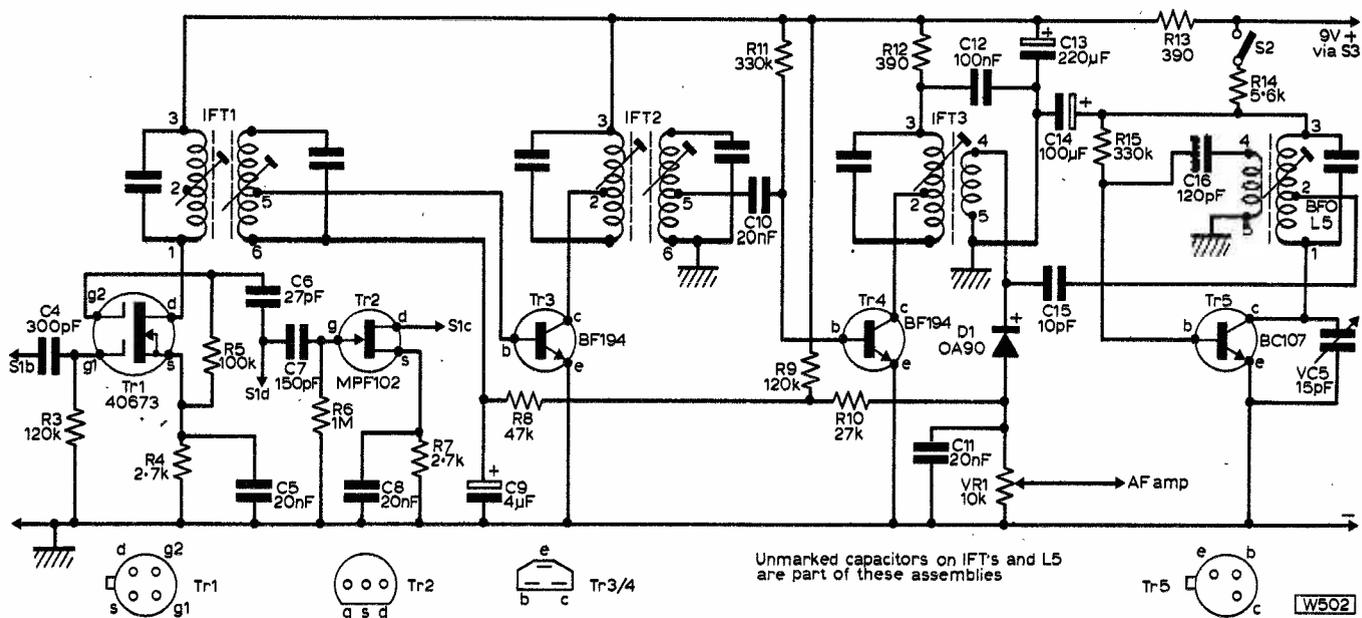
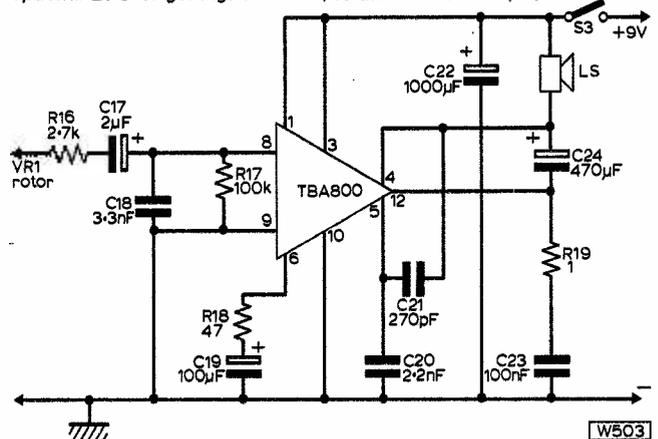


Fig. 2: above, shows the mixer stage Tr1 and oscillator Tr2. Tr3 and 4 are the IF amplifier stages feeding the diode detector D1. Tr5 is the optional BFO stage. Fig. 3: below, is the IC audio amplifier.



centre holes so that the lower cores can be reached. Each of the points MC is a tag secured with a  $\frac{1}{2}$ in 6BA bolt. Later, extra nuts allow the board to be mounted by these bolts, with clearance for wiring. Sleeving should be put on the positive circuit wiring to pins 3 of the IFTs, but is not needed elsewhere.

Provide coloured insulated leads for all external connections. These can be yellow for VC1 (S1b), black for VC2 (S1d), brown for S1c, red for positive, pink for S2, and yellow-green for VR1. When the board is fixed with lock nuts, cut these leads as required and solder them to the capacitor and other components.

The audio board is wired as in Fig. 7, and is mounted in the same manner as described for the other board. Connect R16 to VR1 wiper and positive to the positive line at S2. The board is placed under the chassis, at the right. It is important to note that both sides of the speaker circuit are insulated from the metal and negative line.

### IF Alignment

As the IFTs are pre-tuned by the manufacturer they should not be adjusted until reasonable reception is being obtained. They can then be set for maximum volume, by rotating the cores with a proper trimming tool. Choose a weak, steady signal for this

drain on the battery. It is intended for use with a 16 $\Omega$  speaker but may be used with phones for individual listening.

The audio amplifier is wired on its own board which fits under the chassis. R19 can be two 2.2 $\Omega$  resistors in parallel if any difficulty arises in obtaining 1 $\Omega$ .

### Metalwork

Flanged "universal chassis" members from Home Radio allow an inexpensive case to be made easily. The panel used is 9 x 4in and the chassis 8 x 4in so that it may fit inside. It is secured lin up, with three bolts. If panel and chassis members are the same length, two corners of the chassis part must be cut away so that it will fit inside the flanges on the panel.

A clearance hole is required for the ganged capacitor which has an integral ball drive. The BFO switch S2 occupies a slot, which can be made by drilling a few small holes and filing. The mixer-IF board has four fixing bolts, and the AF board two bolts. To assure an easy fit, boards and chassis can be drilled together before mounting any components.

### Construction

Two 4BA bolts secure the ganged capacitor. Solder a lead to the central frame tag of this before fixing it in place. It is necessary to use washers or other spacers between it and the chassis, and to watch that the bolts do not project very far inside the front of the capacitor. VR1 and other controls can then be fixed to the panel. When placing the coils on the chassis, tighten their fixing nuts with the fingers only. Most of the wiring in Fig. 1 can then be finished, keeping leads reasonably short and direct. If the coil pins are dull clean them before soldering. It is necessary to avoid lengthy heating of the pins and to see that they are not displaced.

Fig. 4 will assist in wiring. One tag of S6 is used as a point for R1, R2, S2 and R13 positive connections. The AF amplifier positive circuit is made at S2, under the chassis. VC4 is directly under the ganged capacitor, so a lead passes down through a hole to it from VC2. Fig. 5 will allow the switch wiring to be checked.

Fig. 6 shows both sides of the mixer-IF board. It should first be drilled for the IFTs, including the

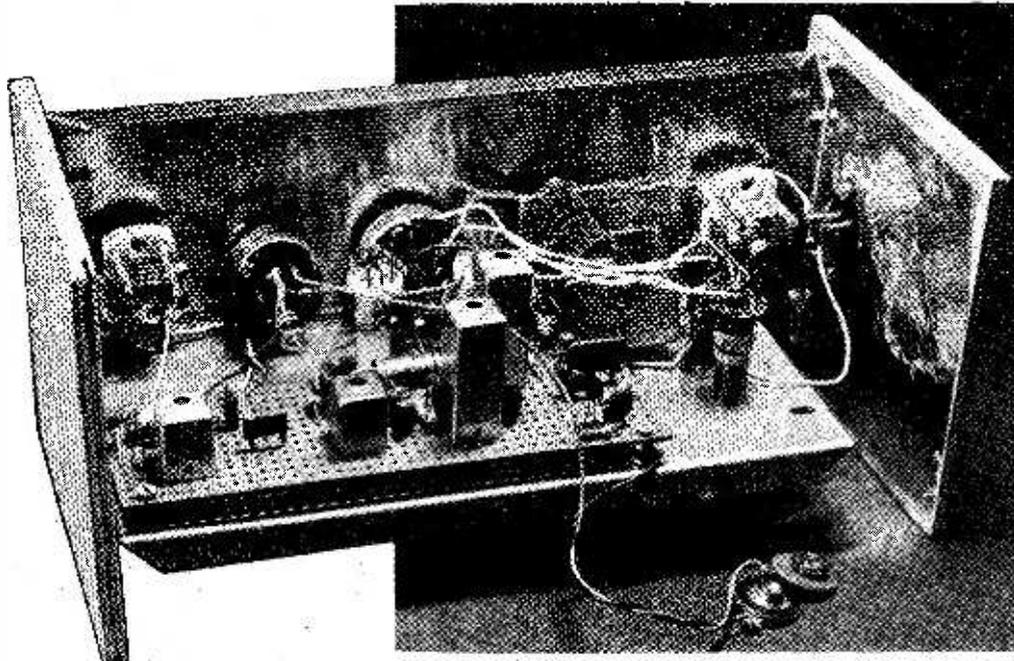
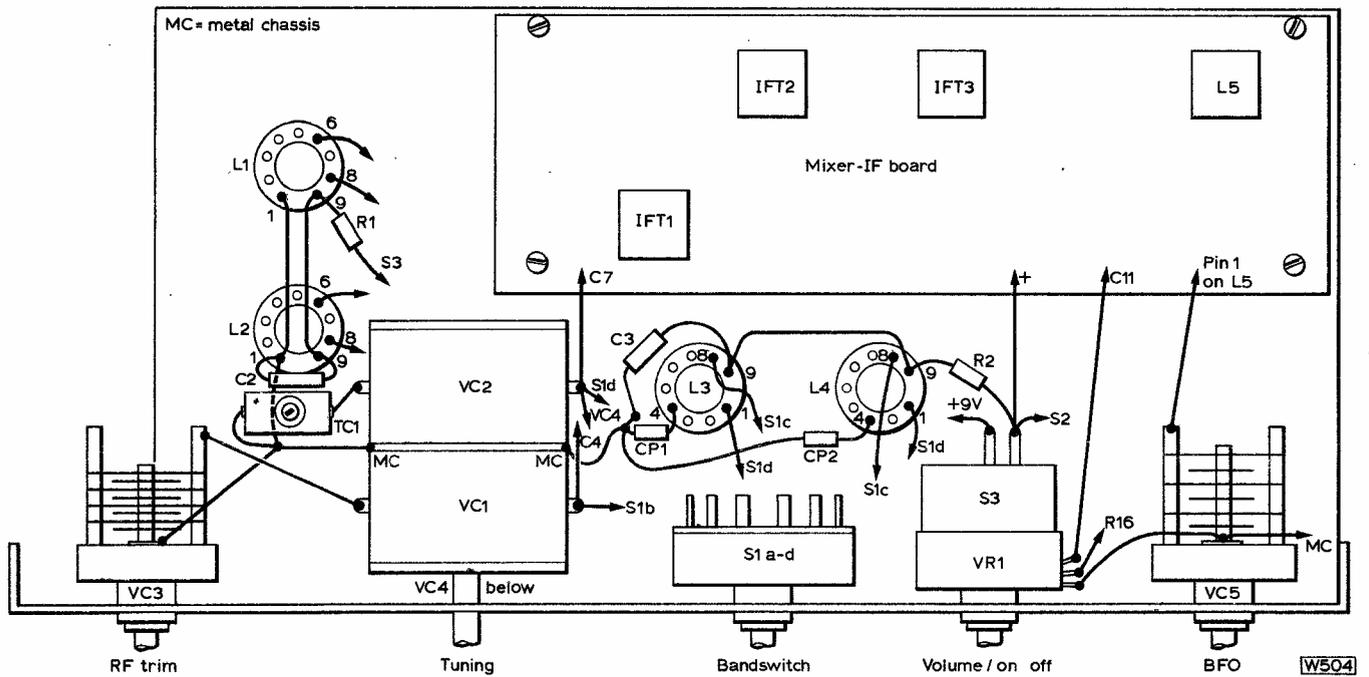
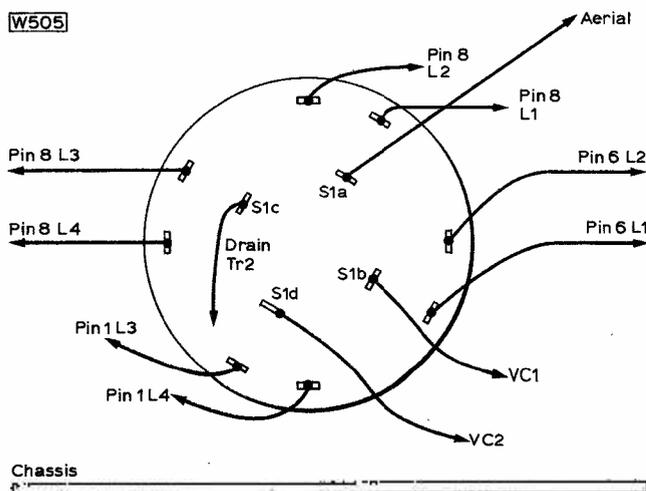


Fig. 4: above, shows the layout of the panel-mounted controls and the position of the mixer-IF board on the chassis. The photograph of the back of the receiver complements Fig. 4, and also shows the piece of aluminum foil stuck to the inside of the case to shield the coils when the pre-selector is used with the receiver. Fig. 5, below left is the wiring between the band switch and the four coils.

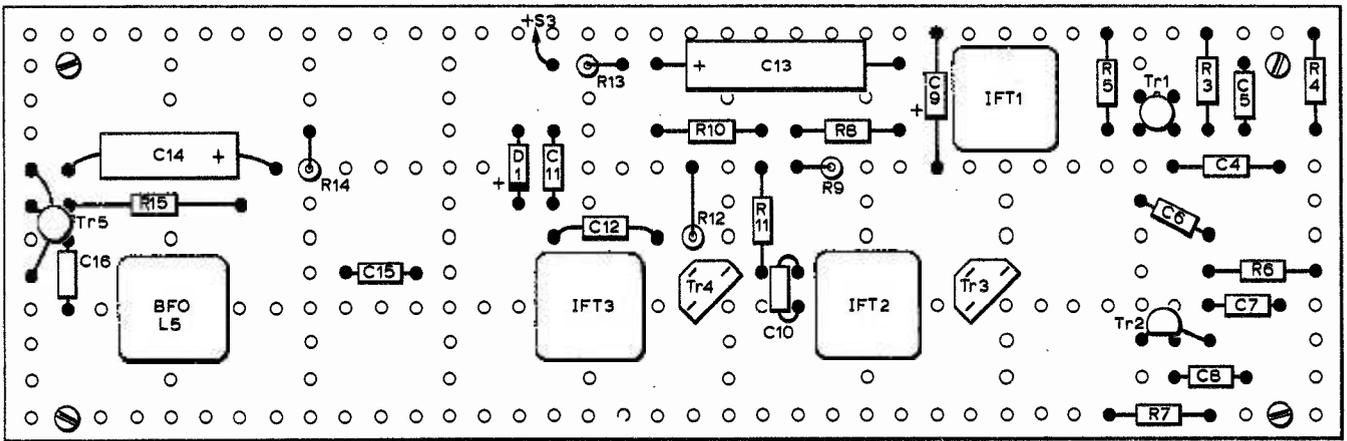
W505



operation. It is a good idea to place the audio board so that the lower cores of IFT1 and IFT2 can be reached through holes in the chassis, or to raise the IF board sufficiently to reach these cores. If the latter method is used, provide a return lead from the negative line to chassis. When the five cores have been peaked up for best results, they need no further adjustment. Alternatively, a signal generator, set to 1.6MHz, may be used for precise alignment after the set is working.

### BFO Adjustment

Initially tune in a steady AM signal precisely and set VC5 half closed, then switch on the BFO with S2. Set the core in L5 so that a strong audio heterodyne is heard and rises in pitch when VC5 is turned either way from the central, zero beat position. This oscillator is never in use for AM reception, only for CW



W506

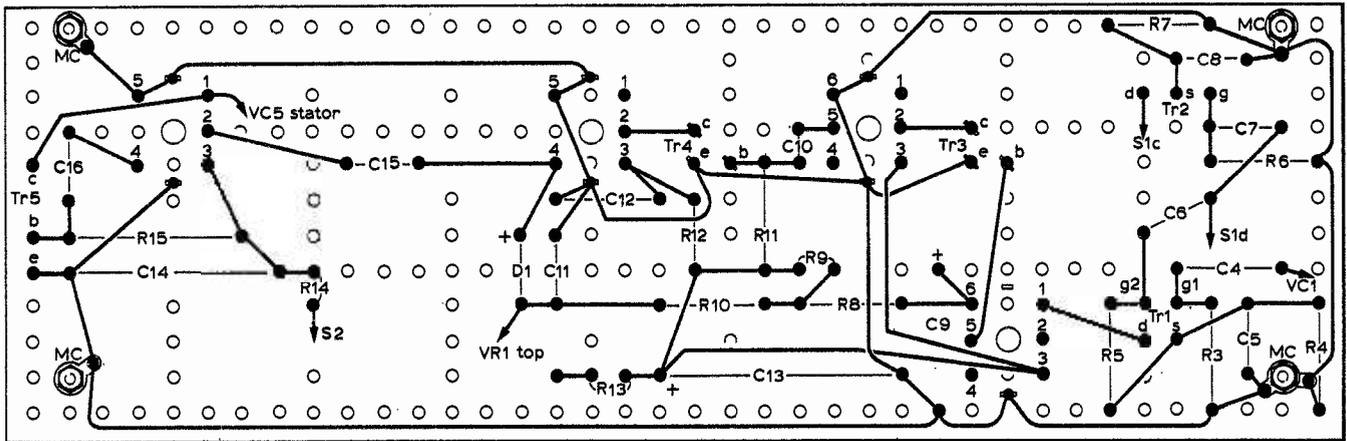


Fig. 6: Wiring and component location on the mixer-IF board is given here, from above and below. The drawings are not to scale.

## ★ components

### Resistors

R1 1.2kΩ	R8 47kΩ	R15 330kΩ
R2 2.7kΩ	R9 120kΩ	R16 2.7kΩ
R3 120kΩ	R10 27kΩ	R17 100kΩ
R4 2.7kΩ	R11 330kΩ	R18 47Ω
R5 100kΩ	R12 390Ω	R19 1Ω
R6 1MΩ	R13 390Ω	VR1 10kΩ log pot
R7 2.7kΩ	R14 5.6kΩ	with switch S3

All ½ or ¼W 5%

### Capacitors

C1 33pF see text	C13 220μF 10V
C2 100nF	C14 100μF 10V
C3 100nF	C15 10pF silver mica
C4 300pF silver mica	C16 120pF " "
C5 20nF	C17 2μF 10V
C6 27pF silver mica	C18 3.3nF
C7 150pF " "	C19 100μF 10V
C8 20nF	C20 2.2nF
C9 4μF 4V	C21 270pF silver mica
C10 20nF	C22 1000μF 10V
C11 20nF	C23 100nF
C12 100nF	C24 470μF 10V

CP1 1nF silver mica	CP2 330pF silver mica
VC1/2 2 x 365pF with slow motion (Jackson type O2)	
VC3 50pF variable (Jackson type 804)	

VC4 10pF " "
VC5 15pF " "
TC1 50pF compression trimmer

Note:—1 nanofarad (1nF) = 1000pF

### Semiconductors

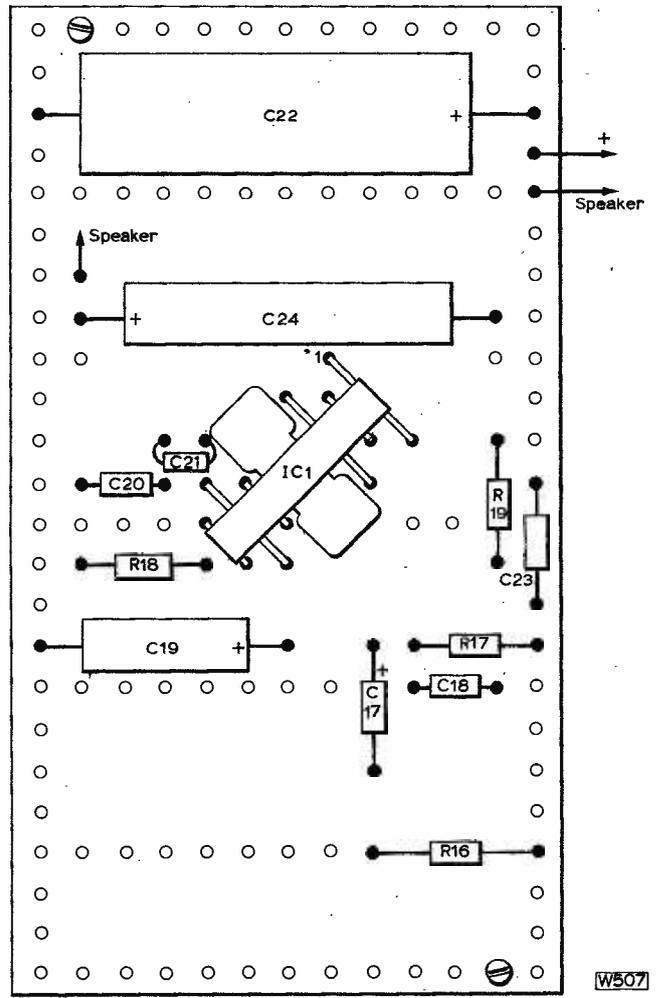
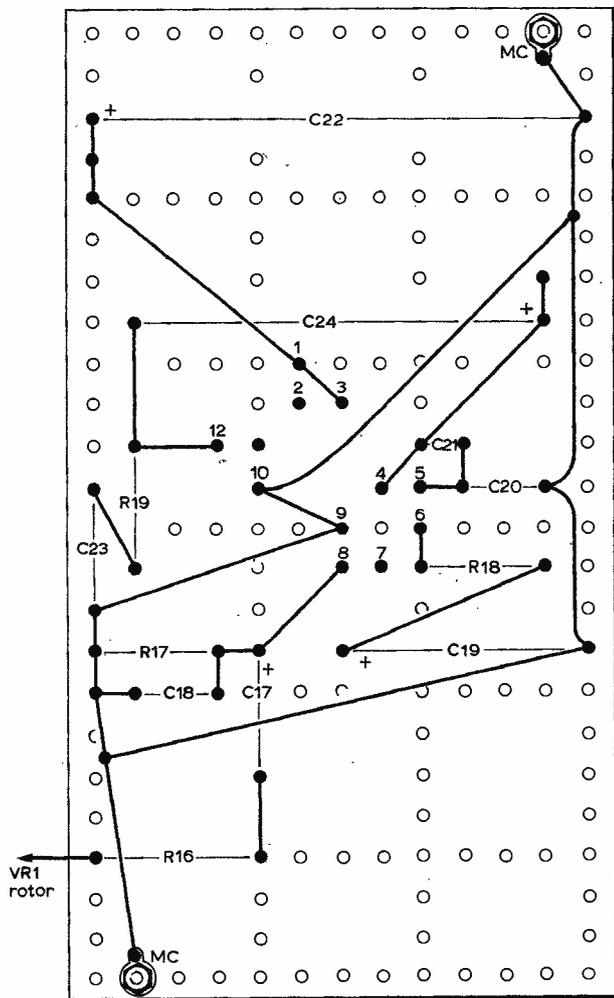
Tr1 40673	Tr5 BC107
Tr2 MPF102	D1 OA90
Tr3 BF194	IC1 TBA800
Tr4 BF194	

### Inductors

IFT1 Denco type IFT18/1.6
IFT2 Denco type IFT18/1.6
IFT3 Denco type IFT17
L5 Denco type IFT17
L1 Denco range 4, blue, valve type
L2 Denco range 3, blue, valve type
L3 Denco range 4, white, valve type
L4 Denco range 3, white, valve type

### Miscellaneous

S1, 4-pole 2-way rotary switch. S2, on-off slide switch. S3, on-off switch, part of VR1. Perforated board 0.15in. matrix 5½ x 1½ and 3½ x 2in. Knobs. Flanged members for panel and chassis (Home Radio). Battery PP6 9V with terminal connectors. Material for cabinet.



W507

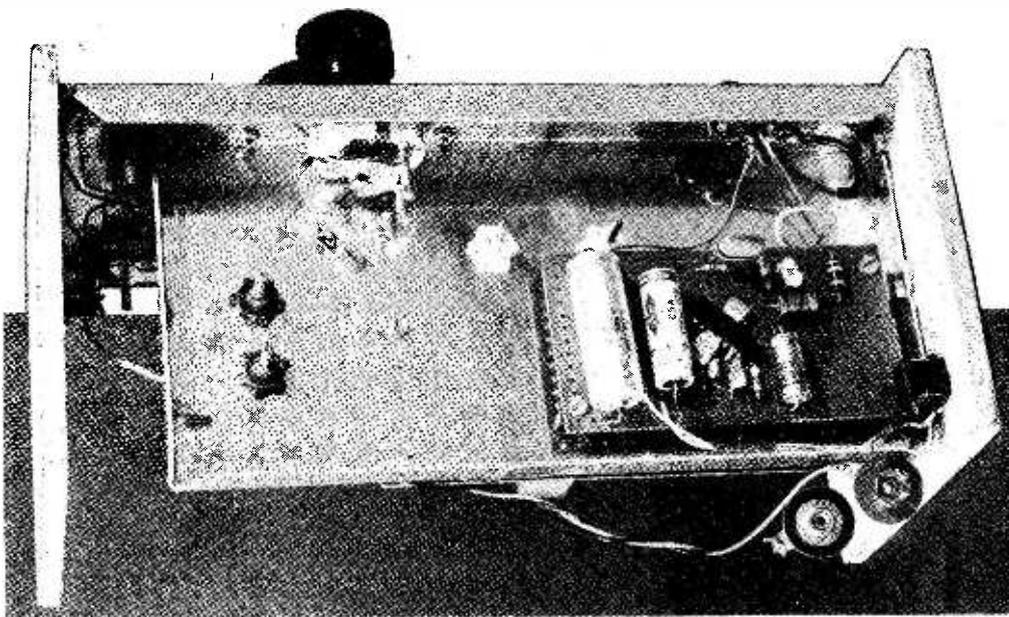


Fig. 7: above, is the piece of Veroboard, 0.15in. matrix, carrying the IC audio amplifier stage. Again, this is not to scale. This board is mounted underneath the chassis as can be seen in the photograph, left. The variable capacitor, top left, is the Microtune or bandspread tuning control, VC4.

or SSB. For CW, set VC5 to produce the wanted audio pitch. With SSB, more critical adjustment of VC5 is necessary, to obtain the best resolution of speech. Remember that lower sideband is used below 10MHz and upper sideband above.

Due to the way in which D1 operates, satisfactory resolution on SSB makes it necessary that the signal

at the diode should not be too strong. When the RF stage is built, a control on this allows gain to be reduced. However, when the receiver is operated without this stage other means of reducing the input from strong SSB signals will have to be employed. Trouble from excessively strong signals at D1 will be unlikely with weak stations and a short aerial, but

will certainly occur with a better aerial, and with strong transmissions. A 50pF or similar variable capacitor in the aerial lead will then be worth while, or a small fixed capacitor as in Fig. 1.

## Aerial/Oscillator Tuning

Trimmer TC1 is screwed down about half way so that when the coil cores are adjusted, signals peak up with VC3 about one-third to two-thirds closed. Band coverage is adjustable between quite wide limits and depends largely on the positions of the cores. For approximately 1.7MHz to 15MHz, set them so that about 1/2in of the 6BA screwed rod projects. Subsequently, adjust the aerial coil cores, one for each band, so that VC3 allows peaking up of signals throughout each range.

Should alignment here be somewhat in error, it will be necessary to re-adjust VC3 for best reception when tuning. This will not cause any lack of efficiency, provided VC3 is neither fully open nor fully closed. Adjust the aerial coil cores near the low frequency end of the bands to minimise this. The bands covered are approximately 1.7 to 5.5MHz and 5.5 to 15MHz.

## Operating Notes

Space is left inside the receiver for a PP6 9V battery. Any wire aerial, including an indoor wire, may be used. Long wire aerials should be coupled with a trimmer or other capacitor, as described, to help reduce the second channel interference which will otherwise arise. (This is greatly reduced by the RF preselector mentioned.) An earth connection will sometimes increase the volume of weak signals, especially at the lower frequencies. It is possible to arrange the coverage to tune to 1.5MHz if required, but whistles must be expected around 1.6MHz (the receiver IF).

A fairly large speaker in a suitable cabinet is best. High resistance or high impedance headsets can be used, provided a resistor is connected across them, about 16Ω. The combination is much less sensitive than when using 16Ω phones, but this is not too important because of the high audio output available.

**Note that C1 cannot be left in circuit when using the preselector.**

## Tuning dial

The main tuning dial cursor is made from a small piece of thin clear plastic sheet. A hairline is scribed length-wise on the back. A hole is drilled to take a 1/4in. internal diameter grommet which is pushed on to the spindle of the tuning capacitor before the knob is fitted. The tuning scale is also clear plastic sheet, backed with white card.

## Cabinet

The cabinet can be made from universal chassis members, or some parts may be of wood. Using 6mm ply, the sides should be 4 1/2 x 4 1/2in each, and the top and back each 9 x 4in. The side near L1/L2 is lined with an aluminium plate or kitchen foil 4 x 4in to avoid coupling with the preselector coils when this unit is adjacent to the receiver.

**Part 2 next month will give full details of the RF preselector for use with this receiver.**

R.A.E.—continued from page 336

## Squares and square roots

If you wish to square an index quantity it is necessary to double the index figure. For example:  
 $10^3$  squared =  $10^6$  and  $10^{-6}$  squared =  $10^{-12}$

If you wish to find the square root of an index quantity it is necessary to half the index figure. For example:

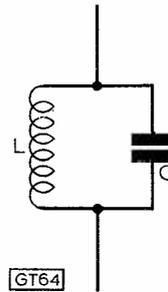
$$\sqrt{10^6} = 10^3 \text{ and } \sqrt{10^{-6}} = 10^{-3}$$

If the index quantity contains a number, for example:

$$\sqrt{81 \times 10^6} \text{ this may be represented by } \sqrt{A \times B}. \text{ First, square root part A, second, halve the index figure of B, thus: } \sqrt{81 \times 10^6} = 9 \times \sqrt{10^6} = 9 \times 10^3 = 9,000.$$

## Indices in calculations

Let's look at a typical problem that might arise in the examination, such as finding the resonant frequency of a capacitor—inductor combination,



L = 1 microhenry ( $1\mu\text{H}$ )

C = 1 microfarad ( $1\mu\text{F}$ )

$$f = \frac{1}{2\pi\sqrt{LC}}$$

If this equation is written out in figures, it is rather large and cumbersome, as shown below:

$$f = \frac{1}{2 \times 3.142 \times \sqrt{0.000,001 \times 0.000,001}}$$

By using indices it is possible to make the whole calculation much simpler. So now re-write in index form:

$$f = \frac{1}{6.284 \times \sqrt{1 \times 10^{-6} \times 1 \times 10^{-6}}}$$

add the indices:

$$f = \frac{1}{6.284 \times \sqrt{1 \times 10^{-12}}}$$

square root by halving the indices:

$$f = \frac{1}{6.284 \times 10^{-6}}$$

rearrange:

$$f = \frac{1 \times 10^6}{6.284} = \frac{1}{6.284} \times 10^6$$

$$f = 0.16 \times 10^6 \text{ Hertz}$$

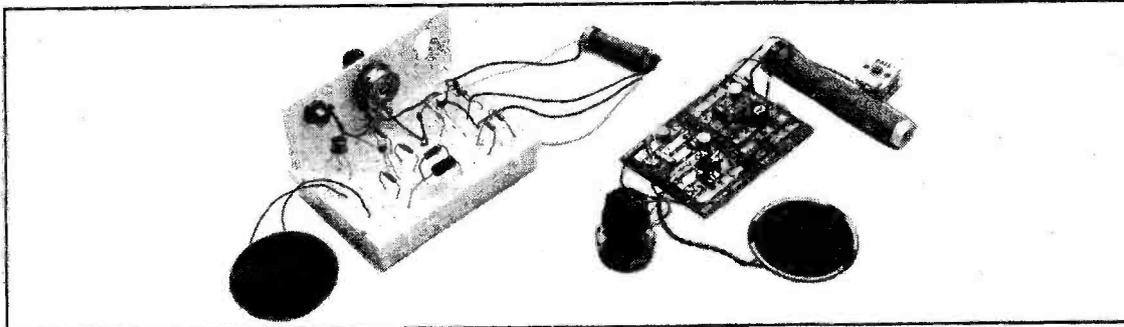
$$f = 160 \times 10^3 \text{ Hertz}$$

$$f = 160 \text{ kilohertz (kHz)}$$

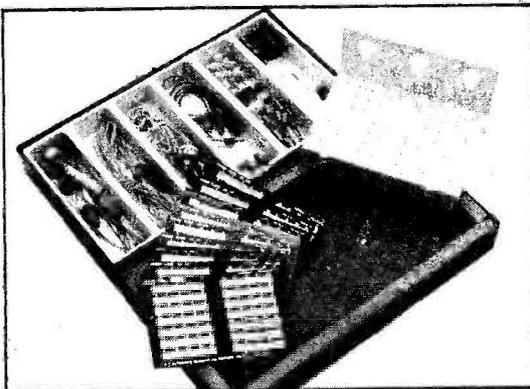
The values of L and C used in this example are not typical for this frequency but were chosen to demonstrate the use of indices in calculations.

**Next month a start is made on Electricity and Magnetism, reviewing the characteristics of common components such as resistors, capacitors, transformers and magnets.**

# FREE BLOB BOARD

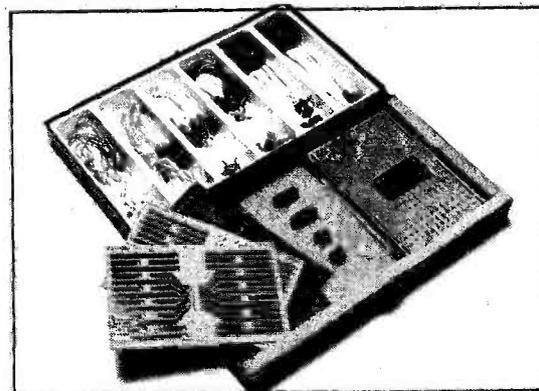


Build this radio-receiver, electronic flasher, binary counter, LC Oscillator, 3 stage amplifier, morse practice oscillator, light-operated switch, CR Oscillator, Wien Oscillators, S-DeC + control panel + 9 project instruction book + Free Blob-Board Only £2.25 + £0.40 post and VAT,



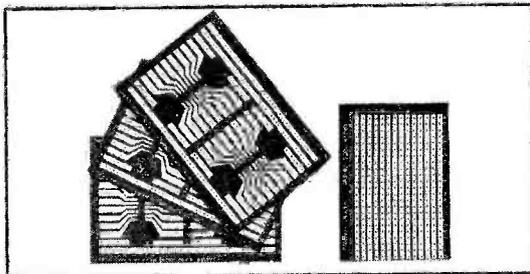
## S-De-K-IT

This S-De-K-IT contains 1 S-DeC + Control panel + 9 Blob-Boards + 20 double-ended leads + Instructions to build 9 projects. Complete in work box with component tray. S-De-K-IT Only £4.95 + £1.00 post and VAT. + Free 9 Extra Blob Boards.



## T-De-K-IT

This T-De-K-IT contains 1 T-DeC + Control panel + 16 Dill carrier + 4 IC Blob Boards + 41Cs + Components + Leads + Circuit Diagrams + Instructions to build, Burglar Alarm + Sound Fuzz Circuit + SR Latch + Two Tone Siren. Complete Kit with all Components £13.00 + £1.66 post and VAT. + Free 4 extra IC Blob Boards.



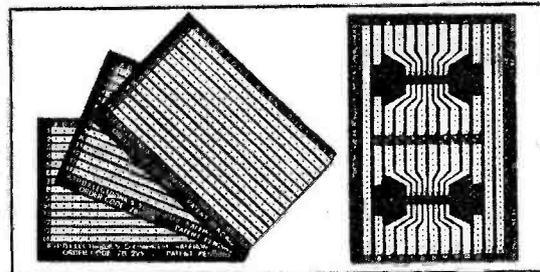
Buy pack of 3 2V5 Blob-Boards and Get 1 21C Blob-Board Free

Please rush me

.....Packs of 3 2V5 + My Free 21C Blob

For only £0.62 per pack of 3.

Please add 20p for Post + VAT for all orders



Buy pack of 3 2-IC Blob-Board and Get 1 2V5 Blob-Board Free.

Please rush me

.....Packs of 3 21C + My Free 2V5 Blob

For only £1.01 per pack of 3.

Please add 20p for Post + VAT for all orders

Offer available from all good component stockists. Save on post.



PB Electronics (Scotland) Ltd.

57 High Street, Saffron Walden, Essex CB10 1AA England. Tel: Saffron Walden 22876.

# TRANSFORMERS

ALL EX-STOCK—SAME DAY DESPATCH. VAT 8%

**12 AND 24 VOLT OR 12-0-12V**  
PRIMARY 220-240 VOLTS

Ref	12V Amps	24V £	P & P
111	0.5	0.2	2.20
213	1.0	0.5	2.64
71	2	1	3.41
18	4	2	4.03
108	6	3	5.35
70	8	4	6.98
72	10	5	7.67
116	12	6	8.99
17	16	8	10.39
115	20	10	13.18
187	30	15	17.05
226	60	30	26.82

**30 VOLT RANGE**  
Prim 220/240V Sec 0-12-15-20-24-30V  
Voltages available 6, 8, 10, 12, 15, 18, 20, 24, 30V 15-0-15V, 12-0-12

Ref	Amps	£	P & P
112	0.5	2.64	0.78
79	1.0	3.57	0.96
3	2.0	5.27	0.96
20	3.0	6.29	1.14
21	4.0	7.44	1.14
51	5.0	8.37	1.32
117	6.0	9.92	1.45
88	8.0	11.73	1.64
89	10.0	13.33	1.84

**50 VOLT RANGE**  
Prim 220/240V Sec 0-10-25-30-40-50V  
Voltages available 6, 7, 8, 10, 14, 15, 17, 19, 25, 31, 33, 40, 50V or 25-0-25V

Ref	Amps	£	P & P
102	0.5	3.41	0.78
103	1.0	4.57	0.96
104	2.0	6.98	1.14
105	3.0	8.45	1.32
106	4.0	10.70	1.50
107	6.0	14.62	1.64
118	8.0	17.95	2.08
119	10.0	21.70	2.08

**60 VOLT RANGE**  
Prim 220/240V Sec 0-24-30-40-48-60V  
Voltages available 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60V or 24-0-24V or 30-0-30V

Ref	Amps	£	P & P
124	0.5	3.88	0.96
126	1.0	5.58	0.96
127	2.0	7.59	1.14
125	3.0	10.54	1.32
123	4.0	12.23	1.84
40	5.0	13.95	1.64
120	6.0	15.66	1.84
121	8.0	20.15	2.08
122	10.0	24.93	2.08
189	12.0	27.13	2.08

**MAINS ISOLATING (SCREENED)**  
PRIM 120/240 SEC 120/240 CT

Ref	VA (Watts)	£	P & P
07	20	4.40	0.79
149	60	6.20	0.96
150	100	7.13	1.14
151	200	11.16	1.50
152	250	12.79	1.84
153	350	16.28	2.15
154	500	19.15	2.15
155	750	29.06	2.15
156	1000	37.20	2.15
157	1500	45.60	2.15
158	2000	54.80	2.15
159	3000	79.95	2.15

**AUTO TRANSFORMERS**

Ref	VA (Watts)	Volts	£	P & P
113	20	0-115-210-240	4.46	0.71
64	75	0-115-210-240	3.59	0.98
4	150	0-115-210-240-240	5.35	0.96
86	300	0-115-210-240-240	7.75	1.14
87	500	0-115-210-240-240	10.00	1.60
84	1000	0-115-210-240-240	18.78	2.08
93	1500	0-115-210-240-240	23.36	2.08
96	2000	0-115-210-240-240	34.82	2.08
93	3000	0-115-210-240-240	48.00	2.08

**HIGH VOLTAGE MAINS ISOLATING**  
Prim 200/220V or 400/440V  
Sec 100/120V or 200/240V

VA	Ref	£	P & P
60	243	5.89	1.32
350	247	14.11	1.84
1000	250	35.65	2.08
2000	252	54.25	2.08

**CASED AUTO TRANSFORMERS**  
240V cable in & 115V USA 2 pin outlet

VA	Ref	£	P & P
20	4	0.96	113V
150	8	1.14	4V
200	9	1.45	65V
250	10	1.45	69V
350	12	1.64	53V
500	15	1.64	57V
750	18	1.76	83V
1000	22	1.84	84V
2000	37	1.84	95V

**SCREENED MINIATURES**

Ref	mA	Volts	£	P & P
238	200	3-0-3	1.99	0.55
212	1A, 1A	0-6, 0-6	2.85	0.78
13	100	3-0-9	2.14	0.38
235	330, 330	0-3-9, 0-3-9	1.99	0.38
207	500, 500	0-3-9, 0-3-9	2.59	0.71
208	1A, 1A	0-9-9, 0-9-9	3.53	0.78
236	200, 200	0-15, 0-15	1.99	0.38
214	300, 300	0-20, 0-20	2.56	0.78
221	700 (DC)	0-12-0-12-20	3.41	0.78
205	1A, 1A	0-15-20-0-15-20	4.63	0.96
203	500, 500	0-15-27-0-15-27	3.59	0.96
204	1A, 1A	0-15-27-0-15-27	5.39	0.96
S112500		12-15-20-24-30	2.64	0.78

**BRIDGE RECTIFIERS**

	P & P
200V 2A	£0.45 0.29
400V 2A	£0.55 0.29
200V 4A	£0.65 0.29
400V 4A	£0.80 0.29
400V 6A	£1.05 0.29
500V 10A*	£1.35 0.29

VAT 12% \*VAT 8%

**AUDIO KIT 25W**

- 2+25W Amplifiers
- 1+Pre-Amp
- 1+Power supply
- 1+Transformer
- 1+Front Panel
- 1+Kit of parts to include on-off switch, neon ind. Stereo head-phones socket. Plus instructions book £27.55.
- Teak veneered cabinet aluminium chassis, heat sink and front panel brackets plus back panel and sockets etc. £9.20
- P & P £1.78 VAT 12%

## PLUS

**HIGH QUALITY MODULES**

10 Watts RMS AMPLIFIER	£3.66
25 Watts RMS AMPLIFIER	£4.57
35 Watts RMS AMPLIFIER	£6.95
125W RMS AMPLIFIER	*£15.95
PRE-AMP for 5-10W	£6.70
PRE-AMP for 25W	£13.88
POWER SUPPLIES 5-10W	£1.30
POWER SUPPLIES 25W	£3.09
TRANSFORMER 5-10W	£4.79
TRANSFORMER 25W	£4.79

P & P Modules 35p. Trans 96p.  
VAT 12% \*VAT 8%

**TEST METERS**

AVO 8 MK5	£68.95
AVO 71	£28.00
AVO 73	£37.80
AVO MMS	£21.94

AVO TT189 in circuit  
Transistor Tester £29.90  
U4315 in case £14.95  
VAT 8% P & P £1.15  
AVO cases and accessories

**RECORD DECK**  
BSR P128R Single Player with Cartridge £16.90 P & P £1.50  
VAT 12%

**PRINTED CIRCUIT KIT**  
PC Board, Circuit Marking Pen, Etchant Crystals, Solvent, £2.40 VAT 8%, P & P 40p.

**MAGNETIC TO CERAMIC CARTRIDGE CONVERTER**  
OPERATING VOLTAGE 20-45V  
ONLY £3.59 P & P 35p VAT 12%

**POWER UNITS**  
Stabilised 3-6-7 5-9V/400mA £5.95  
3300 fits into 13A socket 6-7.5-9V 300mA £3.30  
12B 3, 4-5, 6, 7-5, 9, 12V 500mA £5.32  
VAT 12% P & P 55p

**TRANSFORMERS SPECIAL OFFER**  
(Limited Stocks)  
BG1 Prim 0-120, 0-120V (110 or 240V) Sec 24V 10A £5.50 P & P £1.66  
BG2 Prim 0-90-110-200-220-240V Sec 0-110V 0-20-24V, 2-5A £2.25 P & P 95p. VAT 8%

**BLOB BOARD (Pack of 3)**  
2.5" x 5.1" 1" or 2.5" x 5.1" 1.5" £0.75  
3.75" x 5.1" 1" or 3.75" x 5.1" 1.5" £1.14  
10" x 6" 1" or 10" x 8" 1.5" £3.78

IC Range  
4-8" x 3-2" £0.96. 4-7.5" x 7-5" £2.13  
P & P 35p VAT 8%

**DECS SOLDERLESS BREAD-BOARDING**  
S Dec 70 contacts £1.90  
T Dec 208 contacts £3.99  
U Dec "A" for I.C.s etc £3.99  
U Dec "B" for I.C.s etc £6.99  
VAT 8% P & P 40p

**CARTRIDGES**

AT55	£4.43
SONOTONE V100	£4.05
9TAHC	£2.63

**ELECTRONIC CONSTRUCTION KIT**  
10 projects (including electronic organ). No soldering needed £7.29. VAT 8% P & 70p

**ANTEX SOLDERING IRONS**  
15W £3.75 18W £3.75  
25W £3.40 Stand £1.40  
Soldering iron kit £5.15  
VAT 8% P & P 43p

**ACOS**  
GP93-1 £2.15  
GP96-1 £2.40

**COMPONENT PACKS**  
200 Mixed value resistors (count by weight)  
150 Mixed value capacitors (count by weight)  
30 Mixed value precision resistors 1/2W 2%  
15 Assorted pots and pre-sets  
10 Lead switches

**TI MINI-MULTIMETER**  
DC-1000V AC-1000V DC-100mA Res-150kV 1000V/V Bargain £3.30  
VAT 8% P & P 62p

**B.S.R.**  
SX6M £2.25  
SC12M £2.92

**STEREO FM TUNER WITH PHASE-LOCK LOOP**  
4 Pre-selected stations supply 20-35V 90mA Max £20.45.  
VAT 12% P & P 40p

**SHURE**  
M765 £10.92  
M556 £12.42  
VAT 12% P & P 25p

Prices correct 23-6-77. Please add VAT after P & P.

**Barrie Electronics Ltd.**  
3, THE MINORIES, LONDON EC3N 1BJ  
TELEPHONE: 01-488 3316/7/8  
NEAREST TUBE STATIONS: ALDGATE & LIVERPOOL ST

Our wide range of transformers are too numerous to list, please call (open 9am-5pm Mon-Fri) or send your requirements. Electrofil & semiconductor stockists. Panel, Multi Meters, Audio accessories, send 15p stamps for lists.

Get a great deal from **Marshall's**

**A. MARSHALL (LONDON) LTD. DEPT. P.W.**  
LONDON - 40-42 Cricklewood Broadway, NW2 3ET  
Tel. 01-452 0161. Telex 21492  
GLASGOW - 85 West Regent Street, G2 2QD  
Tel. 041-332 4133  
BRISTOL - 1 Straits Parade, Fishponds Rd., BS162LX  
Tel. 0272 654201

CALL IN AND SEE US  
9-5.30 Mon-Fri.  
9-5.00 Saturday

**EXPRESS MAIL ORDER**  
Tel Orders on Credit Cards  
£10 minimum.

**POPULAR SEMICONDUCTORS**

2N706	-28	2N5294	-40	BC178	-20	BF167	-35	MJE520	-45	LM380-8	-90
2N708	-28	2N5296	-40	BC179	-20	BF173	-35	MJE521	-85	LM380N	-98
2N1131	-30	2N5298	-40	BC182	-11	BF177	-25	MPSA05	-102	LM381A	2-45
2N1132	-37	2N5447	-15	BC182L	-14	BF178	-25	MPSA06	-25	LM381N	1-60
2N1711	-30	2N5448	-15	BC183	-12	BF180	-35	MPSA07	-25	LM382N	1-25
2N2102	-60	2N5449	-19	BC184	-12	BF181	-35	TIP29A	-45	LM384N	1-45
2N2218	-33	2N5457	-32	BC184L	-14	BF194	-15	TIP29C	-60	LM388N	1-05
2N2219	-35	2N5458	-33	BC184L	-14	BF194	-15	TIP30A	-49	LM389N	1-00
2N2220	-35	2N5459	-29	BC212	-14	BF195	-15	TIP30A	-49	LM702C	-75
2N2221	-25	2N5484	-34	BC212L	-17	BF196	-15	TIP30C	-65	LM709C	-65
2N2222	-25	2N6121	-38	BC213	-14	BF197	-15	TIP31A	-60	LM709N	-45
2N2365	-25	2N6122	-41	BC213L	-16	BF198	-18	TIP31C	-66	LM710C	-60
2N2369	-25	2N6123	-43	BC214	-16	BF200	-35	TIP32A	-55	LM710N	-60
2N3053	-26	2N6126	-48	BC237	-14	BF224J	-14	TIP32C	-75	LM723C	-85
2N3054	-60	AC126	-45	BC238	-12	BF244A	-35	TIP41A	-70	LM723N	-75
2N3055	-70	AC127	-45	BC239	-15	BF245A	-40	TIP41C	-90	LM741C	-65
2N3441	-85	AC128	-45	BC257	-17	BF257	-37	TIP42A	-80	LM741N	-40
2N3442	-1.35	AC151	-40	BC258	-18	BF258	-45	TIP42C	-1.00	LM747N	-90
2N3702	-13	AC152	-50	BC259	-18	BF259	-49	TIP2955	-65	LM747N	-90
2N3704	-15	AC153	-55	BC307	-15	BF336	-38	TIP3055	-55	LM748-8	-55
2N3706	-16	AC153K	-55	BC308	-15	BF337	-45	TI543	-43	LM748N	-55
2N3708	-13	AC176	-50	BC309	-15	BF338	-48	TI550	-55	LM1800	1-76
2N3771	-1.95	AC176K	-65	BC327	-20	BF339	-28	TI551	-23	LM1808	1-92
2N3772	-2.00	AC187K	-60	BC328	-19	BF400	-27	TI562	-45	LM301N	1-55
2N3773	-2.90	AC188K	-60	BC347	-12	BF401	-28	TI588A	-40	LM301N	1-85
2N3819	-36	AD161	1-00	BC548	-12	BF479	-28	TI590	-20	LM302N	-40
2N3820	-38	AD162	1-00	BC549	-14	BF480	-27	TI593	-33	LM3401	-75
2N3823	-80	AF106	-55	BC557	-13	BF481	-28	LM301A	-67	LM3900	-70
2N3904	-21	AF109	-75	BC558	-12	BF482	-39	LM301N	-60	LM3905	1-60
2N4036	-67	AF139	-69	BC559	-14	BF483	-39	LM304	-2.45	LM3909	-66
2N4037	-55	AF238	-65	BC558	-25	BF484	-35	LM307N	-65		
2N4058	-20	AF240	1-14	BCV70	-25	BF485	-30	LM308C	1-82		
2N4059	-15	AF279	-80	BCV71	-28	BF486	-30	LM308N	-85		
2N4060	-20	AF280	-85	BCV72	-24	BF487	-30	LM309K	1-85		
2N4124	-17	BC107	-15</								

# S-DeCnology

DAVID GIBSON

10



THIS MONTH



## 'Record Player Amplifier'

This month's project is a simple record player amplifier which is suitable for use with a ceramic cartridge. Although the output could not be fairly described as hi-fi, it does give useful volume which is acceptable in terms of quality.

The prototype used a small 58mm diameter 80Ω loudspeaker but a larger diameter unit would undoubtedly improve the apparent volume and quality, particularly in the base notes. Any speaker with an impedance from 60Ω to 80Ω will be satisfactory.

### Circuit description

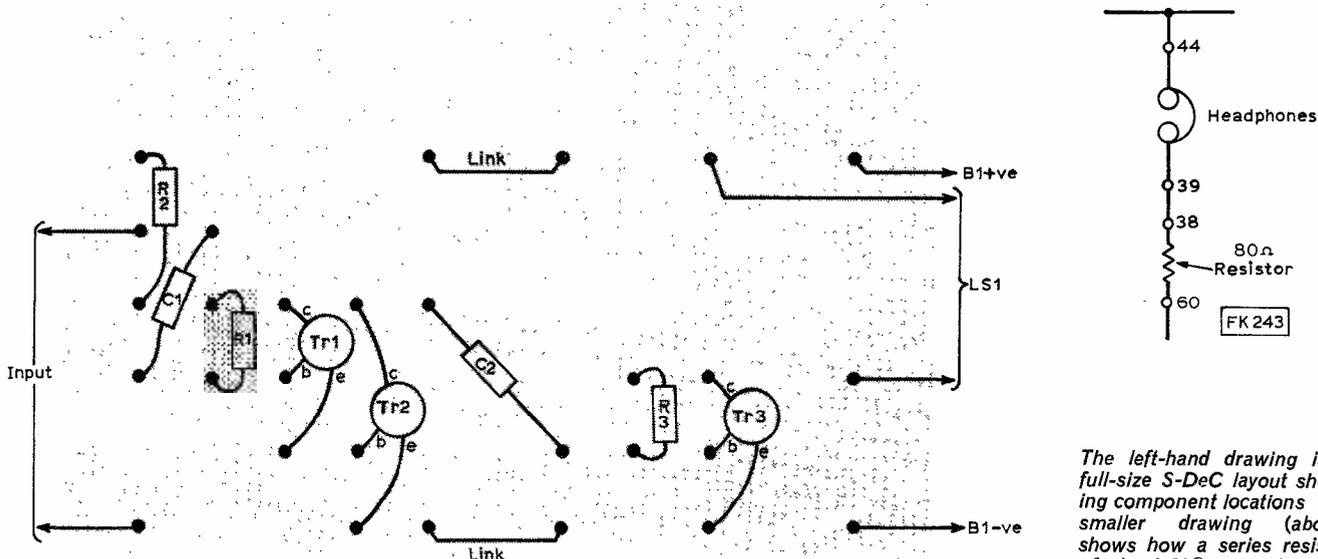
The circuit, Fig. 1, is basically a two-stage amplifier. Transistors Tr1 and Tr2 connected in a Darlington pair configuration form the first stage. This useful arrangement has two main advantages. The first is

that a great deal of amplification is possible. The total current gain from such a circuit is found by multiplying the gain of Tr1 by that of Tr2. In practice it is difficult to calculate exactly what the gain will be because individual transistors have quite a spread in their gain characteristics.

Secondly, the Darlington stage also keeps the input currents very small indeed. In terms of power consumption the two Darlington connected transistors drew less than one fortieth of the total current of the whole amplifier.

Resistor R2 forms an audio load for the Darlington pair while base bias and DC stabilisation is provided by negative feedback resistor R1.

The first stage is capacitor coupled to the output stage, Tr3 via capacitor C2. Again, in the interests of simplicity, a lone resistor R3 provides bias and



The left-hand drawing is a full-size S-DeC layout showing component locations. The smaller drawing (above) shows how a series resistor of about 80Ω must be used when operating the amplifier with low impedance headphones.

FK242

# next month in Television

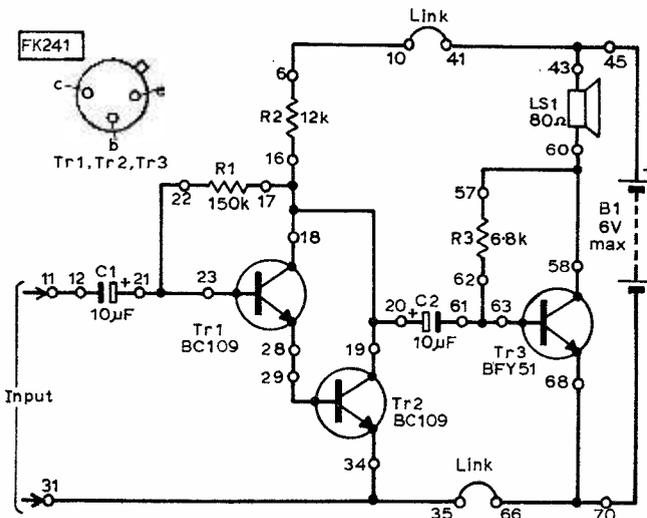


Fig. 1: Circuit diagram of amplifier.

stabilisation. There are two important points to note. First, do not use very low impedance speakers in this circuit, i.e. 3, 4, 8 or 16Ω units. Secondly, note that both capacitors are electrolytics and must be connected with correct polarity. The positive lead of C1 must go to S-DeC hole 21 and the positive lead from C2 must be pushed into hole 20.

Remember the two shorting links which connect together holes 10/41 and holes 35/66 respectively. It is all too easy to forget these since they are not actual components.

This little amplifier works well from any voltage between 1.5V and 6V although sensitivity and output are lower at the lower voltages. At 1.5V the circuit draws approximately 6.5mA; at 3V it is 16mA, at 4.5V it is 25mA and at 6V, 34mA. With 6V applied, the current taken by Tr1 and Tr2 was found to be well under 1mA.

The lead from the record player pick-up should be of the screened variety. The centre conductor should be connected to hole 11 while the screening wire mesh goes to hole 31.

## you will need . . .

R1	150kΩ	R3	6.8kΩ	Tr1	BC109
R2	12kΩ			Tr2	BC109
C1	10µF			Tr3	BFY51
C2	10µF			LS1	60-80Ω loudspeaker
	One S-DeC				6V Battery

The amplifier provides an excellent and inexpensive general purpose unit and to this end is probably well worth transferring to a piece of Blobboard to form a permanent piece of equipment.

A crystal microphone connected to the input (holes 11 and 31) worked well; the unit would make a very useful intercom amplifier by using another, similar speaker as a microphone and connecting this to the input. The amplifier could also be used as the audio section of a radio receiver—even a crystal set—and headphones may be connected if required. Most types offered for hi-fi and record monitoring purposes are of the low impedance kind and it would be wise to insert an 80Ω resistor in series with the phones if this application is envisaged.

### ● ONE-CHIP TOUCH TUNING

Mechanical station selection using a combined potentiometer/switch assembly is the most common method employed in sets equipped with varicap tuners. Our constructional project next month describes an exceptionally easy method of going "all electronic", based on a Plessey touch-tuning i.c. Connection to the receiver is via the existing leads used for the mechanical selector. The unit is powered from the 33V tuning supply and uses l.e.d.s for channel indication.

### ● A DAY IN THE LIFE OF ...

It's that man again. Who else but Les LJ, commenting on an average (?) day's business, faulty sets, dropped Avos, troublesome customers and all.

### ● IC BURST GATE GENERATOR

A precisely timed burst gate pulse is essential for correct colour reception. This can present problems for the constructor, especially if his test equipment is limited. An effective answer is the use of a simple monostable i.c. to provide the pulse.

### ● PYE HYBRID COLOUR SETS

The Pye 691/693/697 chassis were produced in large quantities: Andy Denham provides a run down on the stock faults.

### ● VCR RECEIVER CONVERSION

Older TV sets were not designed to operate with VCRs and can't usually follow the more variable line sync pulses in a VCR's signal. A complete solution is to fit a modern line oscillator i.c. designed for switching between off-air and VCR operation.

PLUS ALL THE REGULAR FEATURES

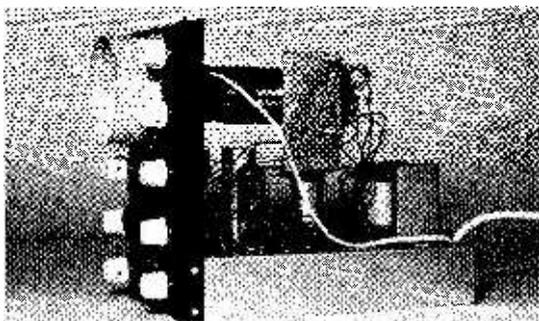
## ORDER YOUR COPY ON THE FORM BELOW:-

TO .....  
(Name of Newsagent)

Please reserve/deliver the **SEPTEMBER** issue of **TELEVISION** (45p), on sale August 15th, and continue every month until further notice.

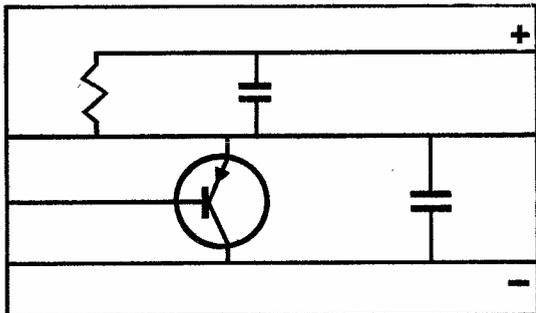
NAME .....

ADDRESS .....



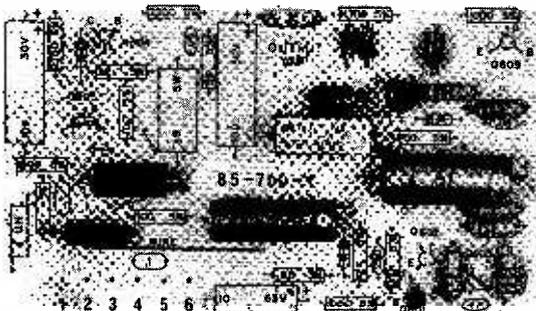
## 1 Build an oscilloscope.

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



## 2 Read, draw and understand circuit diagrams.

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



## 3 Carry out over 40 experiments on basic circuits.

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

# 'There's only one way to master electronics... to see what is going on and learn by doing.'

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 learn the practical way in easy steps mastering all the essentials of your hobby or to further your career in electronics or as a self-employed electronics engineer.

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



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.

Write to:- British National Radio & Electronic School  
P.O. Box 156, Jersey, Channel Islands.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

WB 9/7

# GREENWELD

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

## 71b BARGAIN PARCEL

Hundreds of new components—pots, switches, resistors, capacitors, PC Boards with semiconductor, loads of odds and ends. Amazing value at only £3.45.

## COMPUTER PANELS

Large quantity always available; 31b asstd. £1.90; 71b £3.90; 561b £17. Pack with about 500 components inc. at least 50 transistors £1.10; Pack with 12 High quality panels, incl. IC's power transistors, multivibrator trim pots, hundreds of small signal transistors, resistors, zeners, capacitors, etc. Only £2.95.  
7400 IC pack—20 74 series IC's on panels £1.25.

## PC ETCHING KIT MKIII

Now contains 200 sq. ins. copper clad board, 1lb Ferric Chloride, DALO etch-resist pen, abrasive cleaner, two miniature drill bits, etching dish and instructions. £4.25.

## FERRIC CHLORIDE

Anhydrous technical quality in 1lb double sealed packs, 1lb £1.10; 3lbs £2.30; 10lbs £5.80; 100lbs £39.00.

## FIBREGLASS PCB

Large quantity of offcuts, all usable pieces. 200 sq. ins. single sided, double sided or mixed £1.50.

## DEVELOPMENT PACKS

50V ceramic plate capacitors, 5% 10 of each value 22pF to 1000pF. Total 120 caps. £3.35.

CR25 carbon film 1/2 watt resistors, 5% 10 of each value 10 ohms to 1M, Total 610 resistors £6.90. Electrolytics, wire ended, 25V working 10 each of: 1, 2, 2, 4, 7, 10, 22, 47 and 100µfd.

70 capacitors for £3.50. 400mW zeners 5% 10 each 3V to 30V, 260 in all. Only £15.30. 1 watt Metal Film Resistors, 5% 10 of each value 27R to 10M. E12 series. Total 680 resistors £12.00. Polystyrene capacitors, 180V 2 1/2% 10 of each value from 10pF to 10,000pF.  
Total 370 capacitors £12.30.

## COMPONENT PACKS

400 asstd. carbon resistors £1.50  
100 Wirewounds 2-15W £1.50  
200 Miniature resistors, 1/2, 1, and 1W £1.30  
200 poly, mica, ceramic caps £1.20  
100 polyester, .01-2.2uF £1.00  
200 PC resistors 75p

## TAPE DECKS

Data Tape Deck by D-Mac, Reel-to-reel, takes 3" spool, 2 heads, 12V motor, 3 position switch, 17 transistors, R's, C's 200V 6A SCR, min 6V relay, etc. In good condition but not new. Size 225 x 165 x 120mm high. Reduced to clear £4.

## TRANSFORMERS

All have mains primaries, secondaries as follows: 6-0-6V 100mA 95p; 9-0-9V 75mA £1; 12-0-12V 50mA 95p; 12-0-12V 100mA £1.10; 6-3V 1 1/2A £1.95; 6-0-6V 1 1/2A £2.30; 9-0-9V 1A £2.55; 12-0-12V 1A £2.85; 12V 5A £3.95; 12V 8A £4.35; 20V 55mA 60p; 22V 100mA £1.00; 20V 50mA 30p. Multi-tapped types, 0-12-15-20-24-30V 1A £3.50; 2A £5.00; 20-0-20V 2A £4.40; 24V 500mA £1.85; 20V 2 1/2A £4.15; 14V 1A £2.00.

## MULTIMETER MODEL LT 22

AMAZING  
VALUE !!



Probably one of the lowest priced meters featuring a mirror scale, overload protection and 20000 ohms per volt sensitivity. A modern styled meter with unusually clear scale markings. Ranges: DC Volts 0-0.5-2.5-10-50-250-1000 AC Volts 0-10-50-250-1000 DC Current 0-50uA-25mA-250mA. Resistance 0-50k-500k-5M (Mid scale 300-3k-30k) db's 4 ranges 200b 0 +42dB. Size 130 x 90 x 42mm £12.70.

Our retail shops at 21 Deptford Broadway, London, SE8 (01-692 2009) and 38 Lower Addiscombe Road, Croydon (01-688 2950) stock some of the advertised goods for personal callers only. Ring them for details. All prices quoted include VAT and UK/BFPO postage. Most orders despatched on day of receipt. SAE with enquiries please. **MINIMUM ORDER VALUE £1.** Official Orders accepted from Schools, etc. (Minimum invoice charge £5). Export/Wholesale enquiries welcome. Wholesale list now available for bona-fide traders. Surplus components always wanted.

## CALCULATOR KEYBOARDS CLEARANCE

Many different types, some as previously advertised at up to £1.80, some off Rapid-man calcs. All types at one price £1.20 each.

THE NEW 1977 GREENWELD CATALOGUE WITH DISCOUNT VOUCHERS IS NOW AVAILABLE—PRICE 30p + 15p post.

## ELECTRONIC CAR VOLTAGE REGULATOR

All parts for the project featured in this edition of PW available in kit form for only £4.00.

## MOTORS

240V a.c. 60 r.p.m. High Torque: drive to 6mm shaft 20mm long. Size 70mm dia. x 55mm £2.20.

## LED DIGIT DRIVER

ITT type 7105. 16PIN DIL package. Supplied with Data sheet. 8 for £1.

## VERO OFFCUTS

Pack A, All 0-1"  
Pack B, All 0-15"  
Pack C, Mixed.  
Pack D, All 0-1" plain

Each pack contains 7 or 8 pieces with a total area of 100 sq. ins. Each pack is £1.40. Also available by weight, 1lb £3.45, 10lbs £28. (0-1" only).

We are also Vero wholesalers, trade price list on request from Bone Fide Companies.

## VEROCASES

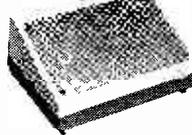
Plastic top and bottom, ally panels front and back.

Type 1410 205 x 140 x 40mm	£3.70
1411 205 x 140 x 75mm	£4.17
1412 205 x 140 x 110mm	£5.20
1237 154 x 85 x 40mm	£2.83
1238 154 x 85 x 60mm	£3.05
1239 154 x 85 x 80mm	£3.7

## VERO PLASTIC BOXES

Professional quality, two tone grey polystyrene with threaded inserts for mounting PC Boards.

Type 2518 120 x 65 x 40mm	£2.42
2520 150 x 80 x 50mm	£2.68
2522 188 x 110 60mm	£3.72



Sloping front version,  
Type 2523 220 x 174 x 100/52mm £6.90

1798 171 x 121 x 75/37.5mm £4.65  
Gen Purpose plastic potting box 71 x 49 x 24mm in black or white 40p Hand Controller box, shaped for ease of use in the hand, 94 x 61 x 23mm 64p.

## SOLDERING GUN

Instant heat soldering gun, mains voltage, built in illumination, 5 spare tips. ONLY £4.00.

S-DEC £2.20; T-DEC £3.85. Insulation tape, 15mm wide x 5m long, 7 diff coloured reels £1; Switch banks, 4 PO 1000 type lever switches in vertical bank. 3 for £1.20. Miniature carbon film 5% resistors, all values from 1R to 10M 1 1/2p each, 100 of one value £1.

## 5V 12A REGULATED POWER SUPPLY

Brand new boxed fully stabilized PSU. Complete with instruction manual. Load regulation 0-15% Thermal & Electronic overload protection. Only £24.00.

Your carpet is no place  
for the Black Dyke  
Mills Band



... they should be half way up the wall! Fidelity Fastenings are the newest, smartest way to place your speakers where they belong — on the

wall. Almost undetectable when fitted they are easily adjustable and allow your speaker system to be placed in the best possible acoustical position, where they stay due to the rubber friction mounting. Fidelity Fastenings take a weight of up to 50 lbs and your speakers are easily lifted off for dusting and redecorating.

Available from all good Audio and Hi-Fi shops and stores at £5.49. Look for the red and black box.

If you have any difficulties in obtaining your Fidelity Fastenings, write for details of your nearest stockists to:

**Fidelity Fastenings**

The Ridgeway, Iver, Buckinghamshire,  
Tel: (0753) 654222.

## COMPLETE digital clock kits

REAL TEAK CASE



NON ALARM £10-65 VAT + 85p  
ALARM £13-43 VAT + £1-07 INCLUDING P & P

## "DELTA"

TEAK OR PERSPEX CASE 6" x 2 1/2" x 3"

## FEATURES:

4 Red 1/2 inch high LEDs. 12 hour display with AM/PM indication. Power failure indicated by flashing display. Precise accuracy from mains frequency. Beautiful Burma Teak case or stylish Perspex (State first & second colour choice: White, Red, Blue, Green, Black).

## NON ALARM:

Complete kit including Teak Case £11-50 incl. Module Kit excluding case £9-00 incl.

## ALARM EXTRAS:

Pulsed alarm tone. Tilt operated "Snooze" period. Automatic brightness control. Simple settings.

## ALARM:

Complete kit including Teak case £14-50 incl. Module Kit excluding case £12-50 incl.

## PERSPEX CASES:

50p LESS than Teak.

## READY BUILT:

Extra £2-00 on complete clocks. Extra 50p on Modules.

## TIMER FACILITY:

Count in seconds up to 9m 59sec. Extra 50p.



## "ALPHA"

£11-00 incl.

Ready Built. Non Alarm. Perspex. 4 digits phosphorescent-green. 1/2" high 12 or 24 hour display. White, black, blue, red, green.

Discount on orders over 5 clocks or kits. Overseas: Add £2-50 for Airmail.

Send payment with order. SAE for details.

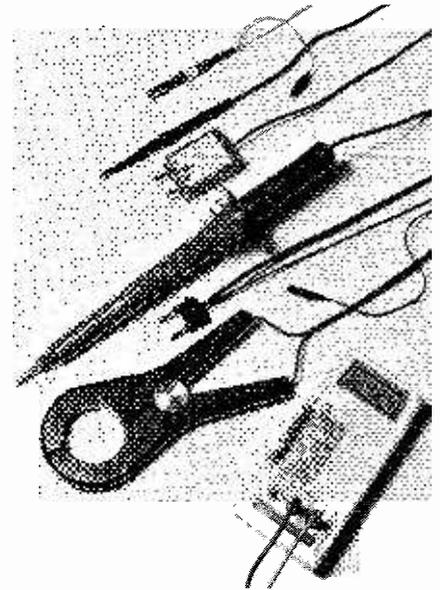


**BARON**

(PW 1) 6 GOWER RD, SOUTHVIEW HOUSE,  
ROYSTON, HERTFORDSHIRE  
Phone Royston (0763) 43695

# PRODUCTION LINES

bill tull



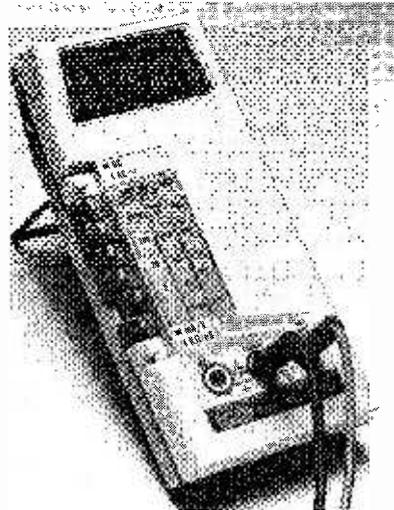
## A free hand from Fluke

Possibly a little on the expensive side for a lot of our readers, but if you are in the market for a new multimeter, don't rush out and buy the first you see, think about the new Fluke model 8020A digital multimeter.

Incorporating a  $\frac{1}{2}$  in  $3\frac{1}{2}$  digit LCD, the various functions and range push-button selectors are so arranged as to allow one-handed operation. The latest CMOS/LSI circuitry is used throughout, and this together with an LCD, ensures that the small 9V alkaline cell lasts for up to 200 hours.

Apart from the usual features of a multimeter such as ten voltage ranges, six resistance ranges, and current measurement up to 2A, the 8020A incorporates three diode test functions and two conductance ranges. In the case of the former of these two functions, the meter applies sufficient voltage to turn on a semiconductor

junction, so that diodes and transistors can be tested for the correct forward bias voltage in situ. Individual paralleled resistors can also be checked without the need to disconnect them from the circuit.



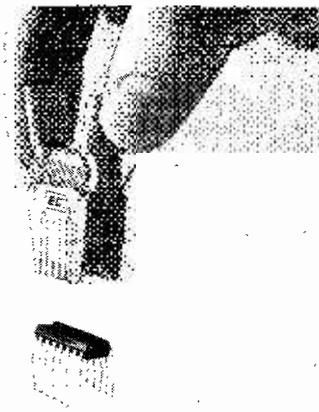
The two conductance ranges enable measurement of resistance as high as 10,000M ohms, thus making possible the checking of HV dividers, leakage in capacitors, PCB's and cables.

Overload protection is also part of this new meter, with full protection against 300V DC continuous, or 6kV transients on any range. Priced at £99 and guaranteed for 2 years the 8020A is complete with test leads and instruction manual, although the versatility of this meter could be extended by purchasing a high voltage probe, RF probes, temperature probe and external battery eliminator.

*ITT Instrument Services, Edinburgh Way, Harlow, Essex. Tel: 0279 29522.*

## IC test clip

Walmore Electronics have introduced a unique DIP test clip which is designed to provide positive contact to eliminate the possibility of accidental disconnection from a device. Called the DIP/LOC it has contacts which provide a wiping action with the DIP leads and end-contacts hook under



the DIP's end-leads in a lock-on action.

14 and 16 pin versions are available, while cable connections can be made quickly and easily with barrier strips between contacts to prevent lead shorting.

*Walmore Electronics Ltd., 11-15 Betterton Street, Drury Lane, London.*

## Cassette centre

Not everyone wants a mini-recording studio in their sitting room as would appear from the complexity and price of many of the commercially available cassette decks. Plustronics, who have recently acquired the Aiko brand, are now marketing the Aiko ATP-711 stereo cassette recorder which is complete with twin speakers and microphones, and would suit the person who requires a good quality recording system, and yet is not too expensive.

Power output into the 8 ohm speak-

ers is claimed to be 5W per channel while frequency response is 50 to 12,000Hz. Controls are of the slider type, with recording level monitored



by twin VU meters. Priced at around £117 the Aiko ATP-711 can be obtained from the usual Plustronics stockists.

*Plustronics Ltd., Hempstalls Lane, Newcastle, Staffs. Tel: 0782 615131.*

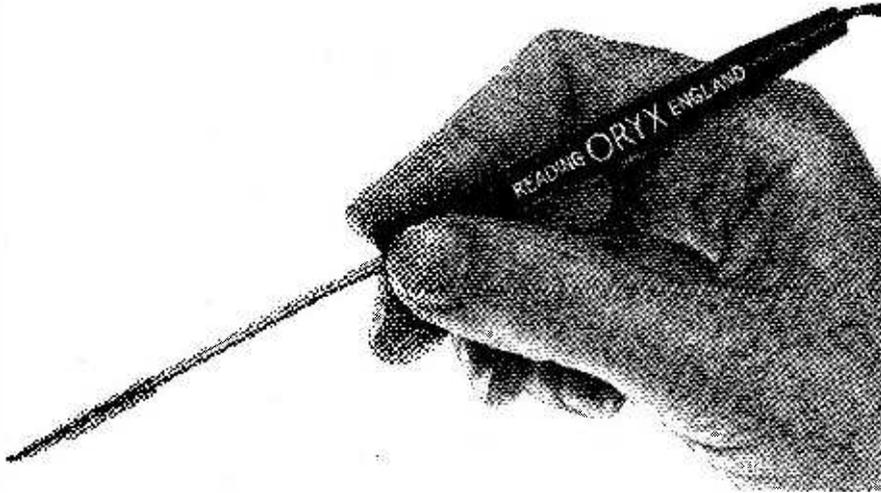
## Flyweight iron

Components seem to be getting smaller and smaller these days, and this coupled with the fact that many of today's IC's are extremely heat and voltage conscious makes the job of soldering a hazardous affair. Now, thought to be the smallest iron in the world, comes the Oryx model 9 low voltage iron that weighs in at only 6 grammes.

Manufactured by Greenwood Elec-

tronics, the element is claimed to give an improved and longer working life, and is available in either 6V, 12V or 24V models. The maximum tip temperature reaches 325°C while power consumption is about 8.3W. The complete iron is only 160mm long and costs £3.02 from the manufacturers or from the usual retail stockists.

*Greenwood Electronics, Portmann Road, Reading, Berkshire, RG3 1NE. Tel: Reading 595844.*



## Tidy tubs

Take a look in one of your drawers in the kitchen, the chances are that if not all of them, at least one of them will be full to overflowing with bits and pieces, pens, pencils, clips and other things which may "come in handy" at some future date. Any attempt to tidy up results in the mess being transferred to another draw, but it's just possible that a new device produced by Platignum (the pen people) will solve this age old problem. Called Tidy-Tubs, it comprises six plastic tubs of varying dimensions joined together to form a "hold-all" for all those small bits that lie in the bottom of draws.

Tidy-Tubs come in six colours, cost £1.50 each, and should be available from all good department stores and stationers.



## Multi-pin resistor

A new style of resistor recently to enter the UK market, has been launched by National Semiconductors. The resistors comprise 0.1in pitch SIP resistor networks available in 6, 8, and 10pin epoxy coated packages, with two styles being offered for each size package. In styles 605, 807 and 109, pin 1 is common to all resistors in the package, whereas in styles 603, 804 and 105 each individual resistor is brought out to a separate pin.

Line terminating resistor networks are available in 8 and 10pin styles with resistor values R1/R2 being 180/390 ohms or 220/330ohms respectively. All styles are rated at 0.125W, and have a tolerance of  $\pm 2\%$ .

*Any further information from National Semiconductors Ltd., Stamford House, Stamford New Road, Altringham, Cheshire. Tel: 061-928 3417.*

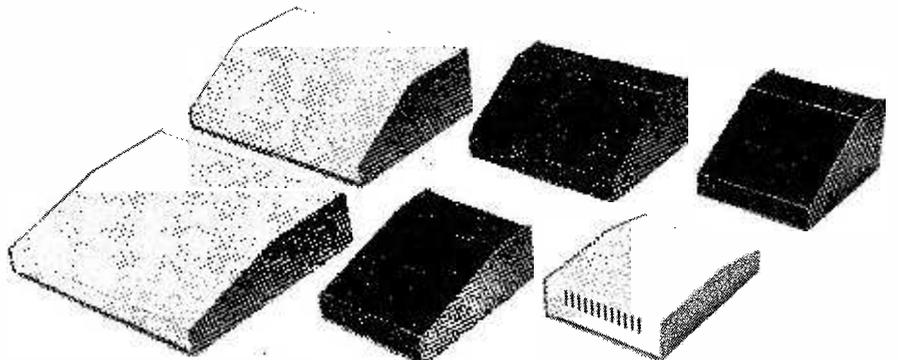


## A good case

Recently introduced by Boss Industrial Mouldings is a new range of aluminium containers, notated the BIM7000 range with a choice of either 15° or 30° sloping front panels. They comprise two sections each and are supplied in blue/off white, green/sand and gold/satin black colour combinations for base and sloping panels respectively.

16 sizes are available, all of which have ventilation slots in both the base and rear vertical panels.

*Boss Industrial Mouldings Ltd., Higgs Industrial Estate, 2 Herne Hill Road, London, SE24. Tel: 01-737 2383.*



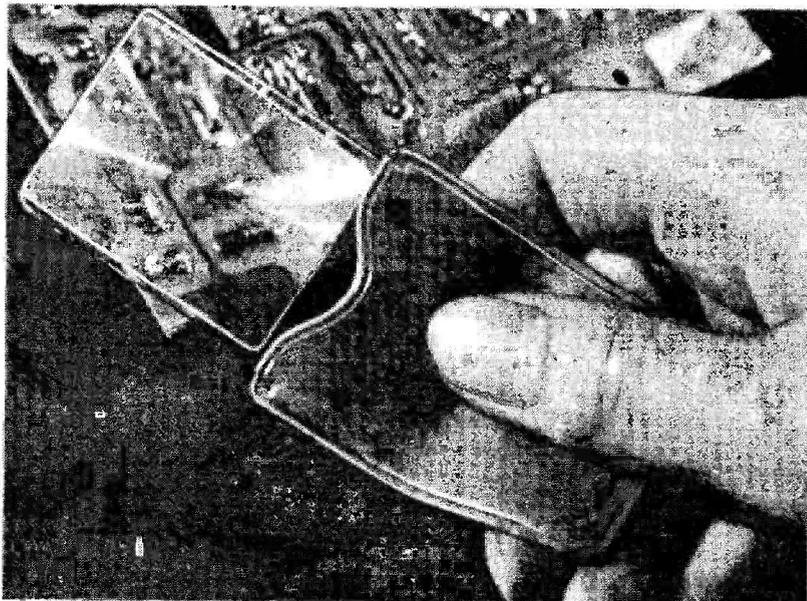
NEXT MONTH IN...

# practical WIRELESS

ON SALE SEPT. 2ND.

## A FREE POCKET MAGNIFIER

Now! You can avoid disappointing results with that new project by checking for dry joints and solder bridges on your printed circuit boards with our FREE Pocket Magnifier. Inspect your handiwork in detail. There's a dozen other uses for this handy gadget.



ALSO

## SOLO SUPERMIND

Losing a few friends through boredom seems to be a hazard of some current "logical" games. October PW features SOLO SUPERMIND, which not only makes the "codemaker" redundant, but permits you to set and break your own codes. Simple circuitry, using readily available transistors disposes of the need for expensive "chips". It's effective, engaging, and cheap to build.



**and:**

Audio Level Indicator  
Inexpensive Sine~Square Wave Generator

The Jubilee is an electronic chord organ with automatic vamping coupled to a three instrument rhythm section. It incorporates a number of features normally found only on the more expensive commercial instruments such as variable sustain length, percussion and other effects. Although automatic organs of this type have been available on the commercial market for a few years they have previously been put out of court for the home constructor because of their inherent complexity and high cost. Nevertheless we have overcome some of the problems with a novel design; simplicity of construction has been obtained by using three specially designed organ integrated circuits—developed for the professional manufacturer by General Instrument Microelectronics. These revolutionary integrated circuits are now available to the amateur.

## Vamp playing

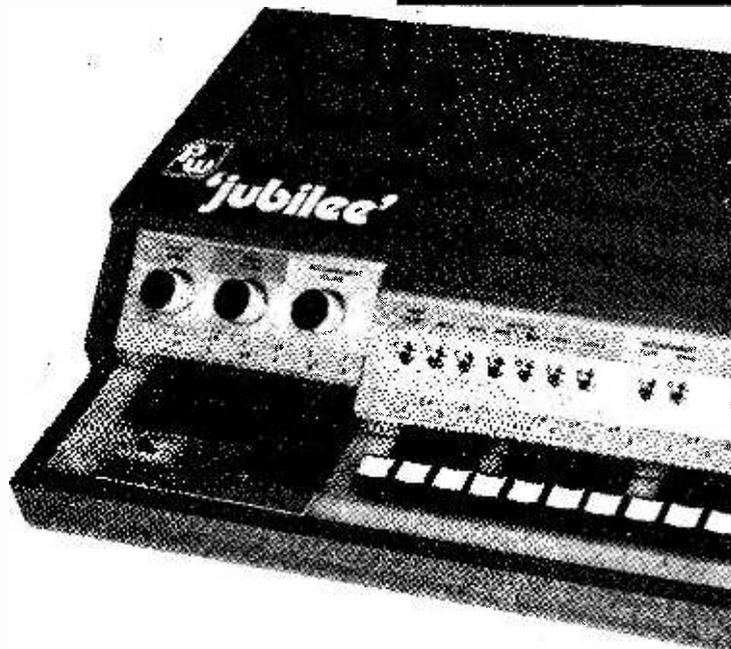
The author, like many readers, is fascinated by electronic organs and the sounds that they produce but, unfortunately, is not sufficiently dextrous to get the best out of a conventional instrument. For this reason every effort has been made to design an instrument that will produce a wide variety of sounds and which can be played by the absolute novice. In practice the melody of a tune is picked out by one finger of the right hand and a four or five note chord (Major, Minor, Major 7th or Minor 7th in any key) is selected by one or two fingers of the left hand (the latter depends on the constructional method adopted as will be seen from reading on). The left hand chords can be played in a static form or can be vamped with an alternating bass note by selecting a suitable rhythm on the tab switches.

A vast range of music is available that enables the person with no previous experience to learn to play in a few minutes. Perhaps the best examples are those written with the Lowrey and Farfissa automatic organs in mind; these scores are sometimes referred to as 'Minute Music' or 'Speed Music'. Apart from these specially written music sheets it is easy to play any music that contains guitar chord notation. The Jubilee will capture the interest of any child and, although it is no substitute for proper music lessons, it provides an incentive to learn to play a more conventional instrument in due course. For those of us with somewhat longer teeth it is a superb fun instrument providing hours of relaxation which can be appreciated by other members of the household!

## Keyboards

Again, like many readers, the author dislikes messy constructional projects which involve lots of discrete point-to-point wiring. This is usually typical of organs and, apart from leaving plenty of scope for error, it turns an interesting project into a bit of a chore. For this reason we have tried to keep construction to the assembly of components on a single printed circuit board and this includes the novel keyboard arrangement suggested for the *Mark I* version. In this example we have used calculator keys instead of a normal keyboard which would need a wiring loom. Calculator keys can be used quite satisfactorily because generally speaking only one has to be depressed at a time and slick fingering is not necessary because of the built-in sustain facility.

**Pw** presents  
THE 'jubilee'

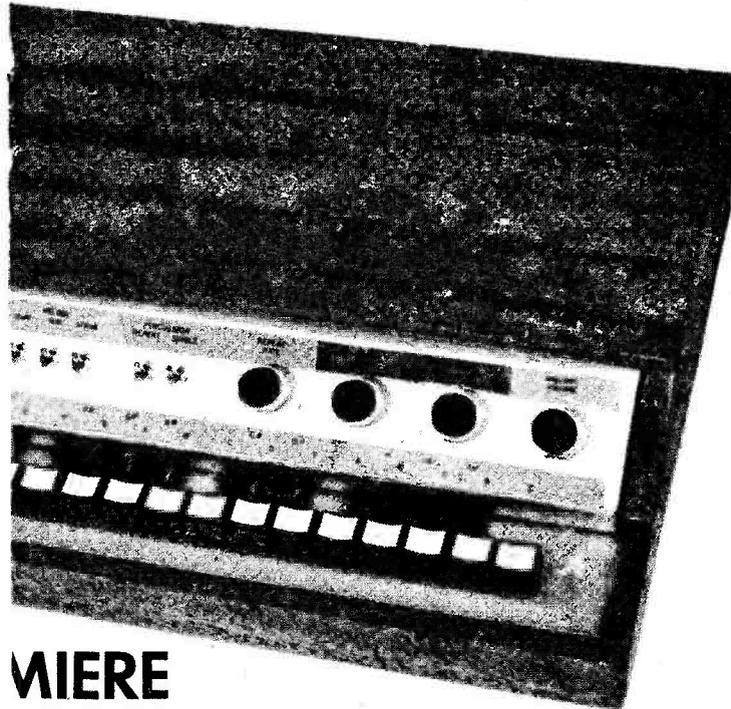


## M.J. HUGHES, MA, C.Eng., ★ specifications

- Three octaves for melody line with three principal tone colours plus any combination of these.
- Variable length sustain.
- Variable depth Vibrato.
- Percussion effect.
- Repeat percussion effect (for banjo and mandolin sounds—by judicious use of length sustain can also simulate xylophone, glockenspiel etc.).
- Variable repeat rate.
- Two octaves of accompaniment.
- Automatic chording giving all major, minor, and seventh chords.
- Two principal tone colours plus their combination.
- Percussion effect gives piano, guitar or banjo accompaniment.
- Automatic vamping with alternating and walking bass.
- Rhythm section comprising bass drum, snare drum, and cymbals.
- Six selectable rhythms—synchronised with vamping accompaniment.
- Rhythms may be mixed.
- Variable rhythm speed.
- Independent volume controls for melody, accompaniment and drums.
- Internal 1W amplifier drives loudspeaker direct or phono output.
- Single board construction—no wiring loom needed for keyboard.

# ELECTRONIC ORGAN

## Part 1



MIERE

### ★ collated components list

Resistors	
1 off 5.6Ω 1/4W	24 off 10kΩ
3 off 220Ω	1 off 12kΩ
1 off 330Ω	11 off 22kΩ
1 off 470Ω	1 off 33kΩ
3 off 680Ω	1 off 68kΩ
2 off 1kΩ	10 off 100kΩ
2 off 1.2kΩ	2 off 470kΩ
1 off 2.2kΩ	3 off 1MΩ
4 off 3.3kΩ	2 off 3.3MΩ
11 off 4.7kΩ	
All 10% 1/4W except where stated	
Capacitors	
5 off 1nF Polystyrene	1 off 1μF
3 off 33nF Polystyrene	2 off 2.2μF 15V Electrolytic
2 off 10nF	1 off 10μF 25V Electrolytic
1 off 15nF	1 off 47μF 25V Electrolytic
3 off 22nF	1 off 100μF 25V Electrolytic
1 off 39nF	1 off 1000μF 25V Electrolytic
10 off 100nF	1 off 2200μF 25V Electrolytic
5 off 220nF	2 off 4700μF 25V Electrolytic
10 off 470nF	
All polyester 10% (voltage greater than 25V) except where stated	
Transistors	
1 off BFY1	
8 off BC148	
Diodes	
6 off 1N914 (or 1N4148)	
1 off 3V 400mW zener	
2 off DIL 1 Amp bridge type VM18 (Marshall)	

**Preset potentiometers**  
 1 off 5kΩ  
 3 off 10kΩ  
 3 off 100kΩ  
 5 off 500kΩ

**Spindle potentiometers**  
 2 off 5Ω lin  
 3 off 10kΩ log<sup>e</sup>  
 1 off 100kΩ lin  
 1 off 1MΩ lin

All sub miniature horizontal  
 \* One of these should have ganged mains switch for conventional keyboard version.

**Integrated circuits**  
 7 off 741  
 1 off AY-1-0212 (Top octave generator)  
 1 off NE555  
 4 off AY-1-5050 (7 stage divider)  
 1 off 4011  
 3 off AY-1-1313 (Priority latches)  
 1 off LM380  
 1 off AY-5-1317A (Chord generator)  
 1 off 7812  
 1 off AY-5-1315 (Rhythm generator)  
 1 off LM390-12 Specify, Pattern 004—'Jubilee' for the latter

NOTE: All devices prefixed "AY" are by General Instruments. These devices are available from Technomatic Ltd., Watford Electronics and other advertisers in the magazine.

**Miscellaneous**  
 1 off mains transformer (Double 12V 1A secondary)—Douglas type MT71-AT  
 \*13 off single pole one way sub-min toggle switches  
 \*1 off double pole change over sub-min toggle switch  
 \*51 off AB Metals low profile calculator buttons (0.8" square)—available from WKF Electronics, Whitwell, Near Worksop, Notts.  
 1 off 1A mains fuse and panel mounting holder  
 \*1 off mains slide switch  
 1 off indicator lamp and holder (optional)  
 1 off printed circuit board (Reader's PCB Service)  
 DIL sockets or Soldercons for IC mounting  
 Board pins (quantity depends on version being built)  
 Standard jack socket 1" (for loudspeaker output)  
 5-pin 180° DIN socket (for phone output)  
 \* If the conventional keyboard version is built the 14 toggle switches can be replaced by organ rocker tabs and the calculator keys by a four octave keyboard with single pole make contacts having common busbars. The mains slide switch is replaced by a ganged switch on melody volume potentiometer. Extra components required for the conventional version are:  
 stereo jack socket 1" (for link to four controlled Minor and Seventh switches)  
 Pair of foot operated push-to-make switches  
 Maplin Electronic Supplies are able to supply suitable foot switches. They also have limited stocks of 4 octave keyboards having the lowest octave in reversed colours (white accidentals). They can supply gold wire for making single pole contacts or, alternatively, low cost contact blocks can be obtained from Harmonics (Bromley) Ltd., Oakley Grange, Plaistow Road, Kirdford, Billingshurst, West Sussex. The latter require palladium busbars which Harmonics can also supply.

Some people might feel that they would prefer a conventional keyboard—certainly the sound of the instrument warrants the extra cost and trouble involved—and if so they can use the same printed circuit board with no changes except for the omission of the calculator keys. Flying leads are taken from each key position to the respective single-pole single-way contacts under each note of the keyboard.

In this part we shall describe the overall workings of the instrument and pay special attention to the large scale integrated circuits used. Constructional details will start next month and in order to allow time for ordering and delivery we are publishing a collated components list immediately. This might enable constructors to obtain components on favourable terms if they are purchased as a package deal.

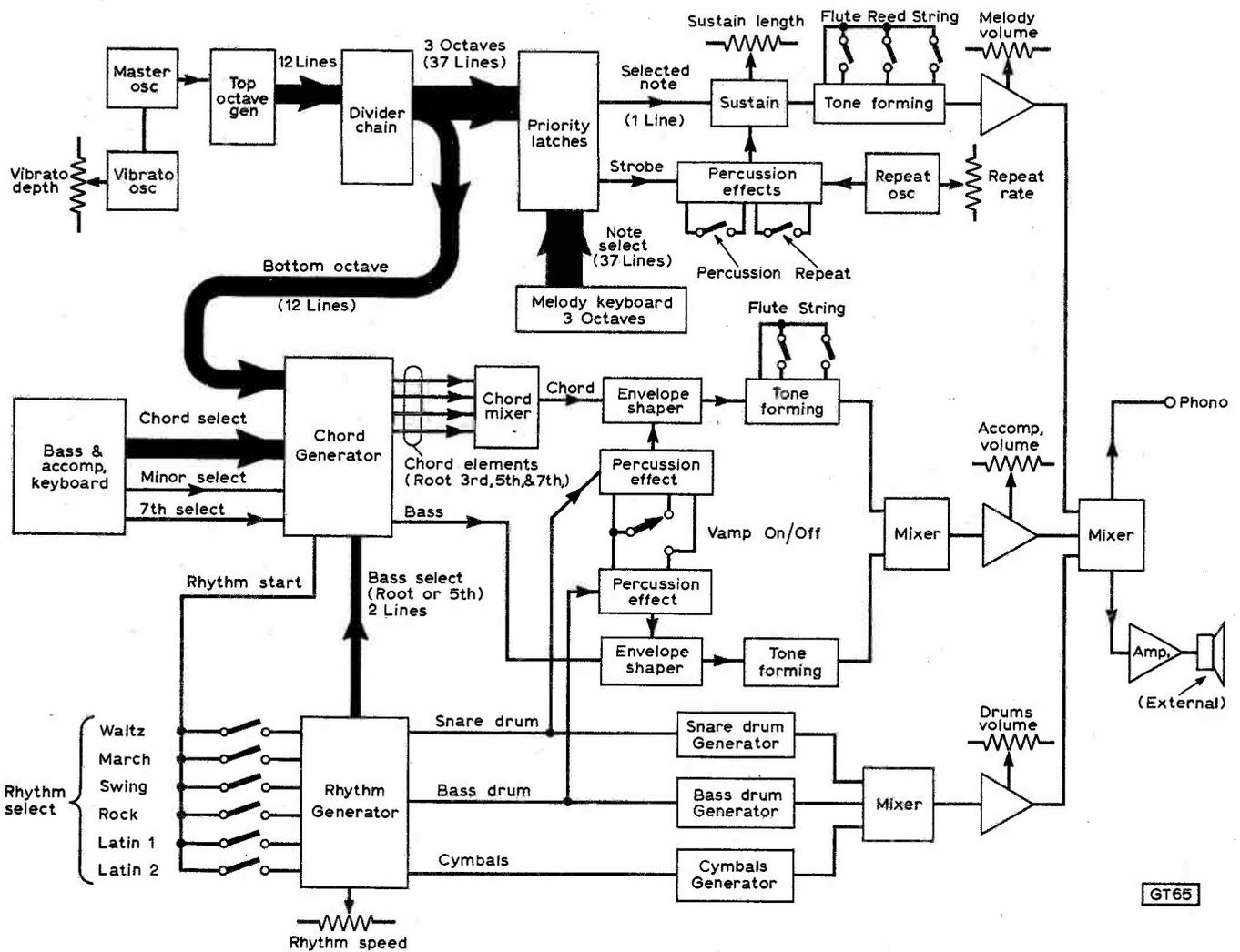


Fig. 1: Block diagram of the complete organ.

## System organisation

Constructors who are more inclined to build a conventional organ, or who have already built our previously published *Easibuild Organ*, might find this single board useful in providing an additional keyboard for solo or special effects. In this application some economy can be effected because the tone generator circuitry would already exist.

A block diagram of the complete organ is shown in Fig. 1. A master oscillator, frequency modulated at variable depth to give vibrato, drives a conventional top octave generator. Each output of this is fed to a two stage divider except for 'C' which is followed by three stages of division to provide a total of three complete octaves plus 'Bottom C'. These notes are used to drive the priority latches for the melody keyboard and the bottom of the three octaves is fed to the chord generator.

The priority latches are contained in three integrated circuits and in simple terms they are flip-flops which control a gate for each note. Each key of the melody board has its own flip flop/gate arrangement with the associated note fed from the tone generator to that gate. When the key is pressed the flip-flop opens the gate and allows the note to appear at the single line output. At the same time any other flip-flop is reset. This means that only one note at a time can be selected by the melody keyboard—it is monophonic. This, at first, sounds as though the scope of

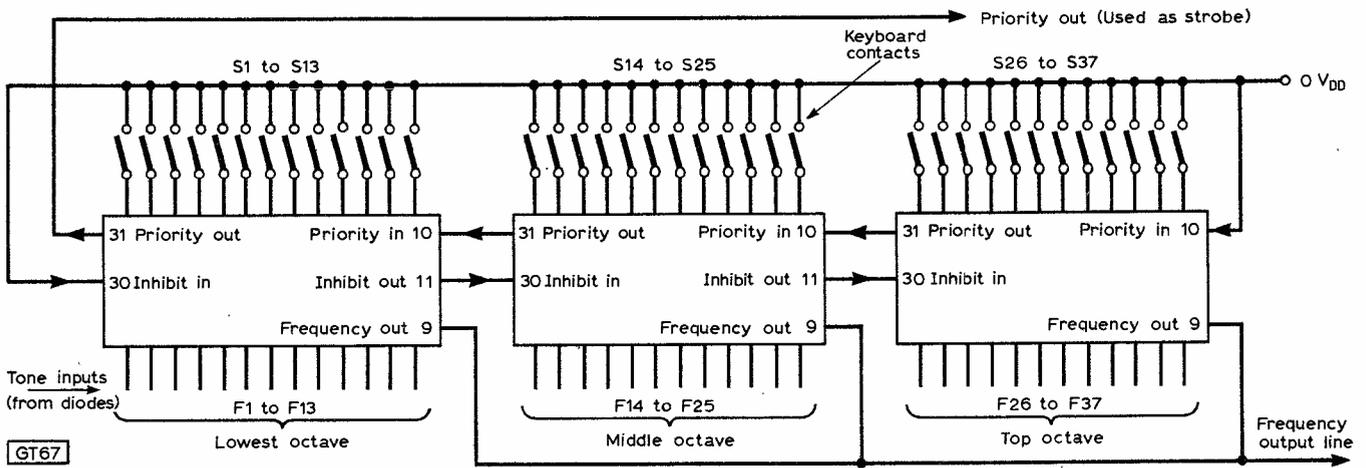
the organ is immediately limited. On the contrary. If the key just selected is released the flip-flop remains in its set state and the note remains active at the output and enables the envelope generator (built into the sustain circuitry) to hold the note over an adjustable period. This allows one note to die away slowly until a second key is pressed.

In order to synchronise the Sustain circuitry with the note selection operation we have to tell it whenever a new key has been depressed. This is easily done by making use of the internally generated 'Priority Output' signal for the priority latches. This signal in conjunction with the 'Inhibit Output' line is used within the priority latches to carry out the reset operation already referred to.

The three priority latch integrated circuits are coupled together in such a way that if two keys are pressed at the same time only the higher note will be selected. A pin connection diagram for this integrated circuit and an illustration to show how the three are coupled together in this application are shown in Fig. 2.

## Sustain

The synchronising signal from the priority latches is called a 'Strobe'. This is fed to the percussion effects-stage which changes the nature of the signal. Normally the signal is high for as long as a key is pressed—thus allowing a continuous tone through the



sustain circuit. The percussion effect, when switched in, allows only a short pulse from the strobe line and this occurs on the instant of pressing the key. The effect of this is that the note is generated for a very short period (even though the key is held pressed) and dies away according to the setting of the sustain length. Depending on the setting of the tone forming circuit the sound so produced could be like a drum stick hitting a wooden block if there is zero sustain length or like a bell being struck if there is a long sustain.

Another feature of the percussion circuit is the ability to repeat the pulse, just referred to, at an adjustable rate for as long as the key is depressed. By careful setting of the various controls one can produce sounds ranging from a xylophone to a banjo being strummed. With the repeat rate set close to the vibrato frequency very weird sounds can be produced!

## Voicing

The shaped signals from the sustain stage are then fed to the tone forming circuits. We used the absolute minimum of circuitry here to keep construction simple but have managed to provide three basic tone colours. In electronic terms these are a heavily filtered square wave which gets close to sinusoidal, a straight square wave, and a spike waveform. These closely resemble the tone colours usually referred to as Flute, Reed and String respectively. The apparently small choice of tone colours is deceiving. By modifying their envelopes, they provide a wide range of sounds

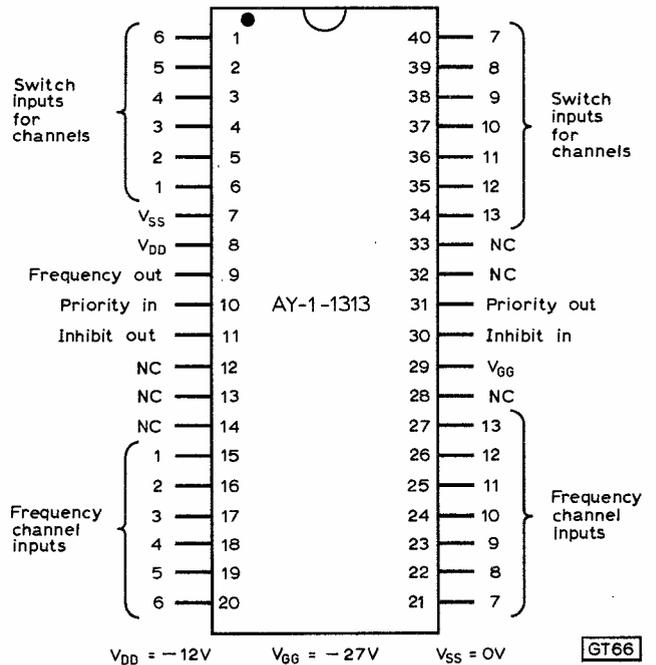
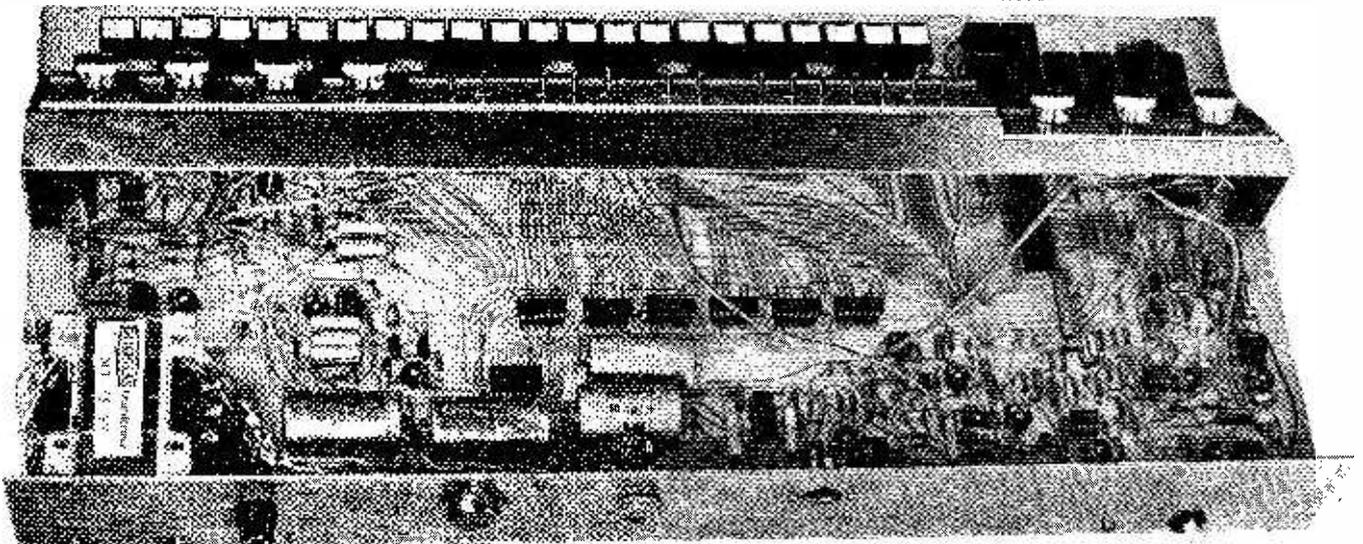


Fig. 2 (above and top) : Pinout and simplified interconnection diagram for the three priority latch IC's AY-1-1313. Among other functions, these circuits ensure that, if two notes are pressed at the same time, only the higher one will sound.

The picture (below) shows a prototype organ and has been included solely to give readers some idea of the work entailed in construction. The IC's referred to above are hidden from view under the front panel hood.



ranging from ecclesiastical to modern plus the instrumental effects, some of which have already been mentioned. The signal is then fed to a pre-amplifier where its volume is independently controlled prior to joining with other signals at the power amplifier.

## Chord and rhythm generator

The more complex part of the instrument is the accompaniment section which is built around General Instrument's chord and rhythm generator ICs.

As the chord generator concept is relatively new to the amateur it is worth spending a few paragraphs describing how this chip works. Its pinning diagram is shown in Fig. 3. The generator can be used in two configurations. One requires 36 separate keys to select the major minor and seventh chords for a complete octave. The alternative configuration re-

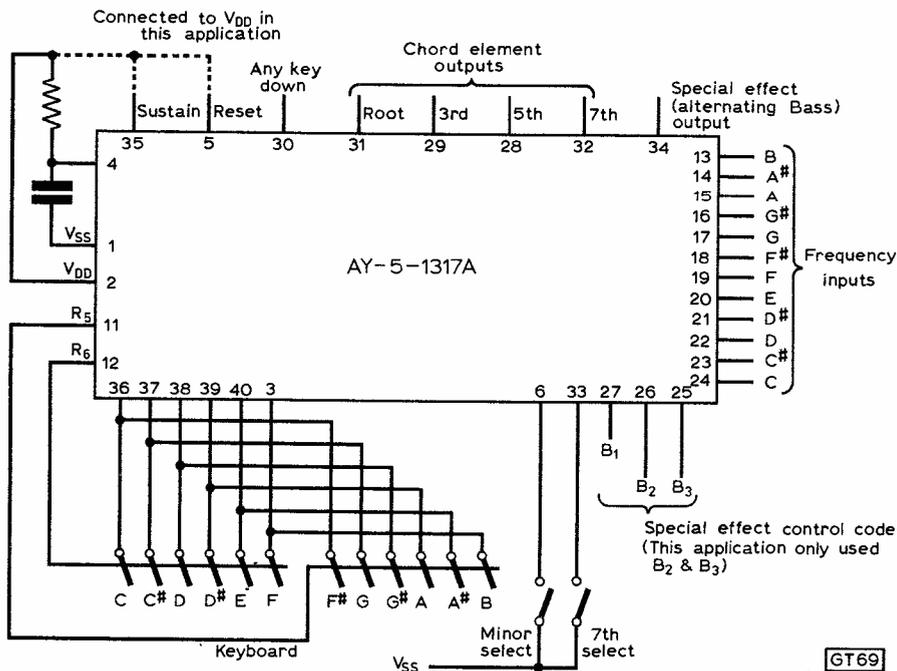
quires 12 contacts to select one of the major chords and utilises two extra switches to convert the selected chord to minor and seventh respectively. The latter configuration is used to economise on keyboard facilities. This means that not all the input pins of the package are utilised. The schematic stage shown in Fig. 4 might be of more help in describing how the device functions in our configuration.

The twelve notes of the bottom octave from the tone generators are connected directly to input pins 13 to 24 and a capacitor and resistor are needed to set the frequency of the internal keyboard multiplexing oscillator. If the key designated 'C' is pressed the generator switches the respective notes of the bottom octave that go to make up the chord of 'C Major' on to the chord element output lines. 'C' would appear at pin 31 being the root note, 'E' at pin 29 as the third and 'G' at pin 28 as the fifth. These three elements

Fig. 3 (below): Pinout details of the AY-5-1317A chord generator.

Fig. 4 (right): Simplified interconnection diagram of the chord generator. This chip operates in conjunction with the AY-5-1315 rhythm generator IC to produce both chords and walking bass effects.

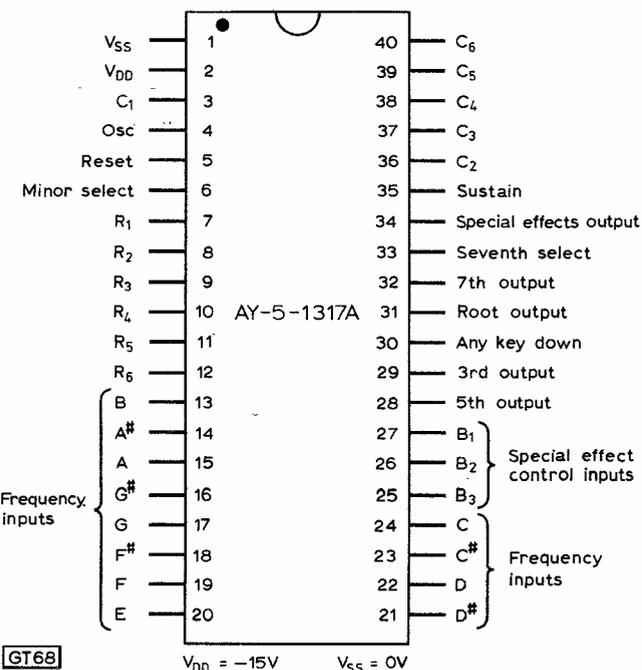
Although we intend to publish reduced scale artwork for the PCB in the next issue, full size etching artwork will be available from the editorial address at the front of the magazine, price 40p. Send a cheque/postal order for 40p together with a large (at least 13" x 11") stamped and self-addressed envelope. Ready-made boards will be available from the Readers PCB service as usual, see ad.



are externally mixed together to produce the chord. If the key designated 'G' were selected the unit would present the notes 'G', 'B' and 'D' at these outputs respectively. If the 'Minor Select' key were depressed at the same time as the chord select, the third element at pin 29 would be changed to a note a semitone lower. If '7th Select' were depressed an extra note would be presented at pin 32. This would be the note a full tone below the root of the chord in question (in both major and minor keys). When this extra note appears it is mixed with the three others producing a very pleasing chord that is frequently used in music notation.

The output designated 'Any Key' is very important. It is made active whenever a key is pressed. It is therefore used to start the rhythm generator in synchronism with a key depression. In the main block diagram this link is annotated 'Rhythm Start'.

Pin 34 is called the 'Special Effects Multiplex Output'. Its effect is not quite so difficult to understand as its name implies. For a given chord selection we can obtain either the root, third, fourth, fifth, sixth or seventh element at this output but naturally only one of these six options at a time. The option is set by the binary code being fed to the control inputs at pins 25, 26 and 27 according to Table 1. If the codes



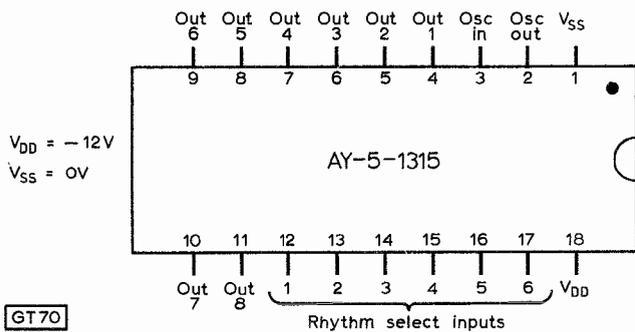


Fig. 5 (above and right): The pinout and simplified connection diagram of the AY-5-1315 rhythm generator. Readers should specify 'pattern 004' when purchasing this IC.

were generated sequentially, it would create an output sequence of the elements comprising the chords. The chord generator chip divides these elements by 1, 2 or 4 so that they fall at least one octave lower than the chord outputs, thus producing a bass note. If the selection were sequenced while a chord was being held it would have the essentials of a walking bass.

Table 1

Pin 27 (B1)	Pin 26 (B2)	Pin 25 (B3)	Note Selected
0	0	0	No change from last note
0	0	1	Root
0	1	0	Fifth
0	1	1	Third
1	1	1	Seventh
1	1	0	Fourth
1	0	1	Sixth

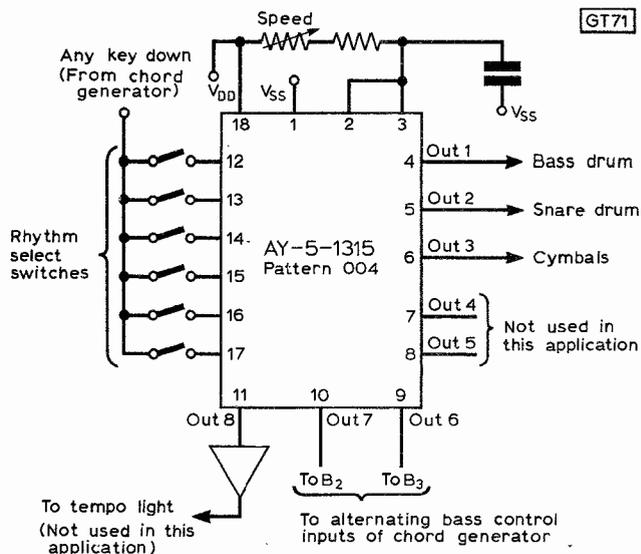
In our application we do not make full use of all the special effect options—we only use two of the control inputs (pins 25 and 26). These are coupled to the rhythm generator which is pre-programmed to change the code in synchronism with the rhythm patterns. This gives an alternating bass which is sounded at the same moment as the bass drum beat.

## Vamp

It should now become easier to understand the details shown in the main block diagram for the accompaniment section. If one assumes that the vamp switch is off, the percussion effect circuits can, for the moment, be ignored. When an accompaniment key is pressed the selected chord elements are presented to the mixer, pass straight through the envelope shaper and on to the tone forming circuits producing two voices 'Flute' and 'String' (Sine and spike respectively). With none of the rhythm select switches closed and the rhythm generator chip outputting the correct code on the bass select lines, there will be a continuous note on the bass output line. This will be the root note of the chord in question.

The bass line from the chord generator is fed to its own envelope shaper and thence to a single tone colour filter. This provides a filtered square wave which sounds reasonably mellow and full. Both the chord and the bass line are mixed before being fed to a volume control and pre-amplifier.

When the Vamp switch is on, the bass note and chord are produced in exactly the same way but do not get through their respective envelope shapers until these receive trigger pulses from the snare drum and bass drum outputs of the rhythm generator. These pulses are short and give a fast attack to the



accompaniment which is followed by a decay set by the sustain circuit within the envelope shapers.

Component values are pre-determined to make the bass note sound like the string of a bass guitar being plucked. Depending on whether flute, string or both are selected, the chords will sound as if played on a piano, banjo or guitar. The bass guitar sounds on the bass drum beat while the chord is struck in synchronism with the snare drum.

When switched to Vamp mode, the accompaniment signals will only appear at the output if the rhythm generator is running; ie if one of the rhythm select switches is on.

## Rhythm

The GI rhythm generator used in this project (Fig 5) is mask programmable so that manufacturers can design their own rhythm patterns. It is not economic to do this for small quantity purchasers so we have settled on one of the standard patterns already being produced by GI. This gives a reasonable selection of six beats, as shown on the figure, but a feature of this circuit is that the rhythms can be mixed by selecting two or more at the same time. Although the chip produces five instrument outputs (plus the alternating bass control signals) we are only using those for bass drum, snare drum and cymbals. These pulses are fed to noise generator circuits which are coupled in a mixer before being fed to their own pre-amplifier. This, again, has its own volume control.

By having separate volume controls on the melody, accompaniment and drum lines the overall balance may be adjusted to individual preference. It also means that the drums can be reduced to zero level while maintaining operation of the rhythm unit which keeps the vamp going. One can operate the accompaniment and drums section in various modes depending on the set of the instrument tabs. For example one can have straight chords with a static root base note; one can have static chords with an alternating bass and drums or a complete vamp—alternating bass syncopated with the chords and drums.

Next month we shall start on constructional details and describe the various circuits as we go along. If you take delivery of the GI Integrated Circuits before the next part do not remove them from their protective packing unless you take steps to prevent damage from static electricity!

# DESIGN YOUR OWN PROJECTS

## No.1 LIGHT TRIGGER

TOBY BAILEY & BOB WHITAKER

This series describes how to design experimental projects for yourself. Each month we hope to set ourselves a reasonably simple problem, produce a set of specifications to which we want our circuit to conform, and design an appropriate circuit. We will give an account of the possibilities we explored and the thought processes we used to arrive at the final circuit, together with details of how we calculated (or guessed!) component values and why we chose particular component types. Last, but not least, we will provide an honest report of what happened when we built our circuit.

One point requires particular emphasis. These are meant to be one-off projects and the methods used to design the circuits will, in some cases, be more casual in approach than they might be if the circuit were, for instance, being designed for mass-production or in the form of a kit or completed unit. This is not because we want to be condescending or that we think that you might need protecting from some of the complexities. It is simply because this is the method of design used by almost all amateurs of some experience when they are experimenting.

### Problem

For the first circuit we decided to tackle the well-worn problem of producing a device which will turn on a light when the evening becomes dark enough. This old favourite often appears under names such as "electronic candle" or "automatic nightlight" or some similar title. With a bit of luck we will try to show that designing one of these devices for your own specific requirements is not as daunting a task

as it might appear at first. Of course designing your own circuit from scratch is not as easy as ferreting out a published design in the back issue of a magazine, but that is not the point.

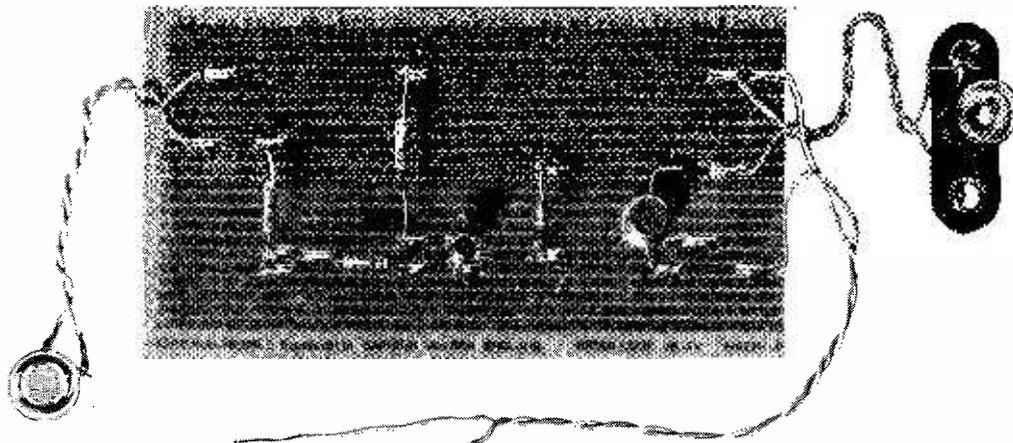
### Specification

So, what exactly are we trying to do? Let's not be overly ambitious, and stick to driving an ordinary torch bulb. The first one we unearthed from the bottom of a drawer has the markings "6V-60mA" still barely decipherable on the side. This seems a pretty reasonable one to use as it doesn't require a terribly unusual power supply anyway. We also need something to sense the light intensity so a light-dependent resistor (LDR) should be just the job. Bob happened to have one of dubious origin attached to a piece of equipment of even more dubious function, from which it was duly severed.

It seemed that the most sensible way of finding out the characteristics of this LDR was to measure its resistance with a meter. A couple of minutes later we possessed the facts that when it was so dark that we could hardly read the meter the resistance was at least 100k $\Omega$  and with rather dingy lighting the value decreased to about 10k $\Omega$ . We decided fairly arbitrarily that the circuit should switch somewhere between these points and that we didn't particularly mind where.

### Design

It would seem pretty perverse to use anything but 6V for the power supply and, short of using a relay which would be absurdly expensive for our modest



Having arrived at the final design for the Light Trigger the components can be plugged into an S-Dec to check the circuit or they may be soldered direct on to a Blob-Board as shown in this photograph of the authors' prototype.

# ★ components

R1	2.2kΩ	} 1/4 or 1/2W 5%
R2	2.2kΩ	
R3	220Ω	
R <sub>F</sub>	100kΩ	
LDR	ORP12	Bulb 6V 60mA and holder
Tr1	BC109	Blobboard ZB-1V
Tr2	BFY51	(PB Electronics Ltd.)

requirements, we are going to end up by driving the bulb directly from a transistor. So, let's start from that end and see how we get on. The next question that needs to be answered is "does the bulb go in the emitter or the collector?" If we put it in the emitter circuit we shall have to drive the base between about 0.5V and 6V to turn the transistor off and on, whereas if the bulb is in the collector circuit then a much smaller voltage swing is required to get the same effect. As the textbooks more formally put it: "Emitter-follower and common-emitter amplifiers have about the same current gain but the latter has a much higher voltage gain than the former."

So let us accept the extra voltage gain as a bonus, it's free and there does not appear to be any obvious disadvantages associated with our choice of the common-emitter circuit. We now have a circuit like that of Fig.1.

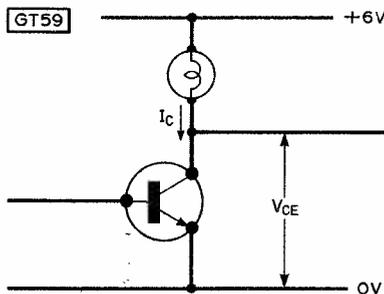


Fig. 1: The use of NPN transistors in the design was determined more by the contents of the junkbox than anything else.

You may have noticed that we have tacitly assumed that we are going to use an NPN transistor. The reasons for this are by no means deep and not entirely unconnected. Firstly, we both have rather more of the NPN type than PNP and, secondly, they tend to be marginally cheaper. Now we need to decide which particular transistor to use, especially since a collector current of 60mA is not small enough to ensure that any transistor we try won't blow up. The highest power dissipation in the transistor is when the collector is at half the supply voltage, i.e.  $V_{CE} = 3V$ . This enables us to calculate the dissipation, given by  $V_{CE} \times I_C$ , and we get  $P = 3 \times 60 = 180mW$ . Now the allowable dissipation for most common small transistors (e.g. BC109, 2N3704 etc.) is around 300mW so we seem to be fairly safe here.

But wait a minute! When a light bulb is just turned on the resistance of the filament is much lower than it is after the filament has had a chance to heat up. This means that the current and hence the dissipation will be rather larger at turn-on. We measured the cold resistance and found that this meant that the peak collector current would be about 150mA, giving a dissipation of 450mW for a

short time. To be on the safe side let us use a BFY51 which can take up to 800mW. Our catalogue tells us that the minimum gain is 40 but neglects to specify the current to which this figure refers. Oh! well, let's say 30 then. This means that we need 2mA at the base of our BFY51 to turn on the light. The stage we have now reached is summarized in Fig.2.

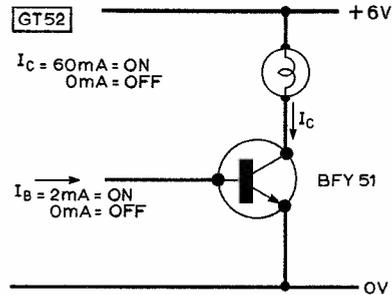


Fig. 2: Already a BFY51 has been chosen in place of a BC109 type because of dissipation problems.

At this point it now becomes abundantly clear that we are going to need another transistor. Since the minimum resistance of the LDR at which the bulb must be turned on is 10kΩ we would need 20V to pass 2mA through the LDR. So how do we connect the second transistor? It can be either NPN or PNP and can be driven from either the emitter or the collector, giving the four possible circuits shown in Fig.3.

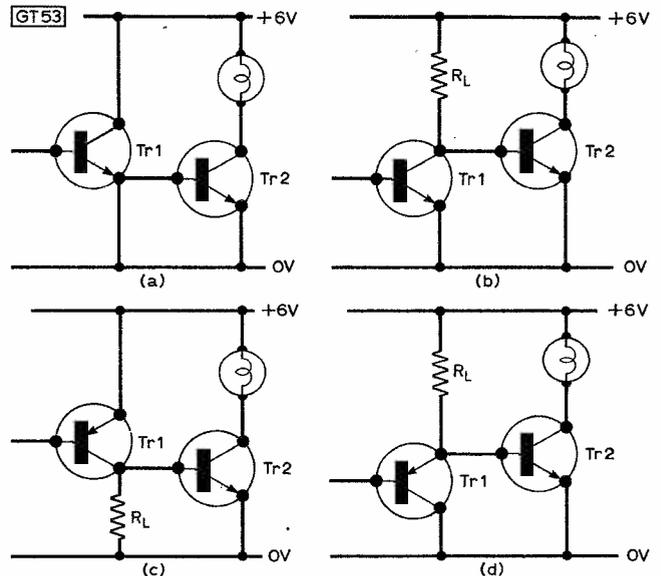


Fig. 3: A second transistor is added but there are four possible ways in which it could be used.

Well, (d) is utterly hopeless since it won't drive the base of Tr2 any lower than around 0.6V so we cannot even guarantee to turn it off. In (c) Tr2 is not going to last very long if Tr1 turns on heavily since Tr1 will then supply a large base current to Tr2. We now have to choose between (a) and (b) both of which use a NPN Tr1. (a) suffers a similar defect to (c) in that we are going to have to be very careful that we do not supply too much base current to Tr1 in order to protect Tr2. Also it is conceivable that when Tr1 is turned off the leakage current might be high enough to upset Tr2, especially if the latter has rather more gain than our conservative estimate.

Circuit (b) seems to be best and we shall now proceed, using this one.

## Practical Values

The next thing to work out is the value of  $R_L$ . When Tr1 is turned off there will be about 5.5V across  $R_L$  which then has to supply 2mA to the base of Tr2 (we are ignoring the leakage of Tr1 which should be negligible). For this condition we get

$$R_L = \frac{5.5}{2} = 2.75k\Omega \text{ so let's use a } 2.2k\Omega \text{ resistor}$$

to be on the safe side. Having fixed this value we can now work out that Tr1 will have to sink a current of  $\frac{6}{2.2} = 2.7\text{mA}$  in order to turn off Tr2. So we want a nice little low power high gain device for Tr1, something like the ubiquitous BC109 should be sufficient, Fig.4.

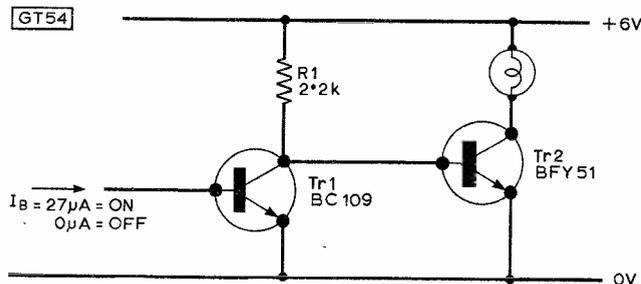


Fig. 4: The value of the load resistor for the BC109 has been decided upon.

The gain of a BC109 is stated as lying in the range 200 to 800. If we assume a value of 100 at worst we're going to need a base current of up to  $27\mu\text{A}$  to turn on Tr1. Well, we want the BC109 to turn on when the resistance of the LDR drops to a low enough value so we are going to have to connect the LDR from the base up to the positive power supply line as shown in Fig.5.

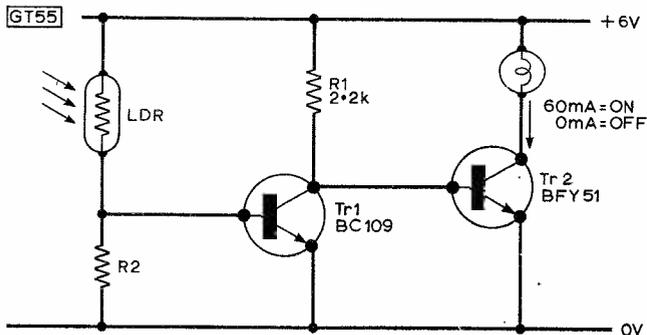


Fig. 5: Safety resistor  $R_2$  and the LDR are introduced into the circuit.

Why have we added the extra resistor  $R_2$ ? Well, the LDR with a resistance of say  $100\Omega$  is still conducting  $60\mu\text{A}$  (note that in calculating bias resistance it's almost always convenient to ignore the resistance of the base-emitter junction: more correctly the input resistance). Let's assume that if the LDR is at  $100k\Omega$  then we want to pull the base of Tr1 down to a 3V to leave a good safety margin. For this condition  $R_2$  has to have a value of at most  $\frac{0.3}{5.7} \times 100 = 5.3\Omega$  so  $4.7k\Omega$  seems safe enough. Now if the value of the LDR drops

to  $10k\Omega$  the base voltage will rise to  $\frac{4.7}{4.7 + 10} \times 6 = 1.9\text{V}$ . We had better just check that the  $27\mu\text{A}$  base current now being drawn by Tr1 does not effect this too drastically. Well, the current being drawn by the bias network of the LDR and  $R_2$  is over  $400\mu\text{A}$  so the  $27\mu\text{A}$  not required by the base is going to make hardly any difference and we have a good margin of error with a base voltage of 1.9V.

## Moment of truth

Right, now comes the moment of truth when we have to wire up the components and see if we have made any drastic mistakes with the design. After a brief flurry of activity with an S-Dec the circuit was assembled and it worked first time. Well no, to be honest it worked second time, we had a resistor in the wrong hole!

The only problems are that it switches rather slowly if the change in light intensity is not relatively fast and that it has a tendency to get caught in a half on/half off state. What can be done about this state of affairs? The answer is positive feedback and this will have several beneficial effects. It will make the switching faster and it will tend to hold the circuit in the state in which it happens to be. This means that the circuit will not 'jitter' around the switching point. If it becomes dark enough to switch on then it has to get considerably lighter before it will switch off again. This effect is known as 'hysteresis'. How can we achieve this desirable characteristic? Well, the only convenient place from which to take the feedback seems to be at the collector of Tr2, as shown in Fig.6.

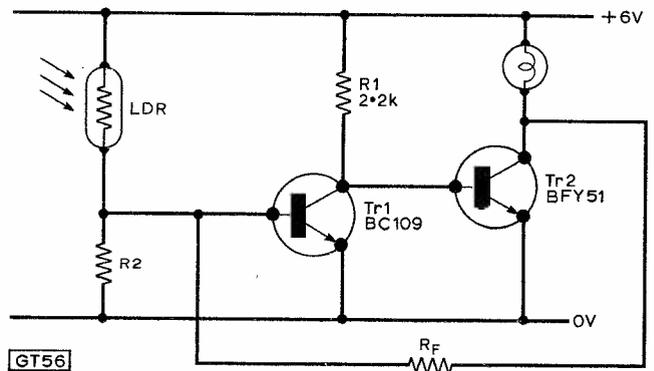


Fig. 6: Positive feedback has been introduced by  $R_f$  which improves the switching characteristics of the circuit.

Is this OK? If the base voltage of Tr1 rises it will turn on further, cutting off Tr2 even more. The collector voltage of Tr2 will hence rise which will tend to cause the base voltage of Tr1 to rise via the feedback resistor. So far, so good then. Oh dear, we shall have to recalculate the value of  $R_2$  again as well as that of  $R_f$ . As is often the case when choosing the values of two interacting resistors the easiest thing to do is guess the value of one of them and see how it goes. How can we go about guessing a reasonable value for  $R_f$  then? Looking at the circuit it is apparent that if  $R_f$  has a much lower value than that of the LDR then the LDR will never be able to change the state of the circuit. If  $R_f$  is too large its effects will be reduced and we won't get enough hysteresis. Hence we shall choose a value of  $R_f$  comparable with that of the LDR, say  $100k\Omega$ .

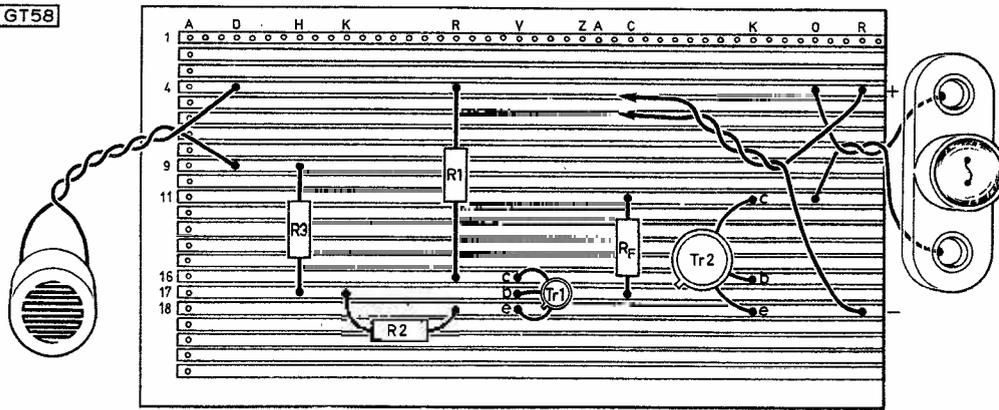


Fig. 8: Layout of components on a Blob-Board, if this method of construction is adopted. A photograph of this board appears on the first page of this article.

Now when the collector of Tr2 is at 6V Rf must not be able to turn on Tr1 without the aid of the LDR. Let us aim to try and get the base voltage down to 0.3V, at least. With an LDR resistance of 100kΩ we have an effective resistance between the base and the 6V line of 50kΩ (100kΩ+100kΩ in parallel) so we can calculate R2 to be  $\frac{0.3}{6.0 - 0.3} \times 50 = 2.63k\Omega$ , so let's say 2.2kΩ. We have now got to check that

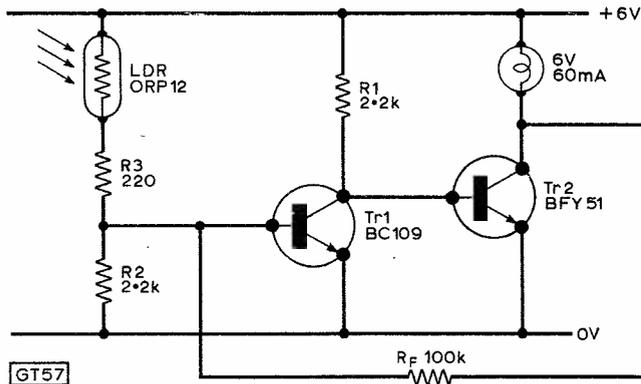


Fig. 7: Final circuit with values of all the components.

when the LDR has a value of 10kΩ the circuit has turned off. If Tr2 is on then Rf will effectively be in parallel with R2 and hence the former may be ignored as its resistance is fifty times higher. So, ignoring the base current again, we find that the base voltage of Tr1 is  $\frac{2.2}{10 + 2.2} \times 6 = 1V$  so this is plenty to turn on Tr1. We can now draw the final circuit as in Fig.7.

You will see that a 200Ω resistor has been added in series with the LDR. The truth of the matter is that neither of us noticed until we constructed this stage that there is the possibility that if the LDR resistance drops down to the 100Ω region (in very bright light) then we would have about 6mA of base current in Tr1. Whilst little harm is likely to come to our BC109 because of this it seems wasteful and the series resistor will protect Tr1 if one of us manages to short out the LDR in an aberrant moment.

The circuit now switches cleanly and quickly regardless of the slowness of change of the light intensity and it is impossible to get the output into an intermediate state.

If you wish, you can build the circuit on a PB Electronic's 'blob board' such as the ZB1V as shown in Fig.8 and the photograph.

### Postscript

Well, we have finished now. You may wonder why at each stage we took fairly pessimistic values for the gain of our transistors and chose our resistor values so as to give something in hand over the value we actually calculated. The idea is that all this gives us sufficient in reserve to deal with all the little things we did not consider such as running the transistors at voltages and currents different from those at which the gain is specified, resistor tolerances or variation of battery voltage.

We hope that it is going to be one of the main messages of this series. For experimental projects you can ignore all these minor effects providing that you design sensibly with "power in reserve"!

Next month's contribution will describe the design procedure for the circuit of a power supply intended to operate a cassette recorder in a car.

**DON'T MISS  
YOUR  
FREE  
POCKET  
MAGNIFIER  
IN  
NEXT MONTH'S  
PW  
ON SALE SEPT. 2**

# PCB SERVICE FOR READERS

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

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

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

Issue Project Ref Price P/P

Issue	Project	Ref	Price P/P	
Dec 75	Sound-To-Light Display	DN0798	1.15+12	<input type="checkbox"/>
Dec 75	Disco System, Amp. (2 required)	each AM0421	4.40+22	<input type="checkbox"/>
Dec 75	Disco System, Light Modulator	AM0423	3.50+22	<input type="checkbox"/>
Mar 76	CMOS Crystal Calibrator	AM0438	1.19+12	<input type="checkbox"/>
Apr 76	Wobblator	AM0443	1.08+12	<input type="checkbox"/>
Apr 76	Auto. Slide Synchroniser	AM0441	2.33+15	<input type="checkbox"/>
June 76	Dig. Freq. Meter (set of 5)	A015 and 4x A004	3.17+15	<input type="checkbox"/>
July 76	Transistor Tester	A002	3.08+18	<input type="checkbox"/>
July 76	Disco Preamplifier	A003	0.65+12	<input type="checkbox"/>
Aug 76	Cassette Player Power Supply	A001	0.65+12	<input type="checkbox"/>
Sep 76	Capacitance Meter	A009	2.59+14	<input type="checkbox"/>
Oct 76	Digital Car Clock (set)	A001/2/3	2.58+12	<input type="checkbox"/>
Oct 76	Interwipe	DN8JM	0.80+12	<input type="checkbox"/>
Oct 76	Video-Writer (set)	D002/3/4/6 A007	21.44+50	<input type="checkbox"/>
Oct 76	Hazard Flasher	D005	0.76+12	<input type="checkbox"/>
Nov 76	Low Level Battery Indicator	A016	0.40+12	<input type="checkbox"/>
Nov 76	Electronic Thermostat	A017	1.30+12	<input type="checkbox"/>
Nov 76	Cirtest Probe	A018	0.48+12	<input type="checkbox"/>
Nov 76	Burglar Alarm	A019	0.50+12	<input type="checkbox"/>
Dec 76	Chromachase	A021	5.70+22	<input type="checkbox"/>
Jan 77	Oscilloscope Calibrator	A023	1.25+12	<input type="checkbox"/>
Jan 77	Icelert	A020	1.45+12	<input type="checkbox"/>
Jan 77	Polyphon, motor and main boards	A025/4	7.90+20	<input type="checkbox"/>
	Polyphon, tune disc, blank, SRBP	A008*	0.90+15	<input type="checkbox"/>
Feb 77	Transistor Checker	A026	1.18+12	<input type="checkbox"/>
Mar 77	FM Stereo Touch Tuner	D023/4/5	7.50+20	<input type="checkbox"/>
Apr 77	Tug 'o' War (set)	A029/030	2.88+12	<input type="checkbox"/>
Apr 77	Gas/Smoke Sensor Alarm	A028	0.65+12	<input type="checkbox"/>
May 77	2-Way Intercom	D019	1.28+12	<input type="checkbox"/>
May 77	Protected Battery Charger	A027	2.38+12	<input type="checkbox"/>
May 77	Seekit Metal Locator	A031	3.38+12	<input type="checkbox"/>
June 77	Reverberation Amplifier	A032	2.38+12	<input type="checkbox"/>
June 77	Versatile AF Generator	A033	2.38+12	<input type="checkbox"/>
June 77	Tele-Games	D029	3.22+18	<input type="checkbox"/>
July 77	20W IC Amplifier	A034	1.38+12	<input type="checkbox"/>
July 77	Radio 2 Tuner	A035	1.68+12	<input type="checkbox"/>
July 77	Digital Clock Timer	A036	3.28+12	<input type="checkbox"/>
Aug 77	Shoot (Telegames)	D035	1.55+15	<input type="checkbox"/>
Aug 77	Atomic Time Receiver	D036	2.65+15	<input type="checkbox"/>
Aug 77	Morse Code Tutor Cards (SRBP)	A037	4.75+15	<input type="checkbox"/>
Sept 77	Jubilee Electronic Organ	A038	19.00+75	<input type="checkbox"/>
Sept 77	Electronic Car Voltage Regulator	D037	1.25+12	<input type="checkbox"/>

Post and packing is for one board or set of boards. Prices include VAT Remittances with overseas orders must be sufficient to cover despatch by sea or air mail as required.

I enclose Postal Order/Cheque

ACCESS welcome.

No.....

Send card number only.

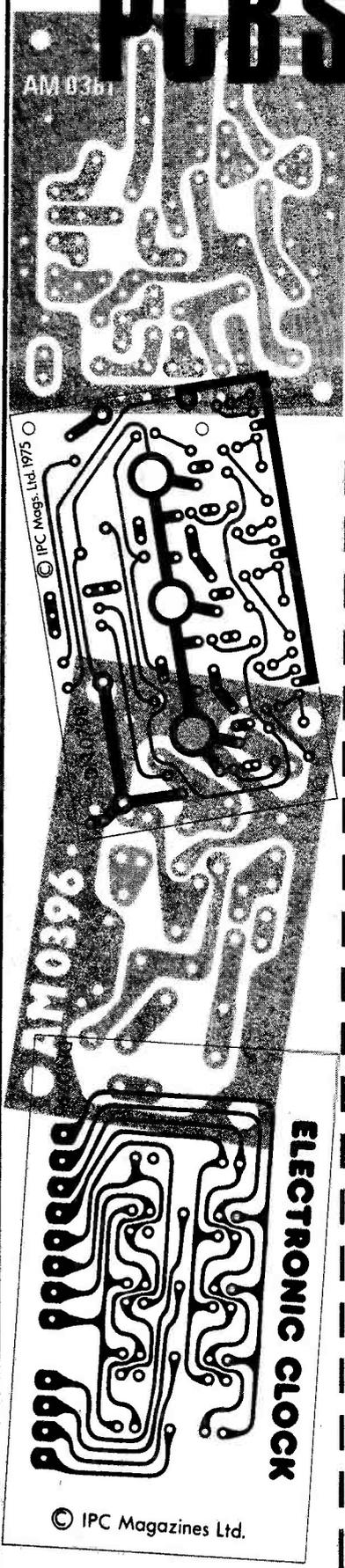
for £..... made payable to READERS PCB SERVICES LTD.

NAME.....

ADDRESS.....

Post Code.....

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



© IPC Magazines Ltd.

# electronic CAR VOLTAGE REGULATOR

C. GRAYSON B.Sc

In this age of sophisticated electronics in the car the traditional method of regulating the supply voltage by a pair of vibrating contacts with all the associated pitting, arcing and electrical noise, is, to put it mildly, outmoded. Therefore, this simple but reliable electronic regulator was designed.

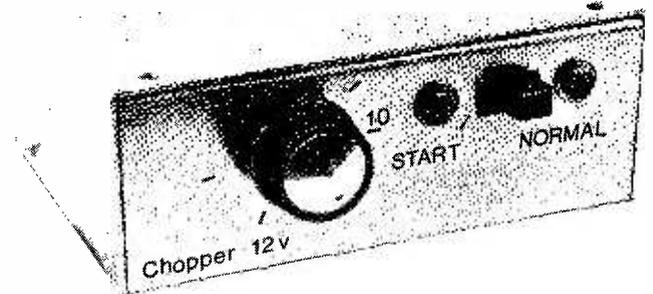
The 'chopper' was originally designed to be a regulator for motorcycles but it can be calibrated for any DC field and armature, dynamo generating system. A CMOS integrated circuit was chosen for the heart of the circuit because of its high immunity to electrical noise, of which there is a great deal in car systems, and its ability to operate at a variety of supply voltages, of which there is precious little on a motorcycle.

## IC Details

Some readers may be unfamiliar with the integrated circuit used in this project. It is the RCA CD4007A described as a 'dual complementary pair plus inverter' and its internal configuration is shown in Fig. 1. Basically the device consists of three CMOS inverters in various stages of dismemberment. Consider the inverter comprising p1 and n1. These are, respectively, a 'p' channel and an 'n' channel enhancement mode MOSFET. These may be considered as a resistive bar of 'p' or 'n' type silicon overlaid with an insulated metal electrode. The potential on the electrode (gate), controls the number of holes or electrons allowed to pass along the bar from source to drain. Thus, each MOSFET is basically a voltage controlled resistor with an  $R_{ds}$  on of about 500 $\Omega$  and an  $R_{ds}$  off of greater than ten thousand megohms! Now if pins 13 and 8 are connected together on the CD4007A and a positive voltage is applied to pin 6 then the 'n' channel MOSFET is in the ON state and the 'p' channel is OFF. Thus, the output at pins 13 and 8 is the inverse of the input. In the 'chopper' two inverters are formed with the inputs at pins 6 and 10. The third 'p' channel device is not used but the 'n' channel is used in isolation as a voltage controlled resistor.

## The Circuit

Now we can consider the circuit Fig. 2, of the 'chopper' in greater detail. Transistor Tr1, diodes D1 and D2, and resistors R1 and R2 form a constant current source of about 8mA which feeds D7 and C1 to give a regulated voltage of about 4V, which is fed to the supply pins of the IC. In the final analysis, this is the reference voltage for the whole system as the



The one control on the Regulator adjusts the voltage while the slide switch enables the system to be started up if the car battery is flat.

voltage-resistance characteristic of the feedback MOSFET is not absolute but relative to the substrate potentials.

The heart of the circuit is a CMOS oscillator with the halves of its cycle separately set in duration. The basic CHOS oscillator is shown in Fig 3. If, say, the output of N2 is high then  $C_{tc}$  becomes charged positive, consequently the input to N2 is high and its output is low, thus  $C_{tc}$  is discharged to ground through  $R_{tc}$ . When the voltage on the input of N1 passes through its transfer point, the output goes high and

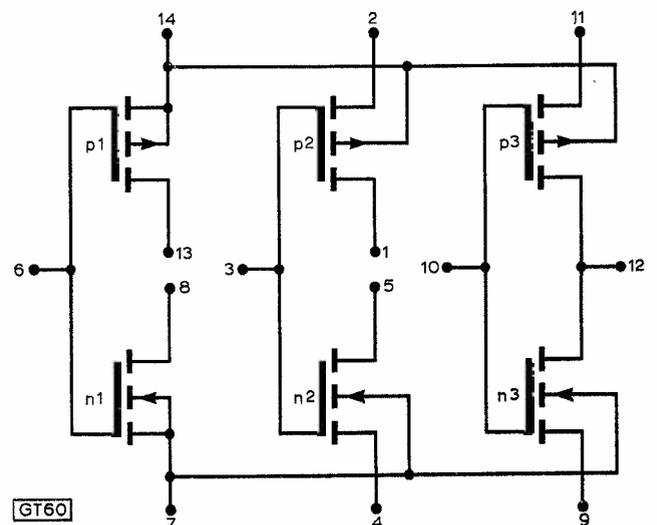


Fig. 1: Basic circuit of the CD4007 IC used in this project as a 'chopper'.

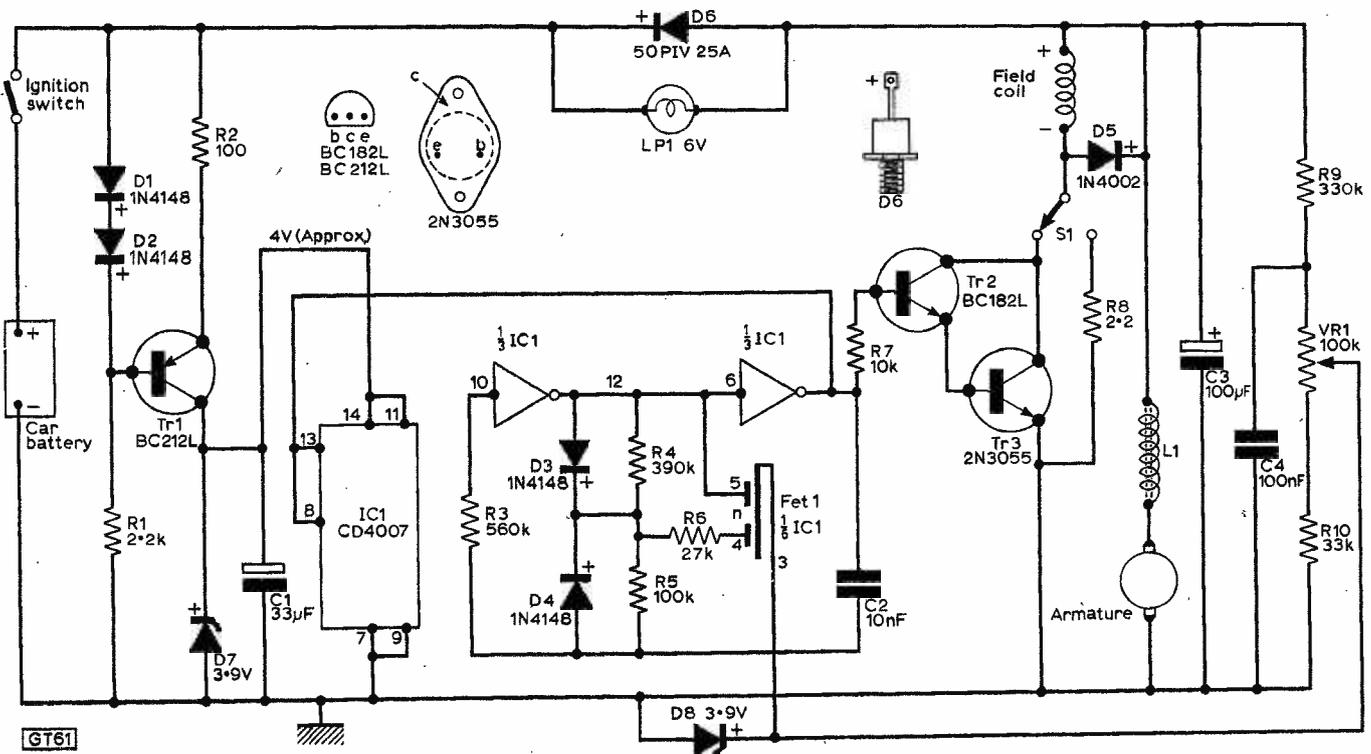


Fig. 2: The complete circuit of the Regulator. It is essential that the transistor Tr3 and Diode D6 are insulated from the metal case with the proper insulating kit or washers.

as a result the output of N2 goes low charging  $C_{tc}$ . Now  $R_{tc}$  provides a charging path for  $C_{tc}$  until the transfer point is again passed and the cycle repeats. For an ideal transfer point of 50% of the supply rails the time period of each half of the cycle is about  $0.7R_{tc}C_{tc}$  but this rises to around  $1.1R_{tc}C_{tc}$  when  $R_x$  is included to limit the current through the input protection diodes of N1 and to make the frequency of the oscillator relatively free from supply voltage variations.

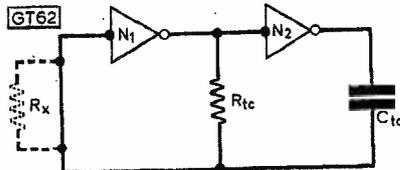


Fig. 3: Basic circuit of the CMOS oscillator, the operation of which is described in the text.

In the voltage regulator the oscillator is used to chop the supply to the field coil of the dynamo. Obviously, the longer the current is allowed to flow in the field coil via Darlington pair Tr2, Tr3, then the higher will be the armature voltage. Accordingly, the OFF period is set at 1.25ms by C2 charging through R5 when the output of N1 is high and the ON period is variable from 350 $\mu$ s to 5ms depending on the combination of R4, R6 and the  $D_{gs}$  of FET1.

The action of the circuit is as follows; when the machine is started up there is no voltage fed back by potential dividing chain R9, R10 and VR1. Hence, the  $R_{ds}$  of the FET is almost infinite and the field coil is energised with a 4:1 mark-space ON waveform and the armature voltage rises to feed the vehicle battery, light, etc through power diode D6 (which is necessary to prevent current feeding back from the battery into the armature winding). A proportion of this voltage is fed back to the gate of the 'n' channel FET to lower the total resistance presented to  $C_{tc}$  as

## ★ components

### Resistors

R1 2.2k $\Omega$	R5 100k $\Omega$	R9 330k $\Omega$
R2 180 $\Omega$	R6 27k $\Omega$	R10 33k $\Omega$
R3 560k $\Omega$	R7 10k $\Omega$	VR1 100k $\Omega$
R4 390k $\Omega$	R8 2.2 $\Omega$ 5W	linear pot

All resistors  $\frac{1}{2}$ W 5% except R8

### Capacitors

C1 33 $\mu$ F 16V electrolytic	C3 100 $\mu$ F 25V electrolytic
C2 10nF paper foil	C4 100nF disc ceramic

### Semiconductors

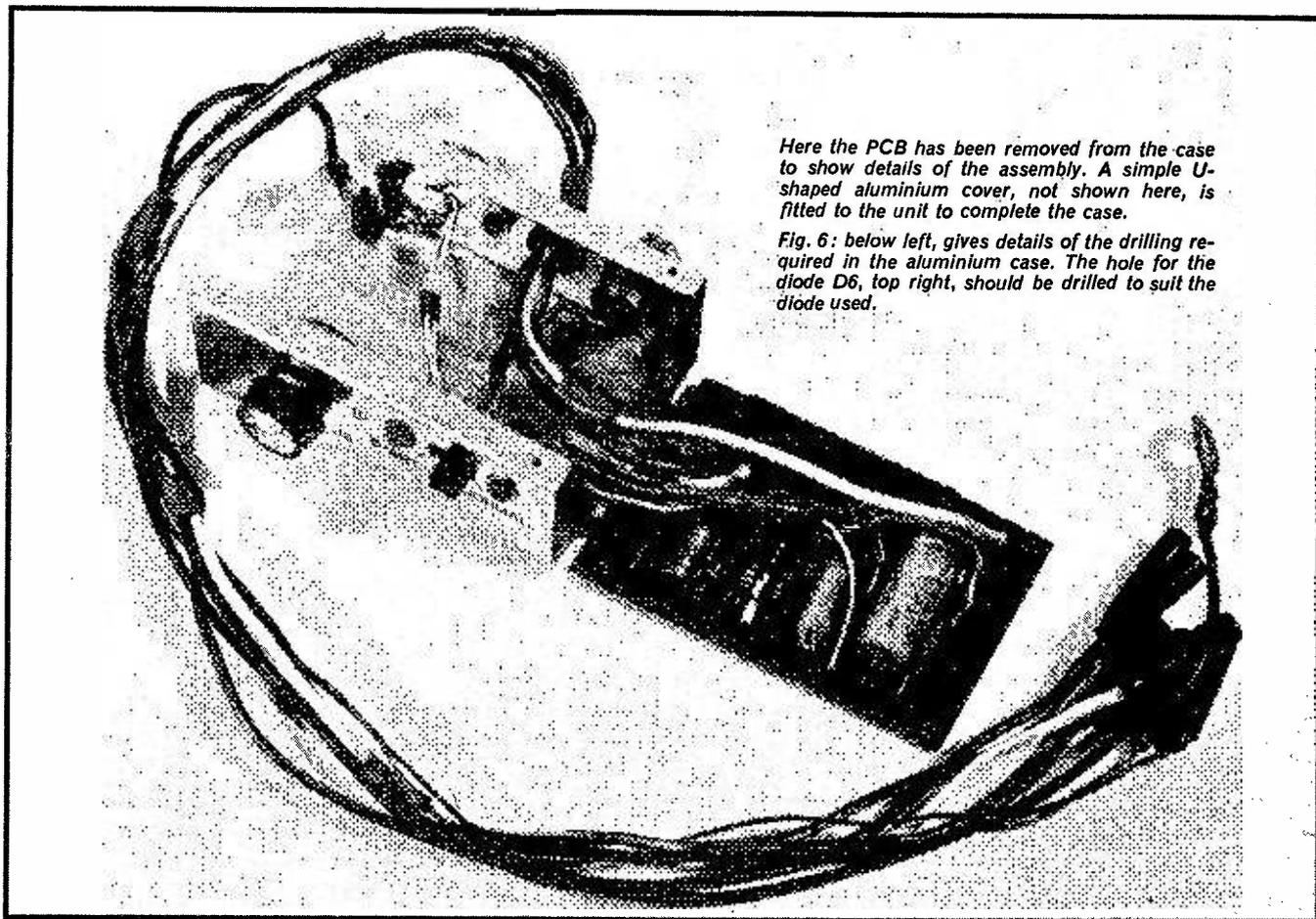
Tr1 BC212L	Tr3 2N3055
Tr2 BC182L	IC1 CD4007A
D1/4 1N4148	D6 50V PIV 25A
D5 1N4002	D7/8 Zener 3.9V (BZY88C3V9)

### Miscellaneous

Insulating kit for 2N3055. Insulating washers for D6. Aluminium case approx 100 x 70 x 40mm or larger. S1, slide switch DPDT (connect contacts in parallel). LP1, lamp 6V 40mA. L1, 50 turns 26SWG insulated copper wire on 10mm dia. ferrite rod. PCB from PW Readers PCB Service.

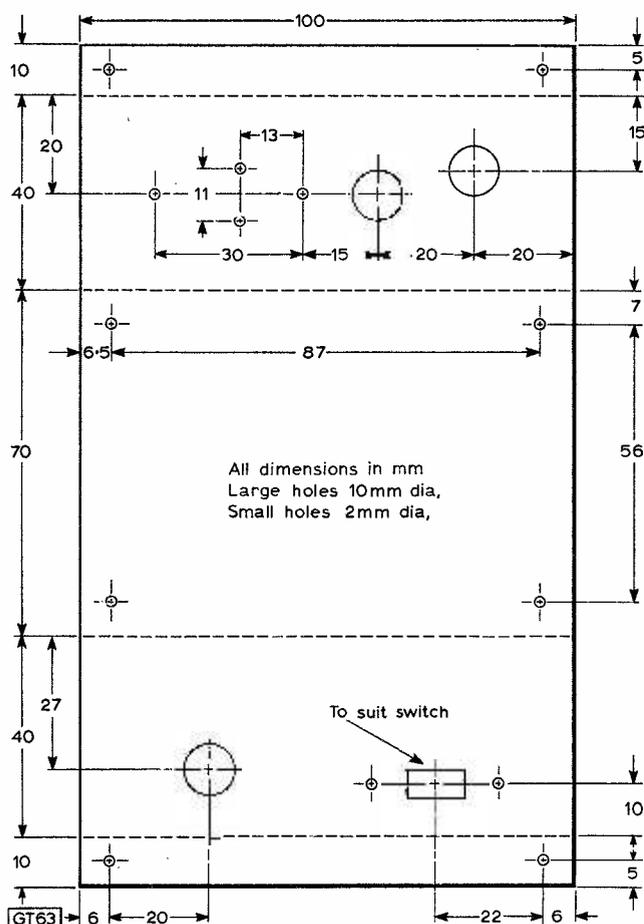
an ON time discharge path. Thus, the field coil is excited for a lower proportion of the time and the voltage tends to fall. The converse is true, and a state of equilibrium is reached and the voltage is stabilised irrespective of engine speed or load. If VR1 is set to tap off less voltage then the regulated voltage at the anode of the power diode will rise to maintain the equilibrium thereby giving a wide range of control. The inductance of the field and armature coils combine to integrate the pulsed drive waveform to give a smooth output voltage.





Here the PCB has been removed from the case to show details of the assembly. A simple U-shaped aluminium cover, not shown here, is fitted to the unit to complete the case.

Fig. 6: below left, gives details of the drilling required in the aluminium case. The hole for the diode D6, top right, should be drilled to suit the diode used.



the values as shown the range of adjustment is from 10V to 16V on a Lucas type C40-1 generator. For a 6V system reducing R9 to 100k $\Omega$  and R10 to 10k $\Omega$  should prove to be about right.

When adjustments are complete the unit should be securely bolted to some convenient earthed part of the chassis with the leads to the dynamo, ignition switch and charging lamp taken out through a hole in the rear of the case and terminated in standard bullet connectors.

### Positive Earth

Finally, it might be added that a positive earth version of the 'chopper' is quite possible and would merely involve reversing all polarised components except D3 and D4, together with transposing Tr1 and Tr2. A 2N2955 or similar pnp power transistor must be substituted for Tr3 and finally the track to the negative supply pin of the integrated circuit must be broken and the supply voltages transposed.

Now, the voltage feedback to the FET acts on the R<sub>ds</sub> in the opposite sense, but the pnp transistors require the complementary logic level to turn them ON. Thus the two phase inversions cancel themselves out and the PCB layout given can still be used. However, with the advent of more electronics in the car many readers will probably wish to do as the author did and take the opportunity of fitting the 'chopper' to convert a positive earth system to the more convenient negative earth. This consists of removing both field and armature coils from the chassis and reconnecting both in the opposite sense, not forgetting to reverse the connections to the vehicle battery and any other polarity sensitive items already fitted. ●

# HOTLINES

## A REVIEW OF RECENT DEVELOPMENTS

In general, the author does not have any more information on products than appears in the article.

### Measured charge

One or two items currently launched on the electronics market tend to remind us of the advances made in the field. Solid state relays, for example, have edged their way up the power-handling capability curve with almost monotonous regularity. I see that one of the very latest to appear (the GB15000 type) can handle a continuous current of 40A with a peak voltage rating of 600V.

Another item is a capacitance meter. Not much bigger than a small hand-held calculator it has a universal socket arrangement for the input(s), a push-to-read button, and a liquid crystal readout. To measure the value of your capacitor, you just poke its leads into the appropriate socket holes and press the button. The unit will give capacitance values from 0.1pF right up to 0.2 Farads. The meter is auto-ranging in that a LED illuminates to show that the reading is in pF, nF,  $\mu$ F or mF.

### Viva la weed

It used to be said that the Chinese were "damned clever", but the French seem to be making a bid for this title: would you believe an electronic greenhouse?

Heart of this system is a thing called Firmin which is contained in an area less than  $5 \times 5 \times 8$ in. Firmin carefully measures things like the soil conditions, the ambient light level, evaporation rates etc. It also computes just how thirsty each plant is and then supplies it with just the right amount of water. The system operates from solar cells as a power source.

Firmin has a calculator and a memory plus a section associated with a motor which controls a valve regulating the water flow. It is continually monitoring and comparing the plants' requirements with the environment so it's quite a precise system. It must be nice for the computer in Firmin to receive an order from hollyhock number five, "A large water—and leave the bottle!"

### Open sesame!

Popular electronics construction journals have often published details of

ultrasonic control systems. Those interested in this area will be pleased to hear that a German semiconductor manufacturer is to launch a set of three ICs which will allow hobbyists to make an infra red control system; useful for things like opening and closing garage doors, TV control, light dimmers etc.

The system employs pulse-code modulation and is initiated by simple push buttons. Up to 60 (sixty) command signals are possible from a hand-held, battery-operated transmitter. The receiver can be built into a space about  $3 \times 3 \times 1$ in.

High hopes are held for the infra red system since it has certain advantages over its ultrasonic brother. For example, in the application of opening and closing garage doors the ultrasonic system could not work efficiently from a hand held device inside the car because the "sound" waves would not penetrate the car body etc. The infra red waves, however, can pass through glass and the IR system could be simply pointed through the cars' front windscreen.

Please note: these ICs are not available as yet.

### Powerful FET

The arguments regarding semiconductor devices and valves at UHF still rages, with the semiconductor people edging a little closer each year. A new device just launched is a FET which can generate 1W at 8GHz with a 9.2dB gain. Impressive though this might be for a gallium-arsenide FET, it does have rather a long way to go to compete with the VTS-5753A1. This is a travelling wave tube which has a power gain of 47dB and a peak output at 3.3GHz of 120kW. I have to smile at the valve manufacturer who said of the semiconductor manufacturers of devices at these frequencies, "Ah yes, they make Watt-nots".

### Get it taped

Video cassette recorders for the home haven't really taken off as yet in the UK, probably on account of the cost. But I am pleased to learn of sensible co-operation between two European manufacturers. Although individually

developed, a close consultation between them during development has resulted in two systems that are compatible. Both will now record over two hours of colour TV programmes without a cassette change. In real terms this long recording time means that an entire football match could be recorded (or even a full length feature film) all on one cassette.

A useful (?) feature on one system is a highly accurate digital clock which allows its owner to select the turn-on and turn-off times of the equipment up to four days ahead of the time that recording is required.

Interesting to note that one manufacturer claims some 90,000 video recorders are in use in West Germany, and over 250,000 in the US.

### Interested?

Good news for computer enthusiasts—cheaper items are on the way. One of the newer systems costs only \$495 in the US and consists of a 73-key keyboard, 9in CRT, an 8-bit microprocessor, and 4,096 bits of random access memory which operates with Basic programme language. A built-in cassette player allows easy entry of recorded programmes.

Anyone interested in this area of electronics should drop a line to Mike Reeve. He is the secretary of the Amateur Computer Club and you can reach him at 6 Limes Avenue, North Finchley, London N12 8QN. Letters should be written in Basic English!

### The write beam

Print-out devices are commonly offered on the electronics market, but one just mentioned in Japan seems to be something else. It uses a laser beam to do the "writing" on a photo-sensitive drum. The letters/characters are made up to a resolution of ten "dots" per millimetre. Printout is at six lines/inch but the twist in the tail is that this printer will printout 10,000 lines every minute! Perhaps it might be called "Print Sprint"?



# ON THE AIR

## AMATEUR BANDS

by **Eric Dowdeswell G4AR**

The Torbay ARS let their hair down at their AGM with no less than eleven complaints on the current operation of the RSGB. Most are long-standing, such as too-technical articles in Radcom and nothing for the newcomer to amateur radio, late and varied posting of Radcom resulting in some readers not being able to take advantage of the 'For Sale' columns. The alleged delay on book orders etc. surprises me in view of the success of the new computer system. However the 1977 President's Committee may come up with some answers in due course, although I doubt it, as the reasons for the complaints are too deep-seated to admit of a simple solution. But one of TARS complaints, that the Society's AGM is always held in London instead of being allowed to 'go on tour', should not be difficult to solve!

First item this month must concern **Barry Harper** of Wednesbury, West Midlands, who was playing around with an old radiogram when he picked up a distress message from an Italian ship in trouble off Rome. Barry alerted his local police who contacted the coastguard authorities who passed a message to Rome. Their coastguards did in fact then locate the fishing vessel in distress. Barry's local press gave him a write-up but, not unusually, got most of the facts wrong! Apparently, Barry is going to rebuild the radiogram and adapt it for SW transmission! And study for a licence to broadcast! Actually, Barry has a No. 19 set that he has been playing with, mostly on 80m, but he's not too happy with the results on SSB.

**Brian Harrison** in Ore, Hastings continues to find plenty of daytime activity on 10m including KV4 and 8P6, while 20m turned up an HH which is not all that common on any band. In Dringhouses, York, **John Hague** continues to swot up the code so let's hope we shall be getting some interesting CW logs from you soon, John. Scottish reader **John Overton** BR36909 of Glasgow has been lucky enough to enlist the help of two local amateurs GM4CNF and GM4EAW and now sports a BC348 receiver in place of his old CR100. John plans to sit the RAE in December and has not forgotten to keep up with the code. Talking of the code, I hope that the Morse Tutor in the August issue of PW proves of interest, especially in

the clubs, where it would make an interesting project. This month sees the start of a series for those interested in studying for the RAE, which, I hope, includes most of the readers of this column!

**John Reynolds**, Bridgend, still plays around with his TRF in lieu of anything better. Being still at school limits the cash available. Well, John, be patient, stick to the 'A' level studies which are, by far, the most important item at the moment and perhaps everything will come right 'ere long.

Changes at the West of Scotland ARS where **Tom Wylie** GM4FDM is now the Hon. Sec. Write to him at 38 Rosedale Avenue, Paisley, if you'd like details of their summer programme. Another reminder of the North West Amateur Radio Convention to be held on 17 and 18 September and organised by the University of Lancaster ARS. Contact P. L. Jones c/o Dept of Physics, Univ. of Lancaster, Bailrigg, Lancaster for details.

**Peter Page** of Epping, Essex is yet another who has returned to the bands after a long break. He has an Eddystone 840 which still worked when the cobwebs were removed! A dipole for 20m suffices for the moment but plans are afoot to improve this situation. **John McFadden** keeps going in Belfast finding plenty of South Americans on 15m in the evenings. John mentioned W7ALD/MM. I normally refrain from commenting on these maritime mobile calls since by the time it appears in print the ship is thousands of miles away somewhere else or in dock and the operator paid off!

Once a reader of this column gets his/her own licence I don't normally expect to hear from him/her again! Quite understandable, of course, since the first flush of enthusiasm lasts quite a while and every spare moment is spent on the air, not writing letters but QSL's! So it was good to have a note from **Jeremy Hinton** who now signs G4EZE (was A8962 and G8LIZ) from Newcastle in Staffs. He used the GE special prefix during the Jubilee celebrations and generated a pile-up of Europeans, just for a change. Nice for the G's to get in the act at last! Jeremy uses an FT200 transceiver into a W3DZZ multi-band trap dipole. He's getting the knack of working the DX but sometimes feels he'd like a kW and a multi-element beam! Then where would the fun be, OM?? It would all be too easy, like working through repeaters!

Another pair of fellows enjoying the DX by sharing a KW201 receiver between them are **Paul Pasquet** A9105 and **Iain Christie** A9201, near Farnham, Surrey. They have another set, built by G4DPP, kept for the BC bands. Back on the amateur bands, they've amassed 160 countries so far this year. Another event on which a reminder would not be out of place

is the RTTY lecture and demonstration by G3MFJ and G3WWF on 16 August by the Wakefield and District Radio Society at Holmfield House. Ring Bob Firth G3WWF on Leeds 825519 for details.

Alan Doherty reports from Portrush, N. Ireland, that he had little response from his appeal for readers in his area to contact him with a view to forming a club. His success with stations in the Pacific has been mostly over the long path in the mornings. He reports poor returns from QSLs sent out but that is not an unusual situation. Personally speaking, I think the average listener to the amateur bands is wasting his time getting QSLs, not to mention the expense. Much better to spend the time studying for the RAE and then to get QSLs that represent much more of an achievement, a two-way QSO!

The Midland ARS is mourning the loss of Bob Palmer G5PP a past President and long established member of the club, giving lectures and organising constructional projects for other members. He was a great contest man and frequently combined holidays with a DX-pedition. This, of course, meant a great interest in mobile rallies which often meant a lot of hard work for him. After his retirement he was able to spend even more time on his hobby. I remember working him myself on many occasions in CW contests and so I know that the Midland ARS has lost a fine operator.

Good news from Paul Barker in Sunderland who says that he is intending to sit the RAE in December next. He is one of many studying at home so I sincerely hope that our news course on the RAE, starting in this issue, will be of some use to him. Paul, you may remember, is a very keen SSTV type and has not entirely deserted the DX bands in search of new countries to log. Just think, Paul, you will soon be able to answer back! Paul was third in his category in the 1st. Worldwide SSTV contest but still feels he did not do as well as he might have done due to QRM. Paul now has an 18AVT vertical multiband aerial which should have gone up by now.

An interesting letter arrived at the last moment from Harry Leeming G3LLL who tells me that, provided there is sufficient support, he will once again be running an RAE course, later in the year. Send your enquiries to the Principal, The College of Technology and Design, Feilden Street, Blackburn.

Late News, page 374.

## Log extracts

P. Barker:— 20m AP5HQ C6ANO (Bahamas) KZ5JM TA1MB VP8SM YB6ACV 20m SSTV DK2ZX LZ1MH OK1KO OZ3WP WA2PCY YU1CS 9G1JX

A. Doherty:— 20m JY25YJ KA6ML KP6AL KP6BD (Kingman Reef) KX6BU TU2EF VP8HZ VR1X YS1ESH 9M8HG 10m A9XBC PY2HY ZP5SD

P. Pasquet:— 20m PJ3BW TT8SM 3D6BE 6W8LZ 15m VP2GAH VP8PC TR8GB 9V1SW

J. Hinton:— worked 20m JY25MB KA6SS

J. McFadden:— 15m CP5AO EA8LD EP2RL HI8XBH HK1ZF KZ5KS LU5MBC PY2FMP PZ1DR VP2LL 6Y5GB

C. Page:— 20m CT3BO HR3JJR 6Y5KD

J. Overton:— 20m HC2CG HR1JAG KH6BTD KS6FL

B. Harrison:— 20m HH2MC OY5NS ZD8RR 15m HM5HB YN7NI 6W8FZ 10m KV4CI YV5ATX 8P6AJ

J. Hague:— 15m EP2RR JY4JW 9H4F

All reports are SSB unless indicated otherwise.



## MEDIUM WAVE DX

by Charles Molloy

Broadcasts from the Near East present quite a problem to the medium wave DXer. The time zones of this part of the world are some two to four hours ahead of GMT which means that many of the medium wave stations there have already signed off for the night by the time European QRM starts to clear at 2300. There are a few exceptions. Bagdad is a regular on 760kHz sandwiched between West Germany on 755 and Switzerland on 764 and it can be heard throughout the evening. Another is Kuwait on 1345 which lies between the BBC on 1340 and France on 1349. Others than can be located in this way are Kerman-shah, Iran on 895 just below Milan on 899, Ahwaz Iran on 1390 between European channels 1385 and 1394, Sharjah in the United Arab Emirates on 1575, between East Germany on 1570 and Norway on 1578.

An alternative is to listen between 0300 and sunrise when stations can be heard signing on for the day but the best time of all for DXing the Near East is during the month of Ramadan, the ninth month in the Moslem calendar which starts this year on the 16th August. During this period broadcasting goes on for most of the night, many stations staying on the air all night and presenting the listener with the opportunity of hearing DX that otherwise would be difficult or impossible to hear. Listen for Basra on 692; Damman, Saudi Arabia on 885; Antalya, Turkey on 890; Cairo 4 on 940; Damascus 944; Izmir, Turkey on 962; Taiz, Yemen on 1000; Istanbul 1016; Teheran 1088; Radio Oman 1240; Radio Afghanistan 1280; Aleppo, Syria 1313; Kirkuk, Iraq on 1360 and Hyderabad, Pakistan on 1010kHz. Broadcasts from the North African coast should be conspicuous during the late evening. Algeria is on 529, 548, 575 and 980; Tunisia on 584, 629, 719 and 962, Libya on 674, 827, 1124 and 1250 and Morocco on 593, 611, 701, 827 and 1232. On the long waves try for Istanbul on 182, Azilal, Morocco on 209 and Tebessa, Algeria on 251kHz.

"I was wondering if there is any publication available listing the addresses of the lower powered US stations, mainly the 5kW outlets, as I have logged a few" writes Denis Taylor from Prestor in Lancashire. No need to worry about station addresses in North America. Use the station call letters and the location as announced over the air. For example Radio WEAN Providence, Rhode Island, USA will certainly find this 5kwatter. Denis uses a Realistic DX160 and MW loop and a few of his latest loggings are La Voz de Antioquia, Colombia on 750; WEAN on 790; All India Radio, Rajkot on 1070; Radio Tiempo, Caracas in Venezuela on 1200; Radio Coro, Venezuela 1210 and WVOJ Jacksonville, Florida on 1320.

A large souvenir QSL card issued by KDKA Pittsburg (1020) mentions that their signal has been heard at some time or other in every country in the world and Denis thinks this must confirm world-wide MW reception as mentioned recently in this column. Worldwide reception depends both on the location

of the listener and on the level of local QRM. In western Europe QRM is the main problem but it is unlikely, QRM permitting, that Hawaii and parts of the Pacific will be logged in the UK in other than freak conditions, as the Great Circle path between the UK and that part of the world passes over the north magnetic pole, a region of high absorption of medium wave signals.

"Freetown on 1205kHz is quite a good signal here around 2300, and I have just sent a report to them" says **Roy Patrick** whose QTH is in Mackworth near Derby. This station is the medium wave outlet of the Sierra Leone Broadcasting Service and it goes off the air at 2335 daily with a half hour extension on Saturday. Programming is largely in English. This station does QSL and the address is simply Radio Freetown, New England, Freetown, Sierra Leone.

Roy mentions that the long wave Algerian outlet on 251kHz has been off the air for a few weeks but is now back in service and transmits the French programme of RTA. Another item from Roy concerns MEKO 2 which is now testing from a harbour in Libya, presumably with the permission of the Libyan Government. It has been heard in Derby on 773kHz with announcements in English until it goes off at 2300 (0100 local time).

A letter from **Paul Griffith**, who lives at St James', in Barbados, refers to a MW loop he is constructing. "I ran into a snag in that I am unable to locate a 500pF tuning capacitor in Barbados and have had to order one from the UK" says Paul. This problem has faced some DXers in the UK as well since 500pF variables do not seem to be in demand, other than by constructors of a medium wave loop! Twin-gang capacitors of around 300pF per section are readily available though and one solution to the problem is to use a single section of a twin-gang to tune the HF end of the band and to switch-in the second section in parallel to cover the LF end. There will be some overlap but the additional capacitance when both sections are in use and the vanes closed, will extend the range by only a few kHz, perhaps to 500kHz instead of 540kHz.

The maximum value (vanes closed) of the tuning capacitor is not at all critical. It is the minimum value (vanes open) that is important as it is this amount plus the self-capacitance of the loop and wiring that will determine the highest frequency at which the loop will resonate. For this reason it is not a good idea to use a twin-gang with the two sections in parallel to cover the whole band. If the loop cannot be tuned to a low enough frequency with the vanes closed then the total capacitance is too low and will have to be increased by switching in additional capacitance. This can either be a fixed capacitor or the second section of a twin-gang variable. There is ample scope for the experimenter who can use a twin or triple-gang capacitor from an old radio or a single gang of lower value than 500pF. One design of loop seen by the writer used a 365pF variable, a switch and a 220pF fixed capacitor to cover the band in two sections, thus getting round the difficulty some DXers experience in constructing a loop that will cover the entire range from 540kHz to 1600 kHz.

My original article, 'Medium Wave DXing', which dealt with a practical loop aerial, appeared in PW for April 1970. Back numbers are not available but Eric Dowdeswell, Asst. Editor, is arranging for reprints to be made. Send an SAE to me if you are interested.



## SHORT WAVE BROADCASTS

by **Derek Bell**

It is with regret that these paragraphs that I write are the last. Over the many years, since December 1974, that I compiled the Short Wave News I have made many friends and, I trust, have helped and entertained many more. I started writing the column with the firm intention of serving all aspects of our hobby from aerials to QSL card collecting. It was never my intention to be a "Radio Times" section and I hope that the items of news and information that were put in helped to broaden my readers' horizons. Indeed it is to these very readers that I owe a debt of gratitude since, were it not for their letters, there would have been no column to write, so if anyone can employ a redundant typewriter jockey any offers will be gratefully received!

Having got that out of the way we will pass on to this month's letters and start with **Roy Patrick** from Derby who passes on the information that Radio Canada is now airing a short DX show on Sundays at 2043. Is this a sign that they are at last reinstating their formerly highly active DX section? Roy also tells me that Radio Nacional Brazilia is to cease its international service due to "technical reasons".

While on Latin Americans, **Alan Proctor** of Bristol has sent an interesting letter on the best verifiers on that continent. He nominates Radio Nacional Bogota and Radio Guaiba, and says that they replied in less than three weeks. Alan does say however that he enclosed two IRCs and, in one case, some Jubilee stamps. These seemed to attract the attention of a staff member who sent a personal reply and Alan is now a firm advocate of the personal touch.

My recent remarks concerning the oldest DXer prompted a reply from **Arthur Leir** of Belfast. While not, let me hasten to add, a candidate for that title, Arthur has been an addict since 1939 when he started with an Eddystone 504. He has QSL cards dating from pre-war which must be something to see. After a lull Arthur had the urge to re-enter the hobby and has purchased a VEF204, and asks about the various publications on the market. Well, Arthur, Short Wave Magazine is still extant but personally I would buy World Radio and TV Handbook from Argus Books, Station Road, Kings Langley, Herts.

It is one of life's ironies that DX strikes in the strangest places. **Andrew Brade**, aged 13, has an old domestic Ferguson 391T with a forty-foot long wire hung on the end. Added to this the cord drive to the dial has broken and so Andrew has to rely on verbal IDs but despite this he has two loggings that deserve a mention, Radio Grenada on 15105 at 2015 and this month's star prize for Voice of the Malayan Revolution on 15790 at 0940 and Andrew logged it for a week. It is reported in WRTVH as a 120kW from Hengyang, China, but I have never seen it reported before.

Recently this column arranged for the delivery of a number of spare speakers to a group of bedfast

# Can YOUR Antenna do all this?

A SMALL SELECTION FROM OUR HUGE FILE OF TESTIMONIAL LETTERS ON THE JOYSTICK VARIABLE FREQUENCY ANTENNA (.5-30MHz)

G4DJY's COPY LOG shows 68 North Americans worked in the ARRL W/VE contest.

W6TYP worked WA6JPR over hundreds of miles on 40m. using the JOYSTICK VFA and MICRO-WATTS "equivalent to 1,000,000 MILES PER WATT" —A WORLD RECORD—we can supply conclusive evidence!

"I have used Rhombics, 4 x 1/2 waves in phase, centre fed dipoles, etc., but the success I have had with the V.F.A. has been AMAZING . . . only 20ft high . . . in front of my mobile home, I NEVER RECEIVE LESS THAN R7 AND MOSTLY R9 ON CWDX WORKING —Bob Green, SUIKG/G3APH. W.B.E. W.A.C. Phone & C.W.

W7OE U.S.A. Government Electronics Engr. (retd.), claims "VFA 5ft below ground, same as dipole, elevated 15ft, on "S" point UP on dipole".

IN USE BY AMATEUR TRANSMITTING AND SWL STATIONS WORLD-WIDE AND IN GOVERNMENT COMMUNICATION

**SYSTEM "A" £36.00**

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

**SYSTEM "J" £42.60**

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

## PARTRIDGE SUPER PACKAGES

COMPLETE RADIO STATIONS FOR ANY LOCATION

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

**PACKAGE No. 1** As above with R.300RX **£210.55**  
SAVE £17.28!

**PACKAGE No. 2** Is offered with the FRG7 RX. **£193.11**  
SAVE £12.21!

**PACKAGE No. 3** New—low priced package. **£154.86**

The all solid state SMC73 RX with all the Partridge extras. SAVE £17.28!

RECEIVERS ONLY, inclusive delivery, etc.

R.300 £184.50 FRG7 £162.00 SMC73 £128.81

All prices are correct at time of going to press inclusive of 12 1/2% VAT and carriage.



Just telephone  
your card number  
Phone 0843 62535  
(or 62839 after  
office hours)



or write for details, send 8 1/2p stamp

**G3CED** **PARTRIDGE ELECTRONIC LTD** **G3VFA**

Box 5, Partridge House, Prospect Road, Broadstairs, CT10-1LD. (Callers by appointment).

# Your free start to a rewarding new hobby.



Heathkit make the world's largest range of electronic kits.

Including amateur radio, test equipment, educational and general interest kits.

Every one of which comes to you absolutely complete—right down

to the last nut and bolt.

You'll also get a very easy to understand instruction manual that takes you step by step through the assembly.

So, besides making an attractive, useful piece of equipment, you'll also have the makings of a satisfying, rewarding hobby.

To find out more, post the coupon and we'll send you our latest catalogue.

Heath (Gloucester) Ltd.,  
Dept. PW-97, Bristol Rd.,  
Gloucester, GL2 6EE.  
Tel: Glos (0452) 29451.



## HEATHKIT

BETTER BUILT BECAUSE YOU BUILD IT YOURSELF

The new Heathkit catalogue. Out now FREE.

To: Heath (Gloucester) Ltd., Dept. PW-97, Gloucester, GL2 6EE. Please send me my Heathkit catalogue. I enclose an 11p stamp for postage.

Name \_\_\_\_\_

Address \_\_\_\_\_

Postcode \_\_\_\_\_



ACCESS AND  
BARCLAYCARD  
WELCOMED

Showrooms at 233 Tottenham Court Road,  
London and Bristol Road, Gloucester.

# LYNX ELECTRONICS (LONDON) LTD

92 BROAD STREET, CHESHAM, BUCKS

Prices correct as at 30th June 1977

Tel. (02405) 75154

P. and P. 30p — Overseas 90p — Matching 20p per pair. ACCESS WELCOME  
VAT 8% except for items \* which are 12½% — No VAT Overseas.

## IMPORTANT NOTICE

PLEASE NOTE ALL SCHOOLS, COLLEGES, UNIVERSITIES AND AMATEUR RADIO AND ELECTRONICS MAY DEDUCT 10% OFF PRE-VAT PRICES. THIS OFFER ONLY VALID FOR ORDERS OVER £20.

### THYRISTORS

PIV	1A		3A		6A		8A		10A		16A	
	(TO5)	(ST-UD)	(C106)	(TO220)								
800	0.35	0.50	0.45	0.40	0.58	0.80	0.68	1.14				
400	0.40	0.60	0.50	0.45	0.87	0.88	0.98	1.40				
800	0.65	0.85	0.70	—	1.09	1.19	1.26	1.80				

BT108 £1.00, BT107 £1.60, BT108 £1.60, BT109 £1.00, BT116 £1.60, 2N3525 £0.50.

### NEWS FLASH

Lynx will be holding a seminar this autumn on microprocessors, microcomputers and their applications. There will be a free competition for a system based on Z80. More details next month.

### RETURN OF POST SERVICE

New Price List 20p



Diodes contd  
BYX36-900 0.18  
BYX36-1200 0.21  
BYX36-300 0.50  
BYX36-600 0.55  
BYX36-900 0.60  
BYX36-1200 0.65  
BZX61 Series 0.28  
BZX83 Series 0.11  
BZV88 Series 0.11  
OA5 0.50\*  
OA10 0.40  
OA65 0.12  
OA90 0.08  
OA91 0.08  
OA200 0.09  
IN415 0.14\*  
IN418 0.13\*  
IN419 0.13\*  
IN420 0.13\*  
IN421 0.13\*  
IN422 0.13\*  
IN423 0.13\*  
IN424 0.13\*  
IN425 0.13\*  
IN426 0.13\*  
IN427 0.13\*  
IN428 0.13\*  
IN429 0.13\*  
IN430 0.13\*  
IN431 0.13\*  
IN432 0.13\*  
IN433 0.13\*  
IN434 0.13\*  
IN435 0.13\*  
IN436 0.13\*  
IN437 0.13\*  
IN438 0.13\*  
IN439 0.13\*  
IN440 0.13\*  
IN441 0.13\*  
IN442 0.13\*  
IN443 0.13\*  
IN444 0.13\*  
IN445 0.13\*  
IN446 0.13\*  
IN447 0.13\*  
IN448 0.13\*  
IN449 0.13\*  
IN450 0.13\*  
IN451 0.13\*  
IN452 0.13\*  
IN453 0.13\*  
IN454 0.13\*  
IN455 0.13\*  
IN456 0.13\*  
IN457 0.13\*  
IN458 0.13\*  
IN459 0.13\*  
IN460 0.13\*  
IN461 0.13\*  
IN462 0.13\*  
IN463 0.13\*  
IN464 0.13\*  
IN465 0.13\*  
IN466 0.13\*  
IN467 0.13\*  
IN468 0.13\*  
IN469 0.13\*  
IN470 0.13\*  
IN471 0.13\*  
IN472 0.13\*  
IN473 0.13\*  
IN474 0.13\*  
IN475 0.13\*  
IN476 0.13\*  
IN477 0.13\*  
IN478 0.13\*  
IN479 0.13\*  
IN480 0.13\*  
IN481 0.13\*  
IN482 0.13\*  
IN483 0.13\*  
IN484 0.13\*  
IN485 0.13\*  
IN486 0.13\*  
IN487 0.13\*  
IN488 0.13\*  
IN489 0.13\*  
IN490 0.13\*  
IN491 0.13\*  
IN492 0.13\*  
IN493 0.13\*  
IN494 0.13\*  
IN495 0.13\*  
IN496 0.13\*  
IN497 0.13\*  
IN498 0.13\*  
IN499 0.13\*  
IN500 0.13\*

### TRIACS—Plastic TO-220 Package Isolated Tab

	4A		6.5A		8.5A		10A		15A	
	(a)	(b)								
100V	0.80	0.80	0.70	0.70	0.78	0.78	0.83	0.83	1.01	1.01
200V	0.64	0.64	0.75	0.75	0.87	0.87	0.97	0.97	1.17	1.17
400V	0.77	0.78	0.80	0.83	0.97	1.01	1.13	1.19	1.70	1.74
600V	0.66	0.99	1.01	1.10	1.21	1.26	1.42	1.50	2.11	2.17

N.B.—(a) without internal diac. (b) with internal diac.

### TTL7400 Series

7400	0.48	7482	0.75	390	0.90*	747	1.80	16 Pin	0.15
7401	0.16	7483	0.22	390D	1.40*	750	1.80	24 Pin	0.45
7402	0.16	7484	0.22	390D	0.78*	753	1.80	40 Pin	0.80
7403	0.16	7485	0.22	390D	0.78*	755	1.80		
7404	0.16	7486	0.22	390D	0.78*	756	1.80		
7405	0.16	7487	0.22	390D	0.78*	757	1.80		
7406	0.16	7488	0.22	390D	0.78*	758	1.80		
7407	0.16	7489	0.22	390D	0.78*	759	1.80		
7408	0.16	7490	0.22	390D	0.78*	760	1.80		
7409	0.16	7491	0.22	390D	0.78*	761	1.80		
7410	0.16	7492	0.22	390D	0.78*	762	1.80		
7411	0.16	7493	0.22	390D	0.78*	763	1.80		
7412	0.25	7494	0.22	390D	0.78*	764	1.80		
7413	0.40	7495	0.22	390D	0.78*	765	1.80		
7414	0.40	7496	0.22	390D	0.78*	766	1.80		
7415	0.40	7497	0.22	390D	0.78*	767	1.80		
7416	0.40	7498	0.22	390D	0.78*	768	1.80		
7417	0.40	7499	0.22	390D	0.78*	769	1.80		
7418	0.40	7500	0.22	390D	0.78*	770	1.80		
7419	0.40	7501	0.22	390D	0.78*	771	1.80		
7420	0.40	7502	0.22	390D	0.78*	772	1.80		
7421	0.40	7503	0.22	390D	0.78*	773	1.80		
7422	0.40	7504	0.22	390D	0.78*	774	1.80		
7423	0.40	7505	0.22	390D	0.78*	775	1.80		
7424	0.40	7506	0.22	390D	0.78*	776	1.80		
7425	0.40	7507	0.22	390D	0.78*	777	1.80		
7426	0.40	7508	0.22	390D	0.78*	778	1.80		
7427	0.40	7509	0.22	390D	0.78*	779	1.80		
7428	0.40	7510	0.22	390D	0.78*	780	1.80		
7429	0.40	7511	0.22	390D	0.78*	781	1.80		
7430	0.40	7512	0.22	390D	0.78*	782	1.80		
7431	0.40	7513	0.22	390D	0.78*	783	1.80		
7432	0.40	7514	0.22	390D	0.78*	784	1.80		
7433	0.40	7515	0.22	390D	0.78*	785	1.80		
7434	0.40	7516	0.22	390D	0.78*	786	1.80		
7435	0.40	7517	0.22	390D	0.78*	787	1.80		
7436	0.40	7518	0.22	390D	0.78*	788	1.80		
7437	0.40	7519	0.22	390D	0.78*	789	1.80		
7438	0.40	7520	0.22	390D	0.78*	790	1.80		
7439	0.40	7521	0.22	390D	0.78*	791	1.80		
7440	0.40	7522	0.22	390D	0.78*	792	1.80		
7441	0.40	7523	0.22	390D	0.78*	793	1.80		
7442	0.40	7524	0.22	390D	0.78*	794	1.80		
7443	0.40	7525	0.22	390D	0.78*	795	1.80		
7444	0.40	7526	0.22	390D	0.78*	796	1.80		
7445	0.40	7527	0.22	390D	0.78*	797	1.80		
7446	0.40	7528	0.22	390D	0.78*	798	1.80		
7447	0.40	7529	0.22	390D	0.78*	799	1.80		
7448	0.40	7530	0.22	390D	0.78*	800	1.80		
7449	0.40	7531	0.22	390D	0.78*	801	1.80		
7450	0.40	7532	0.22	390D	0.78*	802	1.80		
7451	0.40	7533	0.22	390D	0.78*	803	1.80		
7452	0.40	7534	0.22	390D	0.78*	804	1.80		
7453	0.40	7535	0.22	390D	0.78*	805	1.80		
7454	0.40	7536	0.22	390D	0.78*	806	1.80		
7455	0.40	7537	0.22	390D	0.78*	807	1.80		
7456	0.40	7538	0.22	390D	0.78*	808	1.80		
7457	0.40	7539	0.22	390D	0.78*	809	1.80		
7458	0.40	7540	0.22	390D	0.78*	810	1.80		
7459	0.40	7541	0.22	390D	0.78*	811	1.80		
7460	0.40	7542	0.22	390D	0.78*	812	1.80		
7461	0.40	7543	0.22	390D	0.78*	813	1.80		
7462	0.40	7544	0.22	390D	0.78*	814	1.80		
7463	0.40	7545	0.22	390D	0.78*	815	1.80		
7464	0.40	7546	0.22	390D	0.78*	816	1.80		
7465	0.40	7547	0.22	390D	0.78*	817	1.80		
7466	0.40	7548	0.22	390D	0.78*	818	1.80		
7467	0.40	7549	0.22	390D	0.78*	819	1.80		
7468	0.40	7550	0.22	390D	0.78*	820	1.80		
7469	0.40	7551	0.22	390D	0.78*	821	1.80		
7470	0.40	7552	0.22	390D	0.78*	822	1.80		
7471	0.40	7553	0.22	390D	0.78*	823	1.80		
7472	0.40	7554	0.22	390D	0.78*	824	1.80		
7473	0.40	7555	0.22	390D	0.78*	825	1.80		
7474	0.40	7556	0.22	390D	0.78*	826	1.80		
7475	0.40	7557	0.22	390D	0.78*	827	1.80		
7476	0.40	7558	0.22	390D	0.78*	828	1.80		
7477	0.40	7559	0.22	390D	0.78*	829	1.80		
7478	0.40	7560	0.22	390D	0.78*	830	1.80		
7479	0.40	7561	0.22	390D	0.78*	831	1.80		
7480	0.40	7562	0.22	390D	0.78*	832	1.80		

### Regulators

747	1.80
750	1.80
753	1.80
755	1.80
756	1.80
757	1.80
758	1.80
759	1.80
760	1.80
761	1.80
762	1.80
763	1.80
764	1.80
765	1.80
766	1.80
767	1.80
768	1.80
769	1.80
770	1.80
771	1.80
772	1.80
773	1.80
774	1.80
775	1.80
776	1.80
777	1.80
778	1.80
779	1.80
780	1.80

### Clock Chips

747	1.80
750	1.80
753	1.80
755	1.80
756	1.80
757	1.80
758	1.80
759	1.80
760	1.80
761	1.80
762	1.80
763	1.80
764	1.80
765	1.80
766	1.80
767	1.80
768	1.80
769	1.80
770	1.80
771	1.80
772	1.80
773	1.80
774	1.80
775	1.80
776	1.80
777	1.80
778	1.80
779	1.80
780	1.80

### IC Sockets

747	1.80
750	1.80
753	1.80
755	1.80
756	1.80
757	1.80
758	1.80
759	1.80
760	1.80
761	1.80
762	1.80
763	1.80
764	1.80
765	1.80
766	1.80
767	1.80
768	1.80
769	1.80
770	1.80
771	1.80
772	1.80
773	1.80
774	1.80
775	1.80
776	1.80
777	1.80
778	1.80

enthusiasts and it is a pleasant duty to thank Mr. and Mrs. Owen of Dollgellan who took the trouble to take these speakers and other components to Bedford.

J. Hilditch of Nantwich has sent the basic brass tacks letter asking "how do I start DXing"? The answer to this is in two parts. The first is decide which sort of DXing takes your fancy, Latin American, North American, Asian, etc. Then, secondly, the thing to do is to decide which of the technical aspects of DXing interests you, aeriels, receivers or perhaps it might be propagation. Having decided we can then move on to study these. This can be done by getting hold of a good set of leaflets on your chosen themes. Many stations offer these, generally free of charge, or at worst for the cost of return postage or a few IRCs. The best I know are distributed by Radio Nederland, PO Box 222, Hilversum, Holland, and are free. These leaflets will lead you on to thinking and planning your DX rather than random listening and hoping to catch that elusive station. After all, a fisherman who goes for a particular fish arranges his tackle to suit. It is no good trying for a special station when the darkness path does not suit or your aerial is all wrong!

Some DXers concentrate on collecting QSL cards and in order to do this a knowledge of how to write a letter in a foreign tongue may help and this perhaps will lead to a visit to a reference library. So it can be seen that every aspect of our hobby has a spin-off into some other activity.

With that I fear that I must close down and thank you all for your support and to the readers in all the overseas countries that took the trouble to write, I wish you good DX and best 73s to you and yours.

Reports on SW BC bands should now be sent to Charles Molloy, see box for details.



by Ron Ham BRS15744

Members of the Brighton And District Radio Society were sporting their Jubilee call signs at the Peacehaven Carnival on June 6th where they gave the visitors an insight to amateur radio. Their 2m station, an FT221 and a 10-element Sky-Beam, installed on the balcony of the Youth Centre was operated periodically by Brian Fenwick GE8BTC, Nigel Hewitt GE8JFT and Alan Baker, GE8LGQ. The Sky-Beam, mounted on a 15ft mast above the balcony, had a mechanical rotator and an electronic beam-heading indicator.

Among the stations worked during the afternoon were F1DZP and a YL operator F1CSW. The group used their own PA system so that visitors could hear the VHF traffic, which took on a special interest when Alan left the station to give a mobile demonstration. A specially prepared leaflet about amateur radio, listing four local clubs, was given to interested people.

During the early hours of the 4th, GE8LGQ took advantage of a lift and worked PE, ON and F on 2m SSB and at 0330 he contacted GE8DJR the station installed at Windsor Castle. Alan worked 36 stations on 2m and the last one was F6DGU/MM operating

a hand-held set on board the Newhaven Ferry 'Vilandry'.

The major sporadic-E disturbances of the 1977 season began on May 25 when strong signals from east-European FM broadcast stations were received between 65 and 73MHz on a dipole feeding my R216 receiver. Similar events, lasting a few hours occurred on May 27 and periodically each day from June 8 to 15th inc., and each time strong vision pulses on Ch.R1 (49.75MHz), warned of the forthcoming event. The frequency range 40 to 75MHz was open all day on the 9th reaching a climax around 1800 when I counted 42 east-European broadcast signals between 65 and 73MHz. However, the most intense disturbance so far occurred around 1800 on the 14th when I heard 46 of these broadcast stations, and for about an hour the sporadic-E extended it's influence to 2m giving G4FUT, G8LIC and G8LZM the opportunity to work YU, YO, HB, LZ and I0SVS in Rome. Sporadic-E upset Band II during the evening of the 7th and 8th, according to Ken Smith BRS20001 Horsham, who heard several continental FM signals between 95 and 100MHz. Ken's report was soon followed by a post-card from "dampest Devon" where John Wilson G8KIS and Richard Lambley G8LAM were on holiday with their families. Richard wrote "We were listening to North Hessary Tor (R4) on my Beolit 600 portable about 1700GMT when the set started being 'captured' by German speaking stations. The whole band was alive with Austrian, Italian and Yugoslav stations until 1800 when it went flat again; all at ground level with a whip aerial and heavy local screening".

Almost every day from May 26th to June 19th there was activity on 10m. Nigel Golds BRS36910 West Chiltington, Sussex heard South-American stations on the 5th in addition to the short skip signals from Scandinavia to Africa which were predominant on most days. Like many of us, Nigel looked first for the International Beacon Project stations hearing 5B4CY on June 1st and 2nd and strong signals from DL0IGI for some period every day. Alan Baker G8LGQ Newhaven, heard the German beacon around midnight on several occasions and on the 8th he just heard the Canadian beacon VE3TEN.

To add to the fun, the sun went "active" on the 4th, Cmdr. Henry Hatfield, Sevenoaks, using his spectrohelioscope, found a sunspot group in the northern hemisphere, a bright plage in the southern hemisphere and a spray of gas on the east limb. Although overcast skies hampered visual observation, Robert Mackenzie, Dover, who projects the sun's image through his telescope, saw the sunspot group on the 8th. John Smith, Cranleigh, reported a marked increase in solar radio noise at 142MHz on the 5th and G8LGQ heard the "seashore" sound on both 2m and 10m indicating the wide frequency coverage of some of the solar bursts.

Both Henry and myself recorded several bursts and a mild solar noise storm at 136MHz on June 5th, 7th, 8th and 9th and the largest individual burst occurred on the 9th and lasted for six minutes. I hope to have reports soon from Kelvin Lake, Edgbaston, Birmingham, who, with the aid of a friend, has just completed a corner reflector interferometer, with a 25 wavelength baseline, operating at 143MHz, for radio astronomy work.

The prevailing high atmospheric pressure, 30.4" began to fall on June 2nd and 3rd causing a tropo-opening toward the north; during this period I received a 569 signal from GB3SUT 432.890MHz, a picture from Lichfield on 189MHz, and several con-

tinental FM stations in Band II with a dipole feeding the receivers in each case. Another tropo-opening began during the evening of the 16th and Barry Ainsworth G8HYN Sompting, Sussex, worked PA0's, F's and GU4EON/M on 2m SSB and at 2330 he contacted G8HVY in Weymouth on 70cms. At the same time, I heard 8 continental FM stations in Band II and a PA0 working EI on 2m. GB3SUT came up at 2130 and was frequently heard in Sussex until the small hours of the 20th. During the afternoon of the 19th G8LGQ had a contact with G2BAR in Bristol and at 1816 he worked GW4FPX/P in Gwent. As if these were not enough to satisfy a VHF man's ego for one day, Alan heard a very weak GM pop up from the noise around 2000 and he stuck on that frequency until 2315 when, for the first time from his home in Newhaven, he worked GM6UW/P just north of Aberdeen, a distance of 560 miles which is not bad going on 2m!

Owing to the prevailing sporadic-E disturbance to the 4m band I was unable to make a satisfactory observation of the June Lyrid meteor shower which reached it's peak on the 15th. However, the next event to look out for are the Perseids which reach their maximum on August 12th. I would also like to remind you all about the 4m Open Contest on August 13th/14th and the 2m Open Contest on September 3rd/4th and in both events SWLs are welcome to take part.

Ivan Davies G3IZD took advantage of the good conditions and worked OZ1OQ and ON6AG on 2m SSB, from Arundel, Sussex during the evening mobile rally organised by Worthing and District ARC on June 21st. Among the visitors to the rally was Ernie Hoare G8BDJ from Brighton who learned recently that he

Reports on the various bands are welcome and should be sent direct, by the 15th of the month, to:-

**AMATEUR BANDS** Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashted, Surrey KT21 2TW. Logs by bands, each in alphabetical order.

**MEDIUM and SW BANDS** Charles Molloy G8BUS, 132 Segars Lane, Southport, PR8 3JG. Reports for both bands must be kept separate.

**VHF BANDS** Ron Ham BRS15744, Faraday, Greyfriars, Storrington, Sussex RH20 4HE.

was the winner of the 3cm section of the IARU Region 1 contest held last October. Ernie told me that he hopes to get going on 24GHz soon.

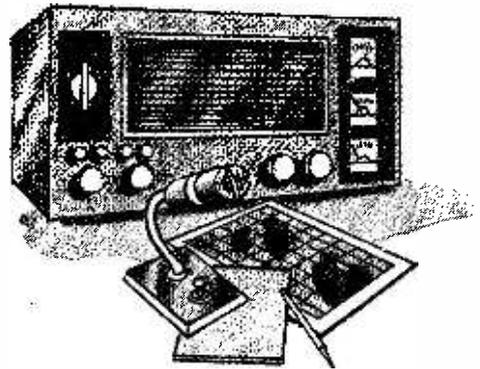
Thanks again to all of you who send me reports, I really do look forward to hearing from you and putting this feature together.

### Amateur Bands—continued

You won't be able to make the next meeting of the Wessex AR Group, on 5 August, because it's too late! But because it will be a very interesting talk perhaps G6MB and G4AMW might consider repeating it, if you ask them nicely! Title is 'Problems encountered in building and operating HF transceivers using the SL600 IC's. You will be able to make the following date on 19 August when Power Supply Units will be discussed followed by a talk on studying for the RAE. Details from Geoff Cole G4EMN, 6 St. Anthonys Road, Bournemouth (Tel: 20027).

# Careers and Hobbies in Electronics.

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



## 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: WL 9/7  
**BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL,**  
 P.O. BOX 156, JERSEY, CHANNEL ISLANDS.

NAME \_\_\_\_\_  
 ADDRESS \_\_\_\_\_

BLOCK CAPS PLEASE

# RETURN OF POST MAIL-ORDER SERVICE

## R.C.S. 100 watt MIXER/AMPLIFIER ALL VALVE CHASSIS



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

## ANOTHER R.C.S. BARGAIN!

ELAC 9 + 5in. HI-FI SPEAKER TYPE 59RM  
This famous unit now available, 10 watts, 8 ohm.  
Price **£3.45** Post 40p



## 10" ELAC HI-FI SPEAKER

Large ceramic magnet.  
Response: 50-18,000 cps.  
Bass resonance 55 cps.  
16 ohm impedance 10  
watts. Post 40p **£4.50**

## TEAK VENEER HI-FI SPEAKER CABINETS

MODEL "A", 20 x 13 x 12in. For 12in.  
dia. or 10in speaker. **£4.50** Post  
£1.60

MODEL "B" BOOKSHELF  
For 18 x 8in. or 8in. **£8.50** Post  
£1

R.C.S. BOOKSHELF SPEAKERS  
Size 14in. x 8in. x 6in. approx.  
Response 50 to 14,000 cps. 6 watts rms.  
8 ohms. **£16** pair Post  
£1-30

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

## GOODMANS CONE TWEETER

3 1/2in. diam. 18,000 C.P.S. 25 WATTS 8 Ω **£3.25**  
8in. Audax 15 watts 24-95.  
8in. EMI mid range 25.

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 battery **£6.75**  
operated.  
TWO CHANNEL STEREO VERSION OF ABOVE £8-50

BARGAIN 3 WATT AMPLIFIER. 4 Transistor  
Push-Pull Ready built with volume, treble and bass  
controls. 18 volt battery operated or Mains Supply **£3.95**

THE "INSTANT" BULK TAPE ERASER &  
HEAD DEMAGNETISER  
Suitable for cassettes, and all sizes of tape  
reels. A.C. mains 200/240V.  
Leaflet S.A.E. **£4.95** Post  
40p

## WAFER HEATING ELEMENTS

THIN  
OFFERING 1001 USES for every type of heating and drying  
applications in the home, garage, greenhouse, factory (avail-  
able in manufacturing quantities). Approx. size 10 1/2 x 8 1/2 x  
1/4in. Operating voltage 200/250V. a.c. 250 watts approx.  
Printed circuit element enclosed in asbestos fitted with con-  
necting wires. Completely flexible providing safe Black heat.  
British-made for use in photo-copiers and print drying equip-  
ment.

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

**ONLY 40p EACH (FOUR FOR £1.50)**  
ALL POST PAID—Discounts to quantity.

CASSETTE RECORDER MOTOR ONLY. 6 Volt. Will replace  
many types. Ideal for models. £1.25.

BLANK ALUMINIUM CHASSIS. 18 x w.s. 2 1/2in. sides 8 x 4in. 70p;  
8 x 6in. 90p; 10 x 7in. £1.15; 14 x 6in. £1.50; 16 x 6in. £1.45;  
12 x 3in. 87p; 16 x 10in. £1.70. All boxes, many sizes in stock.

## DE LUXE BSR HI-FI AUTOCHANGER

Plays 12in. 10in. or 7in. records  
Auto or Manual. A high quality  
unit backed by BSR reliability  
with 12 months guarantee. A.C.  
200/250V. Size 13 1/2 x 11 1/2in.  
Above motor board 2 1/2in.  
Below motor board 2 1/2in.



With STEREO/MONO CARTRIDGE **£17.50**  
Single Player versions £13-50. All Post 75p  
GARRARD MINICHANGER Size 12 x 8in. **£8-95**  
BSR P128 with Ceramic Cartridge **£19-50**

## BAKER MAJOR 12" £15.00



90-14,500 c/s. 12in. double cone, woofer  
and tweeter cone assembly having a flux  
density of 14,000 gauss and a total flux  
of 145,000 Maxwells. Bass resonance 40  
c/s rated 25 watts. NOTE: 4 or 8 or  
16 ohms must be stated. Post £1

Module kit, 30-17,000 c/s with tweeter,  
crossover, baffle and instructions.  
Please state 4 or 8 or  
16 ohms. Post £1-80 **£19.00**

## BAKER SPEAKERS "BIG SOUND"

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

GROUP "25"  
12in. 30 watt  
4, 8 or 16 ohms. **£12.00**  
Post £1

GROUP "35"  
12in. 40 watt  
4, 8 or 16 ohms. **£14.00**  
Post £1

GROUP "50/12"  
12in. 80 watt professional  
model. 8 ohms or 16 ohms. **£21.00**  
Post £1-80

GROUP "50/15"  
15in. 75 watt  
8 or 16 ohms. **£26.00**  
Post £1-80

Send for leaflets on Disco, P.A. and Group Gear.

## BAKER 150 WATT QUALITY TRANSISTOR MIXER/AMPLIFIER



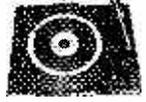
Professional amplifier using advanced circuit design. Ideal for  
disco, groups, P.A. or musical instruments. 4 inputs 4 way mixing.  
Master treble, bass and volume controls. 3 speaker output sockets  
to suit various combinations of speakers. 4-8-16 ohm. Slave output.  
A/C mains. Guaranteed. Details S.A.E. 150w  
SLAVE VERSION 200. **£72** Carr.  
£1-00

Latest 50 watt Model **£49**

100 WATT DISCO AMPLIFIER CHASSIS  
MADE BY JENNINGS MUSICAL INSTRUMENTS **£52**  
4 SPEAKER outputs, vol., treble, bass controls  
CAN BE USED AS 100 WATT SLAVE Carr. £1

## B.S.R. SINGLE PLAYER DECK

8 speed. Plays all size records.  
Stereo Cartridge. Cueing device,  
Ideal Disco Deck.



**£13.50** Post 75p

DRILL SPEED CONTROLLER/LIGHT DIMMER KIT. Easy to  
build kit. Will control up to 500 watts AC mains. **£3.25**  
Post 35p

STEREO PRE-AMP KIT. All parts to build this pre-amp. 3 inputs  
for high medium or low gain per channel, with volume control  
and P.C. Board. Can be ganged to make multi-way **£2.95**  
stereo mixers. Post 35p

## P.W. SOUND TO LIGHT DISPLAY

Complete kit of parts with R.C.S. printed circuit. Three  
channels. 600 to 1,500 watts each.  
As featured in Practical Wireless.  
Cabinet extra £3. Price **£14.00**

8 inch PHILIPS LOUDSPEAKER **£1.95**  
4 ohm, 4 watt ceramic magnet.  
General purpose replacement unit.

## MAINS TRANSFORMERS

6 VOLT 1 AMP. £1.00 3 AMP. £1.40  
12 VOLT 300 MA. £1.00 750 MA. £1.80  
20 VOLT 5 AMP. £2.00 24 VOLT 2 AMP. C.T. £3.45  
30 VOLT 1 AMP. £2.00 3 AMP. £2.20 20-0-20 VOLT 1 AMP. £2.95  
30 VOLT 1 1/2 AMP. £2.50 40 VOLT 2 AMP. £2.95 0-20-40-60  
VOLT 1 AMP. £3.50 2 x 18 VOLT 6 AMP. £11.

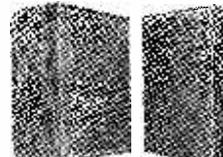
## PERIOD LOUDSPEAKER CABINETS

Two styles available. Regency and Queen Anne. Size approximately  
34 x 19 x 16in. Then cabinets are slightly soiled and are priced  
from £10 each. Callers only.

## R.C.S. BOOKSHELF SPEAKERS

18 x 10 x 6in.  
50 to 14,000 cps.  
3 watts rms. 8 ohms

**£16** pair Post £1-30



## BAKER DISCO SPEAKERS HIGH QUALITY—BRITISH MADE 2 x 12" CABINETS

1 or Disco or PA all fitted with carrying handles and corners. Black  
nylon covered. Other cabinets in stock. SAE for leaflet

50  
WATT  
R.M.S.  
**£52**  
Carr. £3

70  
WATT  
R.M.S.  
**£56**  
Carr. £3

100  
WATT  
R.M.S.  
**£69**  
Carr. £4



1 x 15" + 1 x 12" 100 WATT CABINET  
Size 36" x 24" x 15" **£75.00.** Carr. **£5**  
Ideal for Disco, Organ or PA Work.  
High quality. Full range.

## "SUPERB HI-FI"

### 12in 25 watts

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

**£22.00** Post  
£1-60

## "AUDITORIUM"

### 12in. 35 watts

A full range reproducer for high  
power. Ideal for Hi-Fi and  
Discotheques. Electric Guitars,  
public address, multi-speaker  
systems, electric organs.  
Bass Resonance 35cps  
Flux Density 15,000 gauss  
Useful response 25-18,000cps  
8 or 16 ohms models.

**£21.00** Post  
£1-60

## "AUDITORIUM"

### 15in. 45 watts

A high wattage loudspeaker of  
exceptional quality with a level  
response to above 3,000 cps. Ideal  
for Public Address, Discotheques,  
Electronic instruments and the  
home Hi-Fi.  
Bass Resonance 35cps  
Flux Density 15,000 gauss  
Useful response 20-14,000cps  
8 or 16 ohms models.

**£26.00** Post  
£1-60

Loudspeaker Cabinet Wadding 18in wide, 20p per ft.

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

## E.M.I. 13 1/2 x 8in SPEAKER SALE!

With tweeter. And crossover. **£7.95**  
10W. State 3 or 8 ohm. Post 45p  
As illustrated.

15W model **£10.50**  
8 ohms. Post 65p

20W model **£11.50**  
4 or 8 or 15 ohms. Post 65p



# RADIO COMPONENT SPECIALISTS

Minimum post 30p. Components List 10p.

Cash price includes VAT.

Access & Barclay cards welcome.

Rail Selhurst.

Tel. 01-684 1665

Practical Wireless, September 1977





4 1/2 in x 3 1/2 in METER. 30µA, 50µA or 100µA, £4.78. P. & P. 19p.

### MICROPHONES FOR TAPE RECORDERS

DM228R 200 ohm with 3.5 & 2.5mm Jack Plugs £1.30  
 DM229R 50K with 3.5 & 2.5mm Jack Plugs £1.60  
 DM18D 200 ohm with 5 & 3 pin DIN plug £1.75  
 Postage on above microphones 11p.



### CARDIODYNAMIC MICROPHONES

Model UD-130. Frequency response 50-15,000c/s. Impedance Dual 50K and 600 ohms, £7.55. P. & P. 35p.

All above prices include V.A.T. LARGE S.A.E. for NEW LIST  
 Special prices for quantity quoted on request.

## M. DZIUBAS

158 Bradshawgate · Bolton · Lancs. BL2 1BA

**42 x 42mm METERS**  
 1mA, 10mA, 100mA, 500mA, £2.92, 11p P. & P.

**60 x 45mm METERS**  
 50µA, 100µA, 500µA and 1mA VU METER £4.13, 13p P. & P.

**EDGEWISE METERS**  
 90mm x 34mm, 1mA £3.40, 19p P. & P.

### MULTI-METER

Model ITI-2  
 20,000 ohm/volt, £10.05.  
 P.&P. 33p.



### TRANSFORMERS

Primary 240V  
 6-0-6V 100mA £0.75  
 9-0-9V 75mA £0.75  
 12-0-12V 50mA £0.85  
 12-0-12V 100mA £1.05  
 Post on above transformers 30p.  
 9-0-9V 1A £1.80  
 12-0-12V 1A £2.15  
 15-0-15V 1A £2.36  
 30-0-30V 1A £3.10  
 6-3V 1 1/2 A £1.80  
 6-0-6V 1 1/2 A £2.20  
 Post on above transformers 45p.

## Detecknowledgery

Detecknowledgery - the survey of metal locator theory and principles of operation. £1 post paid.

Bionic Ferret 4000 - the VCO system detector with Fe/NonFe discrimination, metay, loudspeaker, low power drain and high sensitivity. Price now reduced due to volume of demand to £34.26 (inc PP & VAT)  
 More details in catalogue - demonstrations available

**TOKO MFL455 Sideband Mechanical Filter:**  
 SSB filter with 2.1kHz 6dB BW. By popular demand, we now offer this superbly smooth sideband filter - designed for receiver or generator applications. With input/output matching transformers: only £9.95.

Convert our EF5801 to an ultra hi-gain 2m converter: Crystal locked oscillator - details SAE please .

### Radio Control and Short Wave Coils

Ambit is pleased to announce the addition of sets of specially designed TOKO coils for applications in model radio control and shortwave receivers, to our unique range of coils and filters.

- 7E High stability IFs for 455-470kHz, 1st, 2nd and 3rd IFs in three basic impedance ranges. 33p each unit or 75p per set of three. Full details in catalogue.
- 7KN High stability RF coils for 27MHz band. Spiral wound units with tap and secondary windings. 33p each.
- 10K Coils for short wave, new leaflet available, or see catalogue.

### New modular Elektrick Wireless

7122 - A three stage tuned superhet AM radio module, with 80dB AGC, varicap tuning, ceramic IF filter, meter output. For LW, MW, and now short wave - with the correct coil pack. Not band switched, but using a separate module for each desired band. Better than 10uV sensitivity, and a new easy DIY approach to radio building. SAE for full info. Each module (inc. varicaps and coil pack) £9.00 -kit.

91198 - A three stage tuned AM/NBFM receiver module, being a refined version of above, with mechanical IF, MOSFET RF, NBFM discriminator (for afc), audio notch filter, separate oscillator, provision for 'pi' network input atu (with varicaps). Again, not bandswitchable, so as to optimize each module for its specific tuning range. Kit £15.75 each.

### Components as previously advertized, including

CA3089 1.94	EF5800 6cct tunerhead FM 14.00
MC1310 2.20	EF5801 as 5800 with osc op 17.45
TBA120 0.75	EC3802 3cct varicap tunerhead 7.50
TBA120S 1.00	7030 linear phase IF system 12.95
UA753 1.80	91196 top spec decoder 12.99
HA1137 2.20	92310 1310 decoder & filter 6.95
HA1196 3.75	91197 varicap MW/LW tuner 11.35
ua720 1.40	7252 LARSHOLT FM tuner for mono with mosfet head 26.50
TBA651 1.81	7253 FET stereo tuner 26.50
HA1197 1.40	
LM380 1.00	<b>FAMOUS TOKO COILS/FILTERS</b>
LM381 1.81	10mm IFTs 1st, 2nd or 3rd for 455-470kHz 30p
LM3900*0.75	10mm IFTs for FM and detectors such as CA3089E 33p
TDA2020 2.99	7mm IFTs for radio control 33p
TCA940 1.80	CFU series ceramic 470kHz 60p
TBA810S 1.09	CFT series ceramic 455/470 55p
ICL8038C4.50	MFHT series mechanical 455 1.95
NE561B*3.50	MFHK series mechanical filters for 455kHz now stocked 1.65
NE566V*2.50	CFSE/SFE10.7 FM ceramics 0.50
NE567*2.50	BBR3132 FM linear phase 2.25
ua723*0.80	BLR3107N stereo 19/38kHz 1.90
MEM616*0.57	SFE455 and SFD470 0.75
MEM680*0.75	SFE6.0MA TV SIF 0.80
BF256S 0.34	NEW comprehensive choke range 1uH to 100mH see list in catalogue
MVAM series	
2 1.35	
115 0.95	
125 0.90	
BB104 0.45	

We would like to say more, but space has run out. Please remember p&p (25p) and VAT (12 1/2% except where \*) The catalogue has much new info since April. The new sheets will be sent on receipt of an A4 SAE. Or 40p for the complete catalogue and information package. SAE with ALL enquiries please. Callers welcome.

**AMBIT INTERNATIONAL** wireless specialists  
 37 High Street, Brentwood, Essex. CM14 4RH  
 telephone (0277) 216029

## When you make your own PCB's, you need Seno Etch-Resist Transfer Symbols!

High definition, etch resist transfers that adhere perfectly to copper clad board, offering a superb professional finish to the one off PCB. Ten types of symbol, in strip form for greater accuracy. Packs of ten strips, mixed or of any one symbol, for only £2!

From your usual component supplier or direct.

Send in the coupon below for details of the Seno / 33 range of aids to PCB preparation

Decon Laboratories Ltd. Freeport, Portslade, Brighton BN4 1EQ (no stamp needed)

Name: \_\_\_\_\_

Address \_\_\_\_\_

Phone 0273-414371



## SUPER TOUCH—SENSITIVE PIANO

We have shown our special brand of skill and expertise in designing this piano, featuring:—

Wide range of touch-sensitive response ESU design. Free from breakthrough noise.

Choice of keyboard C-C or F-F.

Two models are available. Model TS50 is a touch-sensitive piano only. Model TS53 has extra effects of Honky-tonk, Harpsichord with fast and slow tremolo.

### KIT SECTION PRICE LIST

ESU5 + 5 Keyer Units **£11.95** each, 5 required.

ESU5 + 6 Keyer Unit **£13.95**, 1 required.

Power Supply **£9.50**

Keyboard and Switches **£33.00**

Toneforming, Headphone and Voltage Regulator **£14.50**

Loud and Soft Pedal **£7.95**

Master Tone Generator **£15.00**

Tremolo Unit **£3.75**

Cabinet switches, etc. **£32.50**

### SPECIAL OFFER

We will pay VAT and carriage on all orders received up to 31st October.

Can you afford £750 for an electronic piano? If the answer is NO why not visit our showroom and try our electronic pianos, discuss the technicalities in detail without obligation.

**WE GUARANTEE TO SAVE YOU MONEY. IT IS SIMPLE ONCE YOU KNOW HOW.**

Component shop: 40a Dalston Lane, Dalston Junction, E8 2AZ. Tel. 01-249 5624.

### Parts for organ builders

4-Octave C-C keyboard	<b>£26.00</b>
5-Octave C-C keyboard	<b>£28.00</b>
5-Octave F-F keyboard	<b>£28.95</b>
13 note pedal board	<b>£25.00</b>
25 note pedal board	<b>£55.00</b>
32 note pedal board	<b>£115.00</b>
stop switches	<b>75p</b>

### Tone Generator Units

GD500/5 with 73 outputs	<b>£39.95</b>
GD500/6 with 85 outputs	<b>£48.50</b>
GD500/7 with 96 outputs	<b>£52.50</b>

### Diode Gate Sustain and Distribution Units

4-Octave with 3 pitches	<b>£32.00</b>
4-Octave with 4 pitches	<b>£38.00</b>
5-Octave with 3 pitches	<b>£33.00</b>
5-Octave with 5 pitches	<b>£60.00</b>
5-Octave with 6 pitches	<b>£65.00</b>
4-Octave with 9 pitches	<b>£88.00</b>
5-Octave with 9 pitches	<b>£96.00</b>

### Toneforming Units

3 pitches with 10 voices	<b>£24.00</b>
4 pitches with 10 voices	<b>£26.00</b>
4 pitches with 15 voices	<b>£27.50</b>
5 pitches with 10 voices	<b>£38.40</b>
6 pitches with 19 voices	<b>£65.95</b>
9 pitches with 10 voices	<b>£40.50</b>

### Rotating Speaker Units

Bass unit	<b>£68.00</b>
Mid Range	<b>£75.00</b>
Hi-Fi Horn	<b>£89.00</b>

Other useful components in stock for organ work. Send 50p plus 20p p. & p. for the new monthly magazine 'Electronic Organ Review'.



### ELECTRONIC MUSICAL INSTRUMENTS

12 Brett Road, Hackney,  
London, E8 1JP. 01-986 8455/  
01-986 5063

# FREE WITH SEPTEMBER'S PRACTICAL ELECTRONICS



Britain's best-selling 64-page electronic kit and component catalogue from Doram with new products, new ideas!

Extra copies of catalogue available (send 20p to cover post and packing) from Doram Electronics Ltd, PO Box TR8, Wellington Road Estate, Wellington Bridge, Leeds LS12 2JF. Tel: 34222

(STD code 0532).

# DORAM

### BARGAIN PARCELS SAVE POUNDS

Huge quantities of electronic components must be cleared as space required. 1000's of Capacitors, Resistors, Transistors, etc. and ex equipment Panels, etc. Covered with valuable components. No time to sort, so must sell by weight. 7lb **£3.95**, 14lb **£6.90**, 28lb **£10.90**, 56lb **£15.75**, 112lb **£21.50**, inc. P & P.

### BARGAIN PACKS

500 Mixed Resistors $\frac{1}{2}$ & $\frac{1}{4}$ watt	<b>£1</b>	11b Ferric Chloride	<b>£1</b>
100 Mixed Diodes, IN4148 etc.	<b>£1</b>	5lb Ferric Chloride	<b>£4</b>
100 Mixed Diodes including Zener and Power Types	<b>£3</b>	12 ZTX212 Gen. Purp. PNP	<b>£1</b>
100 New and Marked Signal Transistors inc. ZTX212, BC148, BF194, etc.	<b>£3</b>	1 Dalo Pen, etch resist.	<b>99p</b>
200 New and Marked Transistors inc. AC128, 2N3055, ZTX212, BFY50, BD131	<b>£6</b>	40 OA91/95 type Glass Diodes	<b>£1</b>
		4 Aluminium Boxes 128 x 44 x 38mm. Ideal for Signal Injectors etc.	<b>£1</b>

Add 30p P & P on all above items. Over **£10 P & P FREE**

### DELUXE FIBRE GLASS BOARD P.C. KITS

INC. 150 sq In Copper Clad F/G Board, 1lb Ferric Chloride, A Dalo Pen, Abrasive Cleaner, 2 Mini Drill Bits, Etch Tray and Instructions. Only **£5.30** inc. P & P. Send cheque or P.O. with order to:

**SENTINEL SUPPLY, 20A Waddon Road, Croydon, Surrey.**

## TAPE HEADS

FIT A BRAND NEW HEAD  
AND TRANSFORM THE QUALITY  
OF YOUR TAPE PLAYER  
AN EXTENSIVE RANGE ALWAYS IN STOCK  
ASK FOR OUR SHORT FORM CATALOGUE



SPECIAL I

STANDARD HEADS 10  
FIT MOST TAPE PLAYERS  
AT BULK DISCOUNT  
PRICES.  
ENCLOSE 15p P & P WITH  
ORDER

MONO CASSETTE 30p  
STEREO CASSETTE £2.00  
STEREO 8  
CARTRIDGES £1.00  
M/S CASSETTE  
ERASE 63p

# MONOLITH

THE MONOLITH ELECTRONICS CO. LTD.

517 Church Street, Crewkerne, Somerset, England

Tel.  
Crewkerne 4321

## NEW MAZDA VALVES

All individually boxed, trade discounts to bonafide companies. Prices on application.

DM70	OFF	EF83	OFF	PCC85	OFF	PL508	1.32	30C17	1.20
DY86/7	0.58	EF85	0.99	PC288	OFF	PL509	2.10	30C18/	
DY802	0.72	EF86	1.30	PC289	0.95	PL502	1.90	PCF805 1.28	
EB81	0.72	EF87	0.99	PC290	0.98	PL503	1.90	30F3/5F18	1.00
EB82	0.72	EF88	0.99	PC291	0.98	PL504	1.90		
EB83	0.72	EF89	0.99	PC292	0.98	PL505	1.90		
EB84	0.72	EF90	0.99	PC293	0.98	PL506	1.90		
EB85	0.72	EF91	0.99	PC294	0.98	PL507	1.90		
EB86	0.72	EF92	0.99	PC295	0.98	PL508	1.90		
EB87	0.72	EF93	0.99	PC296	0.98	PL509	1.90		
EB88	0.72	EF94	0.99	PC297	0.98	PL510	1.90		
EB89	0.72	EF95	0.99	PC298	0.98	PL511	1.90		
EB90	0.72	EF96	0.99	PC299	0.98	PL512	1.90		
EB91	0.72	EF97	0.99	PC300	0.98	PL513	1.90		
EB92	0.72	EF98	0.99	PC301	0.98	PL514	1.90		
EB93	0.72	EF99	0.99	PC302	0.98	PL515	1.90		
EB94	0.72	EF100	0.99	PC303	0.98	PL516	1.90		
EB95	0.72	EF101	0.99	PC304	0.98	PL517	1.90		
EB96	0.72	EF102	0.99	PC305	0.98	PL518	1.90		
EB97	0.72	EF103	0.99	PC306	0.98	PL519	1.90		
EB98	0.72	EF104	0.99	PC307	0.98	PL520	1.90		
EB99	0.72	EF105	0.99	PC308	0.98	PL521	1.90		
EB100	0.72	EF106	0.99	PC309	0.98	PL522	1.90		

MULLARD PRICES AVAILABLE ON REQUEST

## NEW VALVES

Individually boxed and guaranteed but of European or other origin at greatly reduced prices. Quotations for any valve not listed.

AZ1	1.50	EF86 Mullard		PCC84	0.45	UCL82	0.50	6J5G	0.45
AZ31	1.10	EF87	2.04	PCC88	0.65	UCL83	1.20	6J6	0.35
CB131	1.50	EF89	0.60	PC289	1.05	UL41	0.75	6J7G	0.80
CL33	2.00	EF91	0.65	PC289	0.65	UF89	0.50	6J7M	0.75
CY31	1.00	EF92	0.75	PC290	0.72	UL41	1.00	6K6GT	0.75
DAF91	0.40	EF95	0.30	PC292	0.50	UL84	0.60	6K7G	0.35
DAF96	1.00	EF98 UK	1.65	PC293	0.65	UY41	0.75	6K7M	0.75
DC930	2.00	EF99	1.25	PC294	0.55	UY85	0.65	6K8G	0.45
DF90	0.40	EF103	0.50	PC295	0.72	VR105/30	0.40	6K8M	0.75
DF96	1.00	EF104	0.50	PC296	1.28	VR150/30	0.45	6L6G	2.50
DK91	0.55	EL32	1.50	PC297	0.80	1R5	0.55	6L6GT	1.75
DK92	1.25	EL33	3.50	PC298	1.28	1S5	0.40	6Q7G	0.80
DK96	1.10	EL34	0.85	PCL82	0.50	1T4	0.40	6Q7M	0.75
DL92	0.75	EL34 CH/SLO.		PCL83	0.92	3S4	0.75	6S17GT	0.55
DL94	1.20	VACK	1.00	PCL84	0.50	3V4	1.00	6S17GT	0.55
DY86	1.10	EL35	0.75	PCL85	0.50	5R4Y	1.00	6S07	0.75
DY88	0.45	EL36	0.60	PCL86	0.66	5U4G	1.00	6U5G	2.20
DY87	0.45	EL41	1.25	PCL87/85	0.80	5U4GB	1.00	6V6G	0.85
DY802	0.68	EL42	1.75	PD500	3.00	5Y3GT	0.85	6V6GT	0.85
EAC80	0.40	EL84	0.35	PD500	1.20	5Z4A	1.50	6X5G	0.55
EAF42	1.25	EL95	0.80	PN45	1.20	5Z4G	1.00	6X5GT	0.55
EB91	0.30	EM80	1.10	PL36	0.92	6A0L2	1.00	7B6	0.80
EB933	1.75	EM81	1.00	PL37	0.92	6A0L2	1.00	7B7	1.00
EB941	1.75	EM82	1.00	PL38	0.92	6A0L2	1.00	7C2	0.85
EB981	1.10	EM84	1.00	PL39	0.92	6A0L2	1.00	7C5	1.75
EB980	0.45	EM85	1.25	PL40	0.92	6A0L2	1.00	7H7	1.00
EB983	1.25	EM87	1.50	PL504	0.96	6A0L2	1.00	7R7	1.50
EB989	0.40	EM88	0.50	PL508	1.32	6A57G USSR	1.50	7S7	2.25
EBL31	2.50	EZ40	1.25	PL509	2.10	6A57G RCA	1.50	7Y4	0.75
ECC81	0.45	EZ41	1.25	PL502	1.80	6A7E	0.85	12A7E	0.45
ECC82	0.45	EZ20	0.30	PL503	1.80	6A7E	0.85	12A7T	0.45
ECC83	0.45	EZ20	0.30	PL504	1.80	6A7E	0.85	12A7M	0.45
ECC84	0.45	EZ21	0.35	PL505	1.80	6A7E	0.85	12A7X	0.45
ECC85	0.45	EZ22	0.35	PL506	1.80	6A7E	0.85	12A7Y	0.45
ECC88	0.45	EZ23	0.35	PL507	1.80	6A7E	0.85	12A7Z	0.45
ECC88 USSR	0.45	EZ24	0.35	PL508	1.80	6A7E	0.85	12B6E	0.80
EC35	2.00	GN309	2.00	PL509	2.10	6A7E	0.85	12B6E	0.80
EC42	1.15	KT61	3.50	PL510	2.10	6A7E	0.85	12B6E	0.80
EC481	0.50	KT66	4.00	PL511	2.10	6A7E	0.85	12B6E	0.80
EC483	0.85	KT81(TC)	2.60	PL512	2.10	6A7E	0.85	12B6E	0.80
ECL80	0.80	KT89	4.75	PL513	2.10	6A7E	0.85	12B6E	0.80
ECL82	0.55	MU14	1.50	PL514	2.10	6A7E	0.85	12B6E	0.80
ECL83	1.50	N78	7.50	PL515	2.10	6A7E	0.85	12B6E	0.80
ECL86	1.50	OA2	0.45	PL516	2.10	6A7E	0.85	12B6E	0.80
EF37A	1.60	OB2	0.45	PL517	2.10	6A7E	0.85	12B6E	0.80
EF39	1.60	OB2	0.45	PL518	2.10	6A7E	0.85	12B6E	0.80
EF80	0.45	PC86	0.85	PL519	2.10	6A7E	0.85	12B6E	0.80
EF85	0.50	PC88	0.85	PL520	2.10	6A7E	0.85	12B6E	0.80
EF86 USSR	0.45	PC97	0.88	PL521	2.10	6A7E	0.85	12B6E	0.80
		PC90	0.75	PL522	2.10	6A7E	0.85	12B6E	0.80

### OSCILLOSCOPE TUBES

Types CV 1526, VCR139A

All at £3.00 each, + p & p 50p 8% VAT

### EXPRESS POSTAGE

25p per order in UK

## VAT To be added to all orders

VALVES 12½%  
TRANSISTORS 8%  
TRANSISTORS MARKED\* 12½%

TERMS OF BUSINESS: C.W.O. A/c's available to approved companies. Open daily to callers 9 a.m. - 5 p.m. Monday to Friday. Prices correct when going to press. Prices on application for any types not listed.

**RST** VALVE MAIL ORDER CO.  
Climax House  
Fallsbrook Road, London SW16 6ED  
SPECIAL EXPRESS MAIL ORDER SERVICE

## TRANSISTORS-INTEGRATED CIRCUITS

All transistors, I.C's offered are new and branded. Manufactured by Mullard, Texas, RCA, Ferranti, Motorola, ITT, etc.

AA119	0.10	BD181	1.38	OC24	3.50	2N2222	0.85	7457	0.48
AA190	0.20	BD182	1.48	OC25	0.90	2N2223	2.75	7458	0.37
AA192	0.20	BD183	0.60	OC26	0.90	2N2224	0.85	7440	0.22
AA193	0.25	BD184	0.85	OC27	2.00	2N2225	0.21	7441 AN	0.92
AA194	0.31	BD185	0.75	OC28	2.00	2N2226	0.21	7442	0.78
AA195	0.35	BD186	1.25	OC29	2.00	2N2227	0.50	7447 AN	1.28
AA196	0.35	BD187	1.25	OC30	2.00	2N2228	0.35	7459	0.29
AA197	0.35	BD188	1.25	OC31	1.50	2N2229	0.35	7451	0.20
AA198	0.35	BD189	1.25	OC32	0.50	2N2230	0.25	7453	0.20
AA199	0.35	BD190	1.25	OC33	1.50	2N2231	0.21	7454	0.20
AA200	0.35	BD191	1.25	OC34	1.50	2N2232	0.15	7480	0.20
AA201	0.35	BD192	1.25	OC35	0.50	2N2233	0.17	7470	0.35
AA202	0.35	BD193	1.25	OC36	0.50	2N2234	0.18	7472	0.38
AA203	0.35	BD194	1.25	OC37	0.50	2N2235	0.18	7473	0.38
AA204	0.35	BD195	1.25	OC38	0.50	2N2236	0.18	7474	0.38
AA205	0.35	BD196	1.25	OC39	0.50	2N2237	0.18	7475	0.38
AA206	0.35	BD197	1.25	OC40	0.50	2N2238	0.18	7476	0.38
AA207	0.35	BD198	1.25	OC41	0.50	2N2239	0.18	7477	0.38
AA208	0.35	BD199	1.25	OC42	0.50	2N2240	0.18	7478	0.38
AA209	0.35	BD200	1.25	OC43	0.50	2N2241	0.18	7479	0.38
AA210	0.35	BD201	1.25	OC44	0.50	2N2242	0.18	7480	0.38
AA211	0.35	BD202	1.25	OC45	0.50	2N2243	0.18	7481	0.38
AA212	0.35	BD203	1.25	OC46	0.50	2N2244	0.18	7482	0.38
AA213	0.35	BD204	1.25	OC47	0.50	2N2245	0.18	7483	0.38
AA214	0.35	BD205	1.25	OC48	0.50	2N2246	0.18	7484	0.38
AA215	0.35	BD206	1.25	OC49	0.50	2N2247	0.18	7485	0.38
AA216	0.35	BD207	1.25	OC50	0.50	2N2248	0.18	7486	0.38
AA217	0.35	BD208	1.25	OC51	0.50	2N2249	0.18	7487	0.38
AA218	0.35	BD209	1.25	OC52	0.50	2N2250	0.18	7488	0.38
AA219	0.35	BD210	1.25	OC53	0.50	2N2251	0.18	7489	0.38
AA220	0.35	BD211	1.25	OC54	0.50	2N2252	0.18	7490	0.38
AA221	0.35	BD212	1.25	OC55	0.50	2N2253	0.18	7491 AN	0.85
AA222	0.35	BD213	1.25	OC56	0.50	2N2254	0.18	7492	0.60
AA223	0.35	BD214	1.25	OC57	0.50	2N2255	0.18	7493	0.70
AA224	0.35	BD215	1.25	OC58	0.50	2N2256	0.18	7494	0.70
AA225	0.35	BD216	1.25	OC59	0.50	2N2257	0.18	7495	0.70
AA226	0.35	BD217	1.25	OC60	0.50	2N2258	0.18	7496	0.70
AA227	0.35	BD218	1.25	OC61	0.50	2N2259	0.18	7497	3.67
AA228	0.35	BD219	1.25	OC62	0.50	2N2260	0.18	74100	1.75
AA229	0.35	BD220	1.25	OC63	0.50	2N2261	0.18	74101	0.45
AA230	0.35	BD221	1.25	OC64	0.50	2N2262	0.18	74102	0.85
AA231	0.35	BD222	1.25	OC65	0.50	2N2263	0.18	74103	0.57
AA232	0.35	BD223	1.25	OC66	0.50	2N2264	0.18	74104	0.85
AA233	0.35	BD224	1.25	OC67	0.50	2N2265	0.18	74105	0.85
AA234	0.35	BD225	1.25	OC68	0.50	2N2266	0.18	74106	0.85
AA235	0.35	BD226	1.25	OC69	0.50	2N2267	0.18	74107	0.85</

BEFORE **YOU** BUY AN AMPLIFIER MODULE—CHECK:

**DOES IT HAVE**

- ★ 30A POWER TRANSISTORS
- ★ 3A DRIVERS (100 W UNIT)

- ★ 2 YEAR GUARANTEE
- ★ INTEGRAL OUTPUT CAPACITOR

THEN COMPARE WITH THE TAMBA RANGE—EXCELLENT VALUE—25, 50 & 100 W RMS

TAM1000 100W 4 OHMS 65V	£9.80
TAM500 50W 4 OHMS 45V	£7.50
TAM250 25W 8 OHMS 45V	£4.75
<b>POWER SUPPLIES</b>	
For 1 or 2 TAM250/500	£7.50
For 1 or 2 TAM1000	£9.80
(Carr. 50p on supplies)	



**ALL PURPOSE MIXER/PREAMP**

(WITH 60 mm SLIDER VOLUME)

- Anodised & printed facia
  - Suitable for multiple input systems
  - High & low impedance inputs
  - High sensitivity
  - Built in supply smoothing
  - 20-20,000 hz ±1dB
  - 80dB Noise level
  - Accepts a wide variety of inputs
  - Wide range bass & treble controls
- Use up to 10 preamps with 1 power

COMPLETE & TESTED assembly with Treble & Bass controls plus slider Volume Control. **£6.50**

- Suits loads 4-16 ohms
- 20-20,000 hz ±1dB
- Silicon circuitry throughout
- Glass fibre P.C.B.
- High sensitivity (100mV 10k)
- Low distortion (0.1%)
- Low profile (1" High 3½" x 3")
- 75% efficient
- Accepts most mixer/preamps
- Four simple connections

High Grade Components used throughout: Texas, Mullard, R.C.A., Plessey, etc.

You may order as follows: C.W.O. (crossed cheques, P.O.s, M.O.s, etc.) C.O.D. (60p extra). We accept Access and Barclaycard—send or telephone your number—do not send your card. Add VAT at 8% to orders for 50-100W units and at 12½% for 25W units

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

# TAMBA ELECTRONICS

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

**PHILIPS**



## YOU & PHILIPS HI-FI KITS

The top sellers for home assembly in Europe—now available in the U.K.

Now—read all about the Philips range of quality kits for home assembly—mixers, amplifiers, speakers, etc. Send today to S.S.T. Distributors (Electronic Components) Ltd., West Road, Tottenham, London N17 0RN

Please send me, quickly, the new colour catalogue.

Name \_\_\_\_\_ PW 9/1

Address \_\_\_\_\_

Postcode \_\_\_\_\_

**free SEND TODAY!**

S.S.T. Distributors is a member of the Philips Group of Companies.



## 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.

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

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_ (Block caps please)

Free!

WAA WK 9/7

**TV GAMES CHIP**  
AY-3-8500 £9.95. Printed circuit and kit of extra parts black and white version £11.95. Colour model £24.95. Rifle kit £4.95. Send sae for data.

**NEW COMPONENT SERVICE**  
Resistors 5% carbon £12 to 10M ±W 1µ, 1W 3p. Preset pots subminiature 0-1W 100Ω to 4M7 9p. Potentiometers ±W 4K7 to 2M2 log or lin. Single 30p. Dual 9p. Polystyrene capacitors 50V 56 22pf to 8200pf 3p. Ceramic capacitors 50V 56 22pf to 47000pf 3p. Mylar Capacitors 100V .001, .002, .005 4p, .01, .02, .025 4p. Polyester Capacitors 250V 56 .01 to 1mf 5p. .15, .22, .33mf 7p. .47mf 11p. Electrolytics 50V .47, 1, 2mf 5p. 25V 5, 10mf 5p. 16V 22, 33, 47mf 6p. 100mf 7p. 220, 330mf 9p. 470mf 11p. 1000mf 18p. Zener Diodes 400mW E24 3V3 to 33V 8p.

**MAINS TRANSFORMERS**  
6.0-6V 100mA 94p 9.0-9V 75mA 94p. 0/12/15/20/24/30-0V 1A £3.85. 12.0-12V 50mA 94p. 0/12/15/20/24/30-0V 2A £3.15. 6-3V 1/2A £2.30. 6.0-6V 1/2A £2.75. 9.0-9V 1A £2.39. 12.0-12V 1A £2.69. 15.0-15V 1A £2.69. 30.0-30V 1A £3.59.

**PRINTED CIRCUIT KITS, ETC.\***  
Contains etching dish, 100 sq ins of pc board, 1lb ferric chloride, etch resist pan, drill bit and laminate cutter £3.85. 100 sq ins pc board 80p. 1lb FeCl £1.05. Etch resist pan 75p.

**S-DECS AND T-DECS\***  
S-DeC £1.94. T-DeC £3.61.  
u-DeC £3.97. u-DeCB £6.97.  
IC carriers with sockets:  
16 dil £1.91. 10705 £1.79.



**SINCLAIR CALCULATORS AND POCKET TV**  
Sinclair pocket TV £168. Cambridge Scientific Programmable £13.99. Prog. library £4.98. Cambridge Scientific £8.45. Oxford Scientific £10.60. Mains adaptors £3.20.

**BATTERY ELIMINATOR BARGAINS**  
**3-WAY MODELS**  
With switched output and 4-way multi-jack connector. Type 1—3/4/6V at 100mA £2.30. Type 2—6/7/9V 300mA £2.90.

**100mA RADIO MODELS**  
With press-stud connectors. 9V £3.45. 6V £3.45. 9V + 9V £3.45. 6V + 6V £3.45. 4+V + 4+V £3.45.

**CASSETTE MAINS UNIT**  
7+V with 5 pin din plug 150mA £3.65.  
**FULLY STABILIZED MODEL £6.40.**  
Switched output of 3/6/7/9V 400mA stabilized.

**CAR CONVERTERS 12V INPUT**  
Output 9V 300mA £1.80. Output 7+V 300mA £1.80.

**BATTERY ELIMINATOR KITS**  
Send s.a.e. for free leaflet on range.  
100mA radio types with press stud battery terminals. 4+V £2.10. 6V £2.10. 9V £2.10. 4+V+4+V £2.50. 6V+6V £2.50. 9V+9V £2.50.

Cassette type 7+V 100mA with din plug £2.10.  
Transistor stabilized 8-way type with low hum. 3/4/6/7/9/12/15/18V. 100mA £3.20. 1 Amp £6.40.

**SINCLAIR PROJECT 80 AUDIO MODULES**  
PZ5 £4.95. Z40 £5.75.  
**BI-PAK AUDIO MODULES**  
S450 tuner £21.95. AL60 £4.86. PA100 £14.95. MK60 audio kit £36.45. Stereo 30 £17.95. SPM80 £3.75. BMT80 £4.25. Send sae for free data.

**SINCLAIR IC20**  
IC20 10W+10W stereo integrated circuit amp kit with printed circuit and data £6.95.  
PZ20 Power supply kit for above £3.65  
VP20 Volume, tone, control and preamp kit £8.95.  
Send sae for free leaflet on the whole system.

**JC12 AND JC40 AMPLIFIERS**  
JC12 6W IC audio amp with free data and printed circuit £1.95.  
Also new JC40 20W model with pcb £3.95.  
Send sae for free leaflet on both models and associated power supply and preamp kits.



**FERRANTI ZN414**  
IC radio chip £1.44. Extra parts and pcb for radio £3.85. Case £1. Send sae for free data.

**MEMORY I.C.s**  
1702A EPROM 1000p  
2102-2 RAM 216p  
2107 RAM 854p  
2116-2 RAM 470p  
AY-8-1013P UART 725p  
C8080A CPU 1400p  
RO3-2513 ROM 850p

**SWANLEY ELECTRONICS**  
DEPT. PW, PO BOX 68,  
32 GOLDSSEL RD., SWANLEY, KENT  
Send sae for free data on kits. Post 30p. Prices include VAT. Official orders welcome. Overseas customers deduct 7% on items marked \* and 11% on others.

**TTLs by TEXAS**

7405	16p	74111	75p
7401	15p	74112	85p
7402	15p	74116	216p
7403	15p	74118	180p
7404	24p	74120	180p
7405	35p	74121	32p
7406	45p	74122	32p
7407	45p	74123	75p
7408	22p	74125	70p
7409	22p	74126	85p
7410	18p	74128	82p
7411	20p	74132	81p
7412	25p	74136	81p
7413	48p	74142	80p
7414	48p	74142	80p
7416	40p	74145	85p
7417	40p	74147	205p
7420	16p	74148	140p
7421	43p	74180	130p
7422	28p	74181	81p
7423	28p	74183	81p
7425	35p	74185	87p
7426	35p	74186	87p
7427	35p	74188	87p
7428	48p	74189	87p
7430	18p	74190	210p
7432	37p	74191	130p
7433	37p	74191	130p
7434	37p	74192	130p
7435	37p	74194	140p
7440	18p	74195	150p
7441	85p	74195	150p
7442	75p	74196	150p
7443	120p	74197	320p
7444	120p	74170	280p
7445	108p	74171	75p
7446	108p	74172	180p
7447	90p	74173	87p
7448	85p	74176	130p
7450	18p	74177	130p
7451	18p	74180	130p
7453	18p	74180	130p
7454	18p	74181	130p
7455	18p	74182	130p
7460	18p	74185	150p
7470	38p	74186	980p
7472	32p	74190	90p
7473	38p	74191	160p
7474	38p	74192	130p
7475	48p	74193	130p
7476	37p	74194	130p
7480	54p	74195	160p
7481	108p	74195	160p
7482	90p	74197	130p
7483	90p	74198	270p
7484	120p	74199	270p
7485	120p	74221	175p
7486	98p	74251	150p
7489	340p	74255	87p
7490	43p	74256	87p
7491	90p	74279	150p
7492	58p	74283	220p
7493	42p	74284	475p
7494	90p	74285	475p
7495	75p	74290	160p
7496	90p	74295	160p
7497	280p	74298	220p
74100	140p	74385	160p
74104	75p	74386	160p
74105	75p	74387	160p
74107	38p	74390	220p
74109	80p	74393	245p
74110	80p	74490	250p

**CMOS ICs**

4000	21p	4040	150p
4001	21p	4042	87p
4002	21p	4043	100p
4006	127p	4046	150p
4007	21p	4047	120p
4009	67p	4049	64p
4011	21p	4050	58p
4012	23p	4051	40p
4013	55p	4054	120p
4014	90p	4055	140p
4015	90p	4056	145p
4016	54p	4060	130p
4017	120p	4069	30p
4018	110p	4071	30p
4019	57p	4072	30p
4020	140p	4081	30p
4021	120p	4082	30p
4022	140p	4093	104p
4023	23p	4510	140p
4024	90p	4511	140p
4025	23p	4516	130p
4026	200p	4518	140p
4027	64p	4528	140p
4028	110p	14433	214
4029	120p	14553	540p
4030	87p	14583	21

**LOW PROFILE DIL SOCKETS by TEXAS**  
8 pin 12p 22 pin 36p  
14 pin 13p 24 pin 48p  
18 pin 14p 28 pin 48p  
18 pin 36p 40 pin 60p

**HEAT SINK for Plastic**  
TO220 130p  
TR5 or VR 22p

**OP. AMPS**

LM301A	40p	741	25p
LM316N	225p	747	75p
LM324N	180p	748	40p
LM339N	175p	MC1488	216p
NE631V	140p	CA3130	75p
709	28p	CA3140	108p
793	160p	LM5900	168p

**VOLTAGE REGULATORS—Fixed**

1 Amp +ve	130p	-ve	215p
5V	7805	7805	80p
6V	7806	7806	80p
12V	7812	7812	80p
15V	7815	7815	80p
18V	7818	7818	80p
24V	7824	7824	80p
100mA — TO22			
5V	78L05	78L05	80p
6V	78L06	78L06	80p
12V	78L12	78L12	80p
15V	78L15	78L15	80p
LM309K (TO3)	1A 5V	180p	
LM323K (TO3)	5A 5V	700p	
LM327N (16 DIL)	100mA ±5-12V		275p
MC1469 (16 DIL)	100mA ±18V		300p
(Adj. by R <sub>e</sub> from ±5V to ±20V)			
TBA425B (TO8)	0-5A 12V		120p
7805 (TO3)	1A 5V		180p

**VARIABLE**

783 14 pin DIL	2V-37V 150mA	45p
LM317T TO220	1A-2V-37V	325p
TL430 TO92	100mA 2V-30V	75p
78MGT2C	4 pin DIL 5V-30V 500mA	148p

**OPTO-ELECTRONICS**

OC7 1	130p	LEDS:	TIL209	Red	14p
ORP 12	75p		TIL211	Green	36p
ORP 80	90p		TIL32	Infrared	81p
ORP 81	90p			0-2"	80p
ORP 87	90p			Green	20p
2N5777	45p			Yellow	36p

**DIODES**

BY127	12p
OA47	9p
OA81	15p
OA85	15p
OA90	9p
OA91	9p
OA95	9p
QA200	9p
QA202	10p
1N914	4p
1N916	7p
1N4148	4p
1N4001/2	6p
1N4004/5	7p
1N4007	8p
1N5401	15p
1N5404	20p
1N5407	25p

**PW "JUBILEE" ELECTRONIC ORGAN**

AY-1-2012	650p	VM18	
AY-1-5050	250p	IA DIL Bridge	45p
AY-1-1313	775p	7812	150p
AY-5-1315	750p	LM320-12	
AY-5-1317A	650p	-12V Regulator	215p
DIL SKTS to suit available.		App prices VAT inc.	

**TRANSISTORS**

AC125	30p	R8008B	225p
AC126	20p	R2010B	285p
AC127	20p	TIP29A	80p
AC128	20p	TIP32C	82p
AC129	20p	TIP33A	87p
AC187	80p	TIP33C	120p
AC188	20p	TIP34A	75p
AD149	90p	TIP31C	56p
AD161	45p	TIP32A	83p
AD162	45p	TIP32C	85p
AF114	25p	TIP33A	87p
AF115	25p	TIP33C	120p
AF116	22p	TIP34A	120p
AF117	22p	TIP34C	180p
AF127	40p	TIP35A	243p
AF130	40p	TIP35C	280p
AF239	48p	TIP36C	297p
BC107B	10p	TIP36C	300p
BC108B	10p	TIP41A	70p
BC109	10p	TIP41C	84p
BC109C	11p	TIP42A	76p
BC147	9p	TIP42C	96p
BC148	8p	TIP2955	76p
BC149	11p	TIP3055	80p
BC151	11p	TIP3055	80p
BC156	13p	TIS93	28p
BC159	13p	2N697	25p
BC160C	15p	2N698	45p
BC171	12p	2N706	22p
BC172	11p	2N708	22p
BC173	11p	2N718	22p
BC176	11p	2N980	19p
BC179	20p	2N1311	25p
BC182	12p	2N1392	25p
BC183	12p	2N1304	75p
BC184	14p	2N1308	75p
BC187	32p	2N1305	75p
BC212	22p	2N1613	22p
BC218	12p	2N1613	22p
BC244	17p	2N1711	22p
BC261	40p	2N1893	32p
BC278	32p	2N2102	80p
BCV770	20p	2N2160	120p
BD131	24p	2N2222	22p
BD124	140p	2N2222	22p
BD131	24p	2N2369	15p
BD132	67p	2N2484	32p
BD135	54p	2N2546	32p
BD136	85p	2N2804/A	22p
BD139	85p	2N2806/A	22p
BD140	85p	2N2806/A	22p
BDV56	225p	2N2907A	9p
BF115	24p	2N2928RB	9p
BF167	25p	2N2928G	11p
BF170	25p	2N3083	22p
BF173	27p	2N3084	85p
BF177	28p	2N3085	85p
BF178	30p	2N3439	72p
BF179	35p	2N3442	131p
BF180	35p	2N3565	34p
BF181	35p	2N3702	14p
BF184	24p	2N3704	14p
BF186	24p	2N3704	14p
BF194	13p	2N3705	14p



## Receivers and Components

**ELECTRONIC DEVICES** and Semiconductors. Components for this month's projects. SAE lists. NKM, 32 Seaside, Eastbourne, Sussex. Tel: 32921.

**LEDs.** Mixed bags of 4 different sizes and 4 different colours. 50 at £5.25, 100 at £9.25, including VAT and post and packing. CWO. Michael Williams Electronics, 47 Vicarage Avenue, Cheddar Hulme, Cheshire SK8 7JP.

### BRAND NEW COMPONENTS BY RETURN.

**Electrolytic capacitors 10V, 25V, 50V.**—0.47, 1.0, 2.2, 4.7 & 10µfd.—5p, 22, 47—3p, (50V—5p), 100—7p (50V—5p) 220—3p, (50V—10p) 470—1p, (50V—16p) 1000/10V—15p, 1000/25V—15p, 1000/50V—22p.

**Subminiature bead tantalum electrolytics.**—0.1, 0.22, 0.47, 1.0, 2.2 @ 25V, 4.7/7.5V—41p, 10/25V—43p, 22/16V, 47/6V, & 100/3V—15p.

**Mullard miniature ceramic E12 series 2% 63V.** 10pf. to 47pf.—3p, 56pf. to 330pf.—4p.

**Vertical mounting ceramic plate 50V.** E12 series 22pf-1000pf. E6 series 1500pf-47000pf.—2p.

**Polystyrene E12 series 63V horizontal mounting.** 10pf to 10000pf.—3p, 1200pf. to 10000pf.—4p.

**Mullard polyester 250V vertical mounting E6 series.** 0.01 to 0.1—4p, 0.15, 0.22—5p, 0.33, 0.47—8p, 0.68—11p, 1.0—13p, 1.5—20p, 2.2—22p.

**Mylar (Polyester) Film 100V vertical mounting.** 0.001, 0.002, 0.005—3p, 0.01, 0.02—4p, 0.04, 0.05—4p.

**Miniature resistors Highstab E12 series 5%.** Carbon Film 0.25W 1Ω to 10MΩ. (10% over 1MΩ)—1p. Metal Film 0.125W, 0.25W & 0.5W 10Ω to 2MΩ.—1p. Metal Film 1W, 2W to 10MΩ.—2p ea.

1N4148—3p, 1N4002—5p, 1N4006—7p, 1N4007—8p, BC107/8/9, BC147/8/9, BF157/8/9 & BF194 & 197—8p. Fuses 20mm. glass. 1/2" glass & 1" ceramic. 21p. Post 10p. (Free over £4.00) Prices inclusive of VAT.

## THE C. R. SUPPLY CO.

127, Chesterfield Rd., Sheffield S8.

**SEMICONDUCTORS:**— IN914E 3p each £1.80/100, £13/1,000. 800v 1 amp (1N4006 equiv.) 5p each, £4/100, £35/1,000. Zeners:— 2.2-36v 5p each, £4/100 (no mix), £4.50/100 (mix). G.P. Silicon Diodes:— 2p each, £1.50/100, £10/1,000. OA90/91 etc 4p each, £3/100. Ltd Qty. Branded Transistors:— BC212L 9p each, ZT 212 10p each, 2N2955 £1 each, 2N3054 £0.40 each, 2N3716 £1.50 each. CZ11 Thermistor 20p each, 10 for £1.50. S.A.E. for lists. P+P 20p. Bale Electronics, "Nanock," Dalton, Lockerbie, Dumfriesshire.

**TRANSISTORS,** capacitors, resistors, diodes, pots, plugs and sockets etc. All top quality at 65 Railway Road, Leigh.

NOSTALGIA

## VINTAGE RADIO

1920 to 1950

COLLECTING

Receivers, valves, components, service data, historical research, books, magazines, repairs and restorations. A complete service for the collector and enthusiast of vintage radio.

S.a.e. with enquiries and for monthly newsletter. Full 1977 catalogue, 70p post paid.

**TUDOR REES (Vintage Services), 84, Broad Street, Staple Hill, Bristol, BS16 5NL. Tel. Bristol 505472.**

# SMALL ADS

The prepaid rate for classified advertisements is 17 pence per word (minimum 12 words), box number 40p extra. Semi-display setting £14.00 per single column inch (2.5cm). All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance, should be sent to the Classified Advertisement Manager, Practical Wireless, Room 2337, IPC Magazines Limited, King's Reach Tower, Stamford St., London, SE1 9LS. (Telephone 01-261 5846).

## CONDITIONS OF ACCEPTANCE OF CLASSIFIED ADVERTISEMENTS

1. Advertisements are accepted subject to the conditions appearing on our current advertisement rate card and on the express understanding that the Advertiser warrants that the advertisement does not contravene any Act of Parliament nor is it an infringement of the British Code of Advertising Practice.
2. The publishers reserve the right to refuse or withdraw any advertisement.
3. Although every care is taken, the Publishers shall not be liable for clerical or printers' errors or their consequences.

## VALVES

Radio - T.V. - Industrial - Transmitting  
We Dispatch Valves to all parts of the world by return of post, Air or Sea mail, 2700 Types in stock, 1930 to 1976. Obsolete types a speciality. List 20p. Quotation S.A.E. Open to callers Monday to Saturday 9.30 to 5.00 closed Wednesday 1.00. We wish to purchase all types of new and boxed Valves.

### COX RADIO (SUSSEX) LTD.

Dept. P.W. The Parade, East Wittering, Sussex PO20 8BN  
West Wittering 2023 (STD Code 024366)

**SURPLUS TRANSISTOR Amplifier Modules** 75p each, Ex GPO Multimeters 20,000Ω/V DC, with leads and leather case, £8.00, plus 50p P&P. Ex GPO Cutters and Pliers, 75p each. Archer, 9 Pine Grove, Maidstone, Kent.

## TOUCH CONTROLLED LIGHTING KITS

These KITS replace conventional light switches and control 300W of lighting. No mains rewiring. Insulated Touch Plates. All with full instructions. NEW! TSD300K—TOUCHSWITCH and DIMMER combined. ONE touch plate to switch light on or off. Brightness controlled by small knob—£4.95  
TS300K—TOUCHSWITCH. TWO touchplates. £3.67  
TSA300K—AUTOMATIC TOUCHSWITCH. Stays on for preset time. £3.67

LD300K—LIGHTDIMMER KIT. £2.45

AY-5-1230 4-digit CLOCK/APPLIANCE Timer £4.90

LOW PRICES!	CMOS (Motorola)	
4000 16p	4013 51p	4040 97p
4001 16p	4015 51p	4049 48p
4002 16p	4016 51p	4077 43p
4007 16p	4017 51p	4501 55p
4011 16p	4023 17p	4519 55p
4012 17p	4025 17p	4566 18p

TRIACS 400V T0220 555 8 pin dll 36p 100 + 25p  
Case isolated tab 44 8 pin dll 24p  
8.5A 78p Diac 21p 1N6027 (PUT) 34p  
6.5A with trigger 80p 1N3055 38p

**QUANTITY DISCOUNTS ON REQUEST**  
Add 8% VAT plus 25p P & P. Mail Order only to:

**T. K. ELECTRONICS (PW)**  
106 Studley Grange Road, London, W7 2LX.

## ORCHARD ELECTRONICS

I.C.s TTL C/Mos. Linear. Capacitors. Resistors. (E12) SIL Rectifiers. Diodes. LED. Thyristors. Zeners. Voltage Reg. DiL Sockets. Bridge Rectifiers. Potentiometers. Presses. Traces. Disc. Plugs. Sockets. Cable. Vero. Carefully selected range, excellent despatch service. Same day turn round. S.A.E. List. Suppliers to A.E.R.E. U.K.A.E.A. Governments Depts. Schools. Universities. Manufacturers. Accounts opened for trade and amateur. Join the professionals. Phone by 4 p.m. Goods out 1st class by 5 p.m. Try us and prove it!

**ORCHARD ELECTRONICS**  
Flint House, High Street, Wallingford, Oxon. Telephone 0491-35529

## Books and Publications

### RADIO BOOK SERVICE

World Radio TV Handbook 1977	£5.75
The Cathode Ray Oscilloscope and its Uses	£3.50
1st & 2nd Books of Transistor Equip & Substitutes (Set)	£1.50
Radio Receiver Constr'n using ICs & Transistors	£0.70
Radio Antenna H'book for Long Dist. Receptn.	£0.95
79 Electronic Novelty Circuits	£0.85
Audio Enthusiasts Handbook	£0.95
The Complete Car Radio Manual	£0.85
Solid State Power Supply Handbook	£0.95
ICs & Transistor Gadgets Construction Handbook	£0.70
Integrated Circuit Equip & Substitutes Handbook	£0.95
Manual of Electronic Circuits for the Home	£0.95
Electronic Gadgets & Games	£0.95

PRICES INCL. P&P. SEND S.A.E. FOR FULL LIST. NOTE NEW ADDRESS  
4 CHICHESTER COURT, WICKHAM RD, BUCKINGHAM KENT MK8 2JW

**SIMPLIFIED TV REPAIRS.** Full repair instructions individual British sets £4.50, request free circuit diagram. Stamp brings details unique TV Publications (Ausepw), 76 Church Street, Larkhall, Lanarkshire.

**YOU CAN'T HELP BUT MAKE MONEY.** If you follow the planned and detailed information on how to start your own business rewinding ARMATURES, set out in the new manual which is profusely illustrated and leads you through easily understood stages of fault diagnosis, taking data, test procedures, laying down new windings, where to obtain work, how to cost jobs, etc. NO PREVIOUS ELECTRICAL KNOWLEDGE REQUIRED. Complete instruction manual, £4.00 plus P&P. CWO. Copper Supplies, 102 Parrswood Road, Withington, Manchester 20. DEPT PWB.

## Aerials

### G2DYM SWL AERIALS

All aerials custom built by G2DYM, Ex-B.B.C. Transmitter and Aerial Engineer. CONSULT US for DESIGN & ADVISORY SERVICE, send large S.A.E., 3 9p stamps. We will quote you for Custom building aerials to your requirements, enclosing free a 3 page aerial article.

**LAMBDA ANTENNA STUD FARM**  
Whiteball, Wellington, Somerset

## Ladders

**LADDERS.** Varnished. 20ft 9in extd. £25.33. Carr. £1.90. Leaflet. Also alloy ext. up to 62½ft. The Ladder Centre (WLS), Halesfield (1), Telford, Salop. Tel: 586644. Callers welcome.

## Educational

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

## Courses

**BE A SUCCESSFUL TV ENGINEER.** Join our Full-time Two-year College Diploma Course, specially designed to cover the examinations of the City and Guilds Radio, Television and Electronics Technician's Certificate. Full theoretical and practical instruction on all types of modern receivers including the latest colour sets. Enrolments are now under way for September 1977. Minimum entrance requirements are Senior Cambridge or 'O' Level, or equivalent in Mathematics and English. September includes a specialised Colour TV and FM Stereo servicing course, plus a 2nd year Technicians' Course. Contact us for free prospectus, THE PEMBRIDGE COLLEGE OF ELECTRONICS, Dept. PW, 34a Hereford Road, London W2 5AJ. Tel: 01-229 9117.

## Business Available

**SHREWSBURY.** Thriving electronics and electrical trade business. Excellent trading position in this busy market town. Previous experience in the trade not essential. Easily run by husband and wife. Premises to be let on lease. £11,000 for goodwill, fixtures and fittings. S.A.V. FULL INFORMATION FROM COOPER AND GREEN, 3, Barker Street, Shrewsbury, Tel. 50081.

**LARGE SUPPLIERS OF SERVICE SHEETS AND COLOUR MANUALS**  
**TV, RADIO, TUNERS, TAPE RECORDERS, RECORD PLAYERS, TRANSISTORS, STEREOGRAMS, RADIOGRAMS.**  
**ALL AT 75p EACH EXCEPT COLOUR TV & CAR RADIOS.**

PLEASE STATE IF CIRCUIT WILL DO, IF SERVICE SHEET NOT IN STOCK. LARGE S.A.E. WITH ALL ENQUIRIES & ORDERS OTHERWISE CANNOT BE ATTENDED TO. UNCROSSED P.O.'s OR CROSSED P.O.'s RETURNED IF SERVICE SHEETS ARE NOT AVAILABLE. ALL SERVICE MEN, PLEASE NOTE, WE OPERATE A SAME DAY RETURN SERVICE, ALL CLAIMS OF NON-DELIVERY SHOULD BE MADE WITHIN SEVEN DAYS. NO OVERSEAS MAIL PLEASE. MAIL ORDER ONLY OR 'PHONE 01-458 4882. FREE TV FAULT TRACING CHART OR TV LIST ON REQUEST WITH ORDER.

**C. CARANNA, 71 BEAUFORT PARK, LONDON, NW11 6BX. NO CALLERS PLEASE**

**BELL'S TELEVISION SERVICES** for Service Sheets on Radio, TV, etc., 75p plus SAE. Colour TV Service Manuals on request. SAE, with enquiries to BTS, 190 Kings Road, Harrogate, N. Yorkshire. Tel: (0423) 55885.

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

**SERVICE SHEETS** for Radio, Television, Tape Recorders, Stereo etc. With free fault-finding guide, from 50p and SAE. Catalogue 25p and SAE. Hamilton Radio, 47 Bohemia Road, St. Leonards, Sussex.

**For Sale**

**BARGAIN PACK** 1,000 assorted nuts and bolts. 2, 4 and 6 BA. NEW, Cadmium plated. Value at least £12. Only £4 inc. P&P. CWO. (UK only). Refund if not delighted. A.P., 171 Great Brays, Harlow, Essex CM18 6DT.

**NEW ISSUES** of "Practical Wireless" available from April 1974 edition up to date. Price 65p post free.—Bell's Television Services, 190 Kings Road, Harrogate, N. Yorkshire. Tel (0423) 55885.

**MAIL ORDER PROTECTION SCHEME**

The Publishers of *Practical Wireless* are members of the Periodical Publishers Association which has given an undertaking to the Director General of Fair Trading to refund monies sent by readers in response to mail order advertisements, placed by mail order traders, who fail to supply goods or refund monies owing to liquidation or bankruptcy. This arrangement does not apply to any failure to supply goods advertised in a catalogue or in a direct mail solicitation.

In the unhappy event of the failure of a mail order trader readers are advised to lodge a claim with *Practical Wireless* within three months of the date of the appearance of the advertisement, providing proof of payment. Claims lodged after this period will be considered at the Publisher's discretion. Since all refunds are made by the magazine voluntarily and at its own expense, this undertaking enables you to respond to our mail order advertisers with the fullest confidence.

For the purpose of this scheme, mail order advertising is defined as:—

'Direct response advertisements, displays or postal bargains where cash had to be sent in advance of goods being delivered'. Classified and catalogue mail order advertising are excluded.

**SERVICE SHEETS — COLOUR TV SERVICE MANUALS**

Service Sheets for Mono TV, Radios, Record Players and Tape Recorders 75p. Please send large Stamped Addressed Envelope. We can supply manuals for most makes of Colour Television Receivers by return of post.

**B.R.C. PYE ECKO PHILIPS ITT/KB SONY G.E.C. HITACHI BAIRD ULTRA INVICTA FERGUSON H.M.V. MARCONI AND MANY MORE**

Let us quote you. Please send a Stamped Addressed Envelope for a prompt reply. Also comprehensive T.V. repair manuals by J. M. Court. S.A.E. for details. MAIL ORDER ONLY

**G. T. TECHNICAL INFORMATION SERVICE**

**10 DRYDEN CHAMBERS, 119 OXFORD ST., LONDON W1R 1PA**

**Wanted**

**SURPLUS???** Turn it into cash. Phone: 0491 35529 (Oxon).

**WANTED NEW Valves, transistors, I.Cs, amplifiers, receivers, televisions (Anything Useful) any quantity.** Stan Willets, 37 High Street, West Bromwich. Tel: 021-553 0186.

**WANTED—NEW VALVES, TRANSISTORS. TOP PRICES,** popular types. Kensington Supplies (C), 367 Kensington Street, Bradford 8, Yorkshire.

**Electrical**

**STYLI CARTRIDGES & AUDIO LEADS** etc. For the best at keenest prices send S.A.E. for free illustrated list to: Felstead Electronics (PW), Longley Lane, Gatley, Cheshire, Cheshire SK8 4EE.

**Miscellaneous**

**AERIAL WIRE.** High quality p.v.c. covered multi-strand copper, 50ft, 85p (15p); 75ft, £1.28 (17p); 100ft, £1.67 (23p); 150ft, £2.51 (34p); 200ft, £3.36 (39p); 250ft, £4.19 (46p); 300ft, £4.97 (48p); P&P in brackets. A.1 Radio Components, 19 The Borough, Canterbury, Kent CT1 2DR.

**ARMATURE & COIL WINDING ENAMELLED COPPER WIRE**

Only top quality materials supplied. All orders dispatched within 24 hrs.

S.W.G.	1 lb reel	1/2 lb reel
16 to 19	£2.95	£1.60
20 to 23	£3.15	£1.80
24 to 27	£3.45	£1.90
28 to 31	£3.65	£2.10

All prices are inclusive of P. & P. in U.K.

**COPPER SUPPLIES, 162 Parrowood Road, Withington, Manchester 20. Tel: 061-445 8753**

**CIRCOSOL.** Solder-Through Coating prevents oxidation and fingerprint formation on printed circuit boards. Greatly eases "Soldering in" components by increasing "wetability". Gives a lasting professional finish. 95p per pack/P&P 20p. Audio Services, 13 Hale Street, Warrington WA2 7BU.

**Bargain Boards**

New equipment PCB's with 100% re-usable components.

- Inverter 12 & 24V DC in 240V AC out untested new equipment £1.00
  - Boards with min. of 600V thyristor plastic transistor caps etc. All long leads. 50p
  - Boards with min. 2 x high speed plastic power TIP41A type good for Hi Fi O.P. 50p
  - Ex. equip. TO3 2N3055 type. 30p
- Add 10p p & p. 20p overseas.

**R. JONES SUPPLIES.**

**3, Centre Vale Close, Littleborough, Lancs. OL15 9EZ.**

**Miscellaneous**

**OUTSTANDING HI-FI FM TUNER,** comprises 7 transistor superhet design with Varicap tuning, AFC. Latest silicon circuitry, full coverage 88-102MHz. Supplied built and tested with metal front, panel and instruction sheet. Only £9.95 plus 30p P&P. Gregg Electronics, 86-88 Parchmore Road, Thornton Heath, Surrey.

**ENAMELLED COPPER WIRE**

swg	1 lb	8oz	4oz	2oz
14-19	2.40	1.20	.80	.50
20-29	2.45	1.00	.82	.59
30-34	2.60	1.70	.89	.64
35-40	2.85	1.90	1.04	.75

Inclusive of p&p and VAT.

SAE brings Catalogue of copper and resistance wire in all coverings.

**THE SCIENTIFIC WIRE COMPANY**

PO Box 38, London E4 9BW  
 Reg. Office: 22 Coningsby Gardens,

1 mm 9v P.C. POWER DRILL uses p.p. 9 Safe Reliable Guaranteed. 2.1 mm drills supplied. £3.95. c.w.o. P. E. LTD., Coedaben, Wrexham, Clwyd.

**THE BRITISH RADIO TECHNICAL ADVISORY SERVICE** and The British Telecommunication Equipment Servicing Centre for all makes of modern Transceivers, Receivers, details. s.a.e. G2DYM Projects, Yaesu Agents, Lambda, Whiteball, Wellington, Somerset.

**SUPERB INSTRUMENTS CASES** by Bazelli, manufactured from heavy duty PVC faced steel. Hundreds of people and industrial users are choosing the cases they require from our vast range, competitive prices start at a low 82p. Examples: width, depth, height, 8in x 5in x 3in, £1.70. 10in x 6in x 3in £2.42, 10in x 8in x 3in £3.02. 12in x 10in x 3in £3.96. 8in x 4in x 4in £1.98. 10in x 6in x 4in £2.97. 12in x 8in x 4in £3.96. 7in x 7in x 5in £2.91. 8in x 10in x 6in £3.96. 12in x 8in x 7in £4.40. 12in x 12in x 7in £4.84. Plus 85p carriage and 8% VAT. Over 400 models to choose from. Prompt despatch. Free literature (stamp would be appreciated). Bazelli, Dept. No. 25, St. Wilfrid's, Foundry Lane, Halton, Lancaster LA2 6LT.

**RECHARGEABLE BATTERIES.** 'AA' pen-cell (HP7), £1.26; Sub 'C', £1.29; 'C' (PH11), £2.38; 'D' (HP2), £2.92; PP3, £4.98. Matching chargers: £5.91 each except PP3 charger, £4.99. Charging holders for 2, 3, 4, 5 or 6 pen-cells, 35p. 'C' and 'D' size holders, 4 cell only, 50p. Prices include VAT. Add 10% post, package and insurance orders under £20. 5% over £20. SAE for full details plus 75p for 'Nickel Cadmium Power' booklet. Mail orders to SANDWELL PLANT LTD., 201 Monmouth Drive, Sutton Coldfield, West Midlands. Tel: 021-354 9764. Callers to T.L.C. 32 Craven Street, Charing Cross, London WC2.

**H. M. ELECTRONICS**

**278a FULWOOD ROAD, BROOMHILL, SHEFFIELD S16, 3BD.**

**SEC. CABINETS (illus'd)**



**METAL CASES DRY TRANSFER LETTERING**  
 Send 18p for leaflets (Refundable)  
 Trade enquiries invited

**ALARM BUZZERS 3-12 VOLT**  
Solid State Type AS1 £1.00 ea

**MORSE PRACTICE OSCILLATORS**  
Built-in Key Type M.P.O. 1 £2.00 ea

**MINIATURE PLUS-IN RELAYS (VARLEY)**  
12 of 24 v. d.c. 4p, 6p, dust covers 40p ea

**SPECIAL OFFER: 3 Relays for £1.00**  
VAT inclusive prices—please add 20p per item p & p.

**BB SUPPLIES (Dept. D), 67 Westliff Road,  
Ramsgate, Kent, CT11 8NP**

**MAKE YOUR OWN PRINTED CIRCUITS**

**RUB-ON TRANSFERS**—Starter pack (5 sheets, lines, pads, i.c. pads) £1.30. Spare sheets 27p.

**FERRIC CHLORIDE**—1lb bags 70p (p.&p. 30p)\*

**SOLDERCON SOCKETS**—100 65p. Quantity prices.

**PLASTIC SUPPORTS**—7 or 8 hole, 6p/pair.

**TRANSISTOR TESTER**—£7 (p.&p. 30p)\*

SAE lists, samples, P.&p. 15p/order except \*.

**P.K.G. ELECTRONICS**  
OAK LODGE, TANSLEY, DERBYSHIRE

**100 RESISTORS 75p**  
1w 8% C/Film 2.2Ω—2.2MΩ (E12)  
10 each of any value

**C90 CASSETTES 30p** All Cassettes in Plastic Case with Index and Screwed Assembly.

**C90 CASSETTES 45p**

All prices include VAT. Add Postage 10p in £1.  
Send stamp envelope for free samples.

Quantity Discounts:  
10 Units 5%  
50 Units 7%  
100 Units 10%

**SALOP ELECTRONICS**  
23 WYLE COP  
SHREWSBURY  
Tel. 33208

**S I N T E L**

**FREE CATALOGUE BY RETURN**

**FOR BY RETURN DELIVERY**

PHONE OXFORD  
0865 49791

OR WRITE TO

**SINTEL**  
P.O. BOX 75F  
209 Cowley Road  
OXFORD

**BUILD THE TREASURE TRACER**

**MK III Metal Locator**

- Various tuning
- Britain's best selling metal locator kit
- Fitted with Faraday shield.
- Speaker and earphone operation
- 4,000 already sold
- Knocks down to only 17in.
- Prebuilt search coil assembly
- Thoroughly professional finish
- As seen on BBC1 and BBC2 TV
- You only need soldering iron, screwdriver, pliers and snips
- Five translator circuit
- Send stamped, addressed envelope for leaflet

Complete Kit £15.95 Built & tested £20.95  
Post £1.20 + £1.37 VAT Post £1.20 + £1.77 VAT

**MINIKITS ELECTRONICS,**  
14 CLEVELAND ROAD,  
LONDON, E18 2AN (Mail order only)

**£29**

**TYPE AD118**

**HIGH QUALITY AUDIO SIG GENERATOR**  
(A JOHN LINSLEY HOOD DESIGN)  
**IDEAL FOR HI FI TESTING.**

Range 10Hz-100Khz. Sine/Square. Output 1V attenuated. Distortion below .02%. 9V battery. Kit of parts £19.50. \*Tax extra 8% P.P. & INS £1.

Other Instruments: T.H.D. Analyser, Milliv V/mtr, F.M. Sig gen. P.S.V.O.-80V 1 amp. etc. **SAE FOR LEAFLETS.**

**TELERADIO ELECTRONICS**  
325 Fore St. London. N.9. 01-807 3719

**HOW'S THE QRM?**

FREE DX from tiring whistles and CW interference, FAST, with a Tunable Audio Notch Filter. Easy kit includes ALL parts, case, printed circuit, screws etc, postage, instructions, money back assurance. MORE RARE DX for only £7.90. SEND TODAY.

**CAMBRIDGE KITS**  
45 (PW) Old School Lane, Milton, Cambs.

**PRINTED CIRCUITS and HARDWARE**

Readily available supplies of Constructors' hardware, Aluminium sheet and sections. Printed circuit boards, top quality for individual designs. Prompt service. Send 25p for catalogue. From:

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

**NOTICE TO READERS**

When replying to Classified Advertisements please ensure:

- That you have clearly stated your requirements.
- That you have enclosed the right remittance.
- That your name and address is written in block capitals, and
- That your letter is correctly addressed to the advertiser.

This will assist advertisers in processing and despatching orders with the minimum of delay.

**ELECTRONIC BROKERS LTD**

**Computer parts for hobby, experimental, educational and professional use.**

**FRESH STOCKS OF THE POPULAR CLARE-PENDAR ASCII KEYBOARD TYPE KB6 NOW TO HAND**

ASCII-Coded TTL-compatible 4-bank alphanumeric keyboards with ROM encoder chip, strobed output, two-key rollover and debounce. Standard 7-bit ASCII code (no parity) Supplied complete with circuit diagrams and code chart.

**SPECIFICATIONS**  
Power Supply: +5VDC +/- 5%, 150mA. -12VDC +/- 10%, 10mA. Output Logic Levels: Data Bits 1 through 7: 0" 45V, 2.6v "1" .25V. Fan Out: One standard TTL load. Strobe: 2.6v "1" 5.25V; 0v "0" 46V. Fan Out: 10 standard TTL loads. Strobe signal delay 10 milliseconds nominal to allow data to stabilize.

**KB6: 56-station standard Teletype layout, AS RECOMMENDED FOR PRACTICAL WIRELESS VIDEO-WRITER PROJECT. Price £39.50 + £1 P&P + 8% VAT (send £43.74).**

**NEW ARRIVALS**

**FABULOUS NEW 96-STATION CRT DISPLAY KEYBOARDS.** 8-bit ASCII code, upper and lower case output PLUS separate numeric pad. TTL Logic. Delayed strobe signal and two-key rollover feature. Mounted in attractive box, overall dimensions 20 1/2 x 7 1/2 x 3 1/2". Price £65.00 + £3 carriage + 8% VAT (send £73.44).

**BCD-CODED 54-STATION KEYBOARD,** brand new, upper and lower case outputs. Mounted on double PCB and set in attractive panel incorporating 5 indicator lamps and on/off switch. Dimensions 15 1/2 x 5 1/2 x 2 1/2". Price £39.50 + £2 P&P + 8% VAT (send £44.82). Also available. A few only of the above model WITHOUT ENCODING OR PANEL. Price £25.00 + £1.50 P&P + 8% VAT (send £28.62).

**18-KEY CALCULATOR KEYBOARDS** (0-9, CK +, -, x, =). Make/break switches mounted on PCB. Overall dimensions 150 x 110 x 40mm. Price £4 plus 50p P&P + VAT (Send £4.86p).

**JUST RECEIVED — SPECIAL PURCHASE OF DATA DYNAMICS MODEL 390 TELETYPE TERMINALS IN BRAND NEW CONDITION.**

**TERMINALS — LARGE STOCKS AVAILABLE.** ASR33 Teletype from £625.00. KSR33 Teletype from £425.00. ASR35 Teletype from £750.00. IBM731/0 Golfball Typewriter from £275.00.

**SPECIAL OFFER**  
Cossor DIDS 401.2A Visual Display Units. 13 lines x 80 characters (8 1/2 x 4 1/2" screen 64 character repertoire with detachable ASCII keyboard (Control device required). Bargain Price: £145.00. Also available Cossor DIDS 402.2A, as above but incorporating control logic. Price £295.00.

**FOR IBM 360 USERS:** Sanders 720 Data Display System consisting of six VDUs, control unit and communications buffer. Complete with connecting cables and technical documentation. Price £2,750.00.

**MINIATURE MATRIX PROGRAMME BOARDS:** Brand new X-Y Matrix boards, with 3mm grating. 3 x 10 positions (1 1/2" x 1 1/2") £4.00. P&P 40p.

**MAGNETIC TAPES.** Manufacturers surplus stocks, brand new in original sealed packing. 1/2" x 2400' £4.00 per reel. P&P extra.

**NAB-centre metal 1" tape spools** 10 1/2" dia. in plastic canister. Min. order quantity 5 for £6.25 + £2.50 P&P + 8% VAT (Send £9.54).

**ELECTRONIC BROKERS LTD**  
49/53 Pancras Road  
London NW1 2QB  
Tel: 01-837 7781

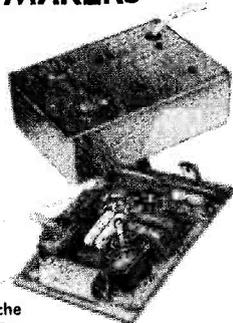
# "SUPER SPARK" Mk5

## NEW ELECTRONIC IGNITION UNIT THAT SAVES MONEY AND IMPROVES PERFORMANCE

### DIRECT FROM THE MAKERS

- ADAPTABLE TO + OR - EARTH AS REQUIRED
- REV. LIMITING CONTROL
- INSTANT REVERT SWITCH TO NORMAL IGNITION
- ON-OFF SWITCH TO IMMOBILIZE ENGINE
- EASY TO INSTALL
- FULLY GUARANTEED
- **VALUE SUPREME!**

Nothing extra to pay for



With Super Spark Mk. 5 you get all the advantages of electronic ignition for your car—year-round easier starting, fuel economy, better working life from the engine PLUS essential features which come as extras in other makes. Built from heavy duty components on improved circuit board, now in heavy gauge aluminium case 6 3/4" x 4 1/2" x 2" with neon indicator and colour coded leads (approx. 27"). **OVER 14,000 SUPER SPARK UNITS HAVE ALREADY BEEN SOLD.** FOR DELIVERY BY RETURN. S.A.E. brings leaflet.

**READY BUILT, TESTED & GUARANTEED, INC. V.A.T.**  
**£12.75**  
POST FREE IN U.K.

**COMPLETE KIT GUARANTEED INC. V.A.T.**  
**£10.50**  
POST FREE IN U.K.

Made in U.K. by  
**STIRLING SOUND (Dept. PW97)**  
37 VANGUARD WAY, SHOEBOURNESS, ESSEX  
Phone (03708) 5543  
Shop—220-224 West Rd., Westcliff-on-Sea, Essex SS0 9DF

## J. BIRKETT

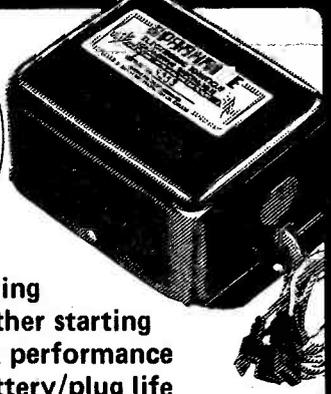
### Radio Component Suppliers

25 The Strait, Lincoln LN21JF Tel: 20767

- 100-0-100UA TUNING METER 1 1/2 x 1 1/2 in square, 90p.
  - 20 ASSORTED VARI-CAP DIODES, untested, 45p.
  - MINIATURE 2-POLE 4-WAY SWITCHES, 20p each.
  - 1 1/2 in DIA. LOUDSPEAKER 8 OHM, 75p each.
  - UNIJUNCTIONS, TIS43 type 20p, MEU21 22p, MV4894 22p, GE4JD5E29 22p.
  - HEAVY DUTY DPDT TOGGLE SWITCHES, 40p each.
  - TEXAS SCR's, TIC47 200PIV 300mA, 18p each.
  - PHONO SOCKETS, single 5p, double 10p, triple 15p, quad 20p.
  - 200 ASSORTED RESISTORS 1/4W, 1W 75p.
  - 100 ASSORTED POLYSTYRENE CAPACITORS, 57p.
  - 100 MULLARD C280 CAPACITORS, assorted, 57p.
  - PLASTIC BC108 OR BC112 TYPE BRANDED TRANSISTORS, 10 for 60p.
  - SILICON SOLAR CELLS 0-5V 5mA, 35p.
  - ZN414 RADIO I.C., with data, £1.
  - TRANSFORMERS 240V A.C. input, type 1 22V 1 amp 88p (20p P. & P.); type 2 22V 300mA, 7V 1 amp, 99p (20p P. & P.); type 3 12V 300mA, 88p (15p P. & P.); type 4 9V 500mA, 88p (20p P. & P.); type 5 50V 2 amp, 50V 500mA, £3-50 (75p P. & P.); type 6 10V 1 1/2 amp twice, 20V 1 1/2 amp twice, £4-50 (85p P. & P.).
  - TWO-PIN DIN SPEAKER SOCKETS, 10p, bank of 2 18p.
  - MINIATURE 8uF 300 V.W. ELECTROLYTICS, 10 for 57p.
  - 500YD REEL OF PVC 14-0048 CABLE, £3.
  - AUDIBLE ALARM SYSTEM, with transistors and I.C., 12V, 75p.
  - TANTALUM BEAD CAPACITORS 0-1uF 35V.W., 0-33uF 35V.W., 1uF 35V.W., 2-2uF 35V.W., 3-3uF 16V.W., 4-7uF 35V.W., 5uF 25V.W., 6-8uF 25V.W., 6-8uF 35V.W., 10uF 25V.W., 15uF 20V.W., 20uF 6V.W., 22uF 16V.W., 33uF 25V.W., 47uF 6V.W., all 9p each.
  - TOKO 55M.H. ADJUSTABLE COILS FOR FILTERS, 18p each.
  - FERRANTI ZTX108 BRANDED TRANSISTORS, 6 for 50p.
  - POWER TRANSISTORS, OC25 50p, AD149 60p, BD112 25p, BD187 25p, BD207 55p.
  - WIDE BAND RADAR AMPLIFIERS, 10-100MHz untested with data, 5 for 57p.
  - 50 ASSORTED BC107-8-9 TRANSISTORS, untested, for 57p.
  - OPTO ISOLATOR LINTRONIX IL-74, with data, 50p each.
  - 0-1uF 160 V.W. POLYESTER CAPACITORS, 20p doz.
  - CA3089Q FM I.F. I.C., £1-40 each.
  - FM FRONT END 88 TO 108MHz with details for conversion to aircraft band or 2 metres, £3.
  - 10 ASSORTED MULTI-TURN TRIM-POTS for 60p.
  - 20 ASSORTED PHOTO AND DARLINGTON TRANSISTORS, untested for £1.
  - 50 AC128 TRANSISTORS, branded but untested for 57p.
- Please add 20p for post and packing on orders under £2, unless otherwise stated. Overseas orders at cost.

# Sparkrite Mk2

## Capacitive discharge electronic ignition kit



- \* Smoother running
- \* Instant all-weather starting
- \* Continual peak performance
- \* Longer coil/battery/plug life
- \* Improved acceleration/top speeds
- \* Optimum fuel consumption

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

Because of the superb design of the Sparkrite circuit it completely eliminates problems of the contact breaker. There is no misfire due to contact breaker bounce which is eliminated electronically by a pulse suppression circuit which prevents the unit firing if the points bounce open at high R.P.M. Contact breaker burn is eliminated by reducing the current to about 1/50th of the norm. It will perform equally well with new, old, or even badly pitted points and is not dependent upon the dwell time of the contact breakers for recharging the system. Sparkrite incorporates a short circuit protected inverter which eliminates the problems of SCR lock on and, therefore, eliminates the possibility of blowing the transistors or the SCR. (Most capacitive discharge ignitions are not completely foolproof in this respect). All kits fit vehicles with coil/distributor ignition up to 8 cylinders.

### THE KIT COMPRISES EVERYTHING NEEDED

Ready drilled pressed steel case coated in matt black epoxy resin, ready drilled base and heat-sink, top quality 5 year guaranteed transformer and components, cables, coil connectors, printed circuit board, nuts, bolts, silicon grease, full instructions to make the kit negative or positive earth, and 10 page installation instructions.

### OPTIONAL EXTRAS

Electronic/conventional ignition switch. Gives instant changeover from "Sparkrite" ignition to conventional ignition for performance comparisons, static timing etc., and will also switch the ignition off completely as a security device, includes: switch connectors, mounting bracket and instructions. Cables excluded. Also available RPM limiting control for dashboard mounting (fitted in case on ready built unit).

**CALLERS WELCOME.** For Crypton tuning and fitting service - 'phone (0922) 33008.

**PRICES INCLUDE VAT, POST AND PACKING.**

**IMPROVE PERFORMANCE & ECONOMY NOW**

Note—Vehicles with current impulse tachometers (Smiths code on dial RV1) will require a tachometer pulse slave unit. £3-35 Inc. V.A.T. p & p.  
**E.D.A. 82 BATH STREET, WALSALL, WS1 3DE.**

**POST TODAY!**

**Quick installation**  
No engine modification required

Electronics Design Associates, Dept., P.W.9  
82 Bath Street, Walsall, WS1 3DE. Phone: (0922) 33652

Name .....  
Address .....

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



# WATFORD ELECTRONICS

(Continued from opposite side)

<b>DIODES</b>	<b>*BRIDGE RECTIFIERS</b>	<b>SPEAKERS</b>
AA119 15p	(plastic case)	5Ω 0.3W 65p
AA215 85p	1A50V 20p	2Ω 5: 3" 85p
AEY11 85p	1A100V 22p	40 Ω 2-5" 65p
BA100 16p	1A200V 25p	64 Ω 2-5" 65p
BA102 16p	1A400V 25p	8Ω 5W 190p
BY100 24p	1A600V 34p	7" x 4" 190p
BY128 14p	2A50V 35p	
BY127 14p	2A100V 44p	
OA9 8p	2A200V 45p	
OA47 8p	2A400V 53p	
OA70 8p	4A100V 72p	
OA74 12p	4A200V 75p	
OA81 15p	4A400V 79p	
OA85 12p	4A800V 125p	
OA90 8p	6A100V 75p	
OA91 6p	6A200V 75p	
OA95 8p	6A400V 85p	
OA200 9p	6A600V 90p	
OA202 8p	6A800V 95p	
IN914 8p	VM18 40p	
IN916 5p		
IN4001/2 5p	<b>ZENERS</b>	
IN4003 5p	Rng: 3-3V-33V	
IN4004/5 7p	400mW 7p	
IN4006/7 7p	1-3W 17p	
IS44 25p		
3A100V* 5p	<b>VARI-CAPS</b>	
3A1400V* 20p	MVAM2 135p	
3A1600V* 27p	MVAM115 95p	
3A11000V* 30p	BB10C 40p	
6A1600V 50p	BB10B 40p	
	<b>Noise Diode</b>	
	Z5J 105p	
<b>SCR's*</b>	<b>ALUM. BOXES</b>	
Thyristors	with lid*	
1A50V 38p	3x2x1" 45p	
1A100V 42p	2 1/2x1 1/2x1 1/2" 64p	
1A200V 47p	4x4x1 1/2" 64p	
1A400V 52p	4x2 1/2x1 1/2" 65p	
1A600V 57p	4 1/2x1 1/2x1 1/2" 70p	
1A800V 62p	4x2 1/2x2" 64p	
3A50V 38p	5x4x2" 82p	
3A100V 43p	6x4x2" 91p	
3A200V 48p	7x5x2 1/2" 114p	
3A400V 53p	8x5x3" 145p	
3A600V 58p	10x7x3" 186p	
3A800V 63p	10x4 1/2x3" 142p	
5A400V 126p	12x5x3" 160p	
7A400V 125p	12x8x3" 205p	
8A400V 156p		
BT106 150p		
C106D 35p		
TIC44 25p		
TIC45 45p		
2N4444 191p		

<b>OPTO ELECTRONICS*</b>	<b>SWITCHES*</b>
LEDS + Clip	TOGGLE 2A 250V
TIL209 Red 13p	SPST 26p
TIL211 Grn 23p	DPDT 35p
TIL220 Red 20p	4 pole on off 50p
1 1/2" Red 17p	
Yellow, Green, Amber	
OCPT70 21p	<b>SUB-MIN TOGGLE</b>
ORP12 40p	SP changeover 50p
2N5777 54p	SPST on off 54p
	DPDT 6 tags 70p
<b>OPTO ISOLATORS</b>	DPDT Centre off 92p
TIL111/2 105p	DPDT Biased 115p
TIL114 115p	
TIL117 164p	
<b>DRIVERS</b>	
75491/75492 90p	
<b>VOLTAGE REGULATORS*</b>	
723 DIL 45p	<b>SLIDE 250V</b>
T03 T05 53p	1A DP 14p
TBA25B 95p	1A DP C O 16p
MC7805 1A 5V 135p	1A DP 13p
MC7815 1A 15V 135p	4 pole 2-way 24p
MC7818 1A 18V 140p	
FTN24 1A 24V 140p	
Variable Type	
1A 15V 190p	<b>PUSH BUTTON</b>
1A 18V 210p	Spring loaded
LM309K 150p	SPST on off 55p
LM326N 12V 240p	SPDT C cover 65p
LM323K 825p	DPDT 6 Tag 85p
LM327N 180p	
LM317K 20W 1-5A 320p	
MVR5 180p	
MVR12 180p	
1A -5V 220p	
1A -12V 220p	
1A -12V 320p	

<b>LAMP HOLDERS AND LAMPS*</b>	<b>SWITCHES* PUSH BUTTON:</b>
LES HOLDER Dome shaped, Red, Blue, Green, Yellow, White 16p	Miniature Non Locking
LES BULBS 6v and 12v 8p	Push to Make 15p Push to Break 25p
MES HOLDERS Chrome cover, Red or Amber, Jewelled top 50p	ROCKER (white): 10A 250V 23p
LES OR MES Batten Holders 10p	SP changeover centre off 20p
MES BULBS 3-5V 6V 12V 9p	ROCKER: (black) on/off 10A 250V 23p
NEONS Mains, Sealed with Resistor, Sq. Top, Red or Grn. Round Top Red 24p	ROCKER: Illuminated (white) 52p
Neon with leads, 95V AC (No resistor) 9p	lights when on, 3A 240V
	ROTARY: (ADJUSTABLE STOP) 1 pole/2-12 way, 2p/2-6W, 3p/2-4W, 4p/2-3W 41p
	ROTARY: Mains 250V AC, 4 Amp 42p
<b>FERRIC CHLORIDE*</b>	<b>KNOB'S*</b> fit 1" shaft with grub screws, except K2 (push fit) & K8 (for sliders),
1lb bag Anhydrous 65p + 30p p. & p.	K1 Black or White pointer type 8p
	K4 Black serrated. Metal top with line indicator 33mm diam. 22p
<b>DALO ETCH RESIST</b>	K4 As above but 25mm diam. 20p
PEN* + spare tip 75p	K5 Black fluted metal top and skirt calibrated 0-10, 37mm diam. 26p
<b>COPPER CLAD BOARDS*</b>	K6 PK2 as K5, pointer on skirt 26p
Fibre Single-Double-SRBP 26p	K7 Black, knurled, tapered. Metal top & skirt. Calib. 0-10, 30mm 25p
Glass sided 7" x 8" 6" x 6" 75p 90p 60p	K8 Black or silvered for slider pot 10p
6" x 12" 130p 175p	K9 Solid Aluminium, Amplifier Knob, Professional type, with etch line indicator 16.5 x 12mm diam. 26p
<b>CASES*</b>	K10 As above but tapered 18.5 x 17mm diam. 26p
NJHC 1 85p	K11 Aluminium, (Top Hat) Knurled body with 18.5mm skirt. Knotted Attractive 30p
NJHC 2 275p	
We stock many more cases, Vero, Classic, NJHC, NJSF ranges, Classic, our Vinyl-coated low cost attractive steel cases (PJ Range).	

# COLOUR ADAPTOR FOR YOUR EXISTING BLACK & WHITE TV GAMES

Are you fed up with playing TV Games in Black and White on your colour set? Grass is Green not Grey! Watford Electronics, the innovators of the renowned "Olympic" Games and the "Sure Fire Rifle" now bring you a unit which can convert your existing TV Games to produce a colour picture.

Improves contrast - Increases Realism - More Fun - Can be built in a couple of hours. Simply wire into your existing unit with a few short wires. Draws only a few milliamps. (Very essential for battery-operated units.)

P.A.L. compatible. (4-43 MHz xtal included.) Uses existing modulators. (Modulators available separately UHF/VHF.) No complicated setting up. Approx. size 4" x 2 1/2" x 1". Designed to work with the "Olympic" and other TV Games using AY-3-8500 IC. e.g. Videomaster, E.T.I., P.E., P.W., etc. (Available in Kit Form or Ready Built and Tested.) KIT PRICE: £9.89 incl. VAT plus 45p p&p insured. Ready Built, and Tested: £11.39 incl. VAT. 45p p&p insured. Ready Built, Tested and Fitted £12.75.

**SPECIAL OFFER**

The "Olympic" TV Games Kit £25.49 incl. VAT (95p p&p insured)  
 "Olympic" Kit in Colour £34.85 incl. VAT (95p p&p insured)  
 "Sure Fire Rifle" Kit for the Olympic £9.50 incl. VAT (40p p&p)  
 "Sure Fire Rifle" Kit for other TV Games £10.25 incl. VAT (40p p&p)

# TV Games IC AY-3-8500 £5.10\*

Demonstration on at our shop. Send SAE for leaflet.

<b>JACK PLUGS</b>	<b>SOCKETS</b>	<b>VEROBOARD*</b> Pitch
Screened chrome body 2.5mm 12p	Open metal with break contacts 8p	0.1 (copper clad) 0.15 (plain)
3.5mm 15p	10p 8p	25 x 33" 30p 28p
MONO 23p	15p 13p	25 x 5" 45p 38p
STEREO 31p	18p 15p	35 x 33" 45p 40p
		35 x 5" 45p 53p
		25 x 17" 134p 107p
<b>DIN</b>	<b>Plugs</b>	35 x 17" 173p 143p
2PIN Loudspeaker 3 4 5 Audio 13p	<b>Sockets</b>	45 x 17" 222p
	<b>In line</b>	Pkt of 36 pins 20p
		Spot face cutter 69p
<b>CO-AXIAL (TV)</b>		Pin insertion tool 89p

# INDEX TO ADVERTISERS

A. H. Supplies ... 329	G2DYM Aerials & Projects ... 382	Radio Book Services ... 382
Alben Engineering ... 320	Greenwell Electronics ... 318	Radio Components Specialists ... 375
Ambit International ... 377	G.T. Technical Information Service ... 383	Radio Exchange ... cover iii
Astro Electronics ... 320	H.A.C. Short-Wave Supplies ... 376	Radio Society of Great Britain ... 329
Bamber B. ... 326	Harversons... 325	Ramar Construction Services ... 384
Barrie Electronics ... 344	H. M. Electronics ... 383	R.S.C. (Hi-Fi) ... 319
Baron Electronics ... 318	Heathkit Limited ... 371	R.S.T. Valve Mail Order ... 379
B. B. Supplies ... 384	Home Radio ... 326	Radio & TV Components Ltd. ... 321
Bentley Acoustic Corp. ... 376	I.L.P. Electronics Limited ... 327	Salop Electronics ... 384
Bi-Pak Ltd. ... 331	Intertext I.C.S. ... 388	Saxon Entertainments ... 323
Birkett, J. ... 385	Jones Supplies ... 383	Scientific Wire Co., The ... 383
British National Radio & Electronics School ... 322, 347, 374, 380	Kramer & Company ... 376	Sentinel Supplies ... 378
Cambridge Kits ... 384	Lektropaks ... 320	Sintel ... 384
Caranna C. ... 383	Lion House ... 329	Sonic Hi-Fi ... 372
Copper Supplies ... 383	Lynx Electronics ... 372	Sonic Sound ... 324
Cox Radio (Sussex) Ltd. ... 382	Manor Supplies ... 328	Southern Valve Co. ... 388
C. R. Supply Co. ... 382	Maplin Electronic Supplies cover iv	S.S.T. Distributors ... 380
Crescent Radio Limited ... 324	Marshall, A. & Sons ... 344	Stirling Sound ... 385
Crofton Electronics ... 328	Minikits Electronics ... 384	Swanley Electronics ... 381
Decon Laboratories ... 377	Monolith ... 378	Tamba Electronics ... 380
Doram ... 378	Newmart Electronics ... 326	Technomatic Ltd. ... 381
Dziubas M.... 377	Newnes-Butterworth ... 322	Teleradio Electronics ... 384
Electronic Design Assoc. ... 385	Orchard Electronics ... 382	Tempus ... 348
Electronic Mail Order ... 322	Partridge Electronics Limited ... 371	T.K. Electronics ... 382
Electronic Brokers Limited ... 328, 384	P.B. Electronics ... 343	Trampus Electronics ... 348
Electrovalue ... 328	P.K.G. Electronics ... 384	Tudor Rees (Vintage) Services ... 382
Elvins ... 378	Precision Pettite ... 330	Vero Electronics ... 324
Fidelity Fastenings ... 318		Watford Electronics ... 386, 387
Flairline Supplies ... 376		West London Direct Supplies ... 330
		Williams, Michael ... 330
		Wilmslow Audio ... 348
		Xeroza ... cover ii
		Z & I Aero Services ... 388



# RADIO EXCHANGE LTD.

**ALL PRICES  
INCLUDE VAT**

## NEW EDU-KIT MAJOR

Completely Solderless Electronic Construction Kit. Build these projects without soldering iron or solder



Total Building Costs **£9.00**

P & P + Ins. £1.10

- ★ 4 Transistor Earpiece Radio
- ★ 7 Transistor Loudspeaker Radio MW/LW
- ★ Batteryless Crystal Radio
- ★ Signal Tracer
- ★ 5 Transistor Short Wave Radio
- ★ One Transistor Radio
- ★ Signal Injector
- ★ Electronic Metronome
- ★ 2 Transistor Regenerative Radio
- ★ Transistor Tester NPN-PNP
- ★ Electronic Noise Generator
- ★ 3 Transistor Regenerative Radio
- ★ 4 Transistor Push Pull Amplifier
- ★ 10 Transistors
- ★ Audible Continuity Tester
- ★ 5 Transistor Push Pull Amplifier
- ★ 21 Capacitors
- ★ Sensitive Pre-Amplifier

Components include: 24 Resistors ★ 21 Capacitors ★ 10 Transistors  
 ★ 5" x 3" Loudspeaker ★ Earpiece ★ Mica Baseboard ★ 3 12-way connectors  
 ★ 2 Volume controls ★ 2 Slider Switches ★ 1 Tuning Condenser ★ 3 Knobs  
 ★ Ready Wound MW/LW/SW Coils ★ Ferrite Rod ★ 6½ yards of wire  
 ★ 1 Yard of sleeving, etc. Complete kit of parts including construction plans.

## VHF AIR CONVERTER KIT

Build this Converter Kit and receive the Aircraft Band by placing it by the side of a radio tuned to Medium Wave or the Long Wave Band and operating as shown in the instructions supplied free with all parts. Uses a retractable chrome plated telescopic aerial, Gain Control, V.H.F. Tuning Capacitor, Transistor, etc.



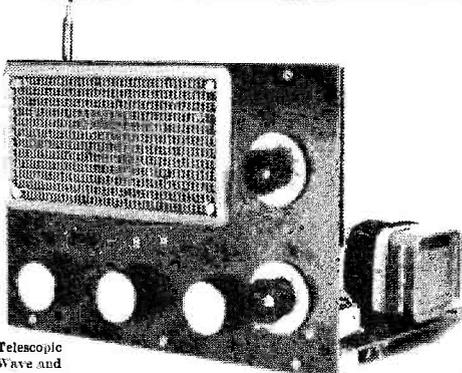
All Parts including Case and Plans. **£3.95**

P & P and Ins. 60p.

## NEW ROAMER TEN MODEL R.K.3.

MULTIBAND V.H.F. AND A.M. RECEIVER  
 13 TRANSISTORS AND FIVE DIODES  
 QUALITY 5" x 3" LOUDSPEAKER

WITH Multiband V.H.F. section covering Mobiles, Aircraft, T.V. Sound, Public Service Band, Local V.H.F. Stations, etc. and Multiband A.M. section with Airspaced Slow Motion Drive Tuning Capacitor for easier and accurate tuning, covering M.W.1, M.W.2, L.W., Three Short Wave Bands, S.W.1, S.W.2, S.W.3, & Trawler Band. Built in Ferrite Rod Aerial for Medium Wave, Long Wave and Trawler Band, etc., Chrome Plated 7 section Telescopic Aerial, angled and rotatable for peak Short Wave and V.H.F. reception. Push Pull output using 600mw Transistors. Gain, Wave-Change and Tone Controls. Plus two Slider Switches. Negative Feedback circuit and SPECIAL POWER BOOSTER SOCKET AND RESISTOR, to virtually double gain if required. Powered by P.P.9 9 volt battery. Complete kit of parts including carrying strap. Building Instructions and Operating Manuals.

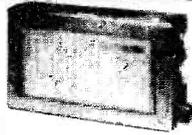


**£13.99** Including Post and Packing

Case Enclosure Kit (if required) £1.90 inc. P & P.

## POCKET FIVE

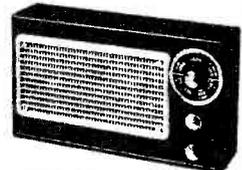
NOW WITH 3" LOUDSPEAKER  
 3 Tuneable wavebands. M.W., L.W., and Trawler Band, 7 stages, 5 transistors and 2 diodes, supersensitive ferrite rod aerial, attractive black and gold case. Size 5½" x 1½" x 3½" approx. **£3.60**



All Parts including Case and Plans. P & P + Ins. 80p.

## NEW Everyday Series

Build this exciting new series of designs.



E.V.5. 5 Transistors and 2 diodes. MW/LW. Powered by 4½ volt Battery. Ferrite rod aerial, tuning condenser, volume control, and now with 3" loudspeaker. Attractive case with red speaker grille. Size 6" x 5½" x 2½" approx. All parts including Case and Plans.

Total Building costs **£4.30** P & P + Ins. 80p.

E.V. 6. Case and looks as above. 6 Transistors and 3 diodes. Powered by 9 volt battery. Ferrite rod aerial, 3" loudspeaker, etc., MW/LW coverage. Push Pull output. All parts including Case and Plans.

Total Building costs **£4.95** P & P + Ins. 90p.

E.V. 7. Case and looks as above. 7 Transistors and 3 diodes. Six wavebands, MW/LW, Trawler Band, SW1, SW2, SW3, powered by 9 volt battery. Push Pull output. Telescopic aerial for short waves. 3" Loudspeaker. All parts including Case and Plans.

Total Building costs **£6.95** P & P + Ins. 90p.

## ELECTRONIC CONSTRUCTION KITS

**ECK2** Self Contained Multi-Band V.H.F. Receiver Kit. 8 Transistors and 3 Diodes. Push/Pull output. 3" Loudspeaker. Gain Control. 7 section chrome plated telescopic aerial. V.H.F. Tuning Capacitor, Resistors, Capacitors, Transistors, etc. Will receive T.V. Sound, Public Service Band, Aircraft, V.H.F. Local Stations, etc. Operates from a 9 Volt PP7 Battery (not supplied with kit). Complete kit of parts including construction plans. **£7.95**

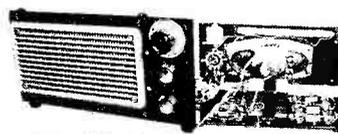
P & P and Ins. 90p.



**ECK4** 7 Transistors, 6 tuneable wavebands, MW, LW, Trawler Band, 3 Short Wave Bands. Receiver Kit. With 5" x 3" Loudspeaker.

Push/Pull output stage, Gain Control, and Rotary Switch. 7 Transistors and 4 Diodes. 6 section chrome-plated telescopic aerial. 8" Sensitive Ready Wound Ferrite Rod Aerial. Tuning Capacitor, Resistors, Capacitors, etc. Operates from a 9 Volt PP7 Battery (not supplied with kit). Complete kit of parts including construction plans. **£7.25**

P & P and Ins. 90p.

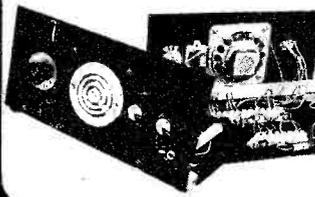


## EDU-KIT JUNIOR

Completely Solderless Electronic Construction Kit. Build these projects without Soldering Iron or Solder.

- ★ Crystal Radio Medium Wave Coverage — No Battery necessary.
- ★ Electronic Metronome.
- ★ One Transistor Radio.
- ★ 4 Transistor Push/Pull Amplifier.
- ★ 2 Transistor Regenerative Radio
- ★ All parts including Loudspeaker, Earpiece, MW Ferrite Rod Aerial, Capacitors, Resistors, Transistors, etc. Complete kit of parts including construction plans.
- ★ 3 Transistor Earpiece Radio Medium Wave Coverage.
- ★ 4 Transistor Medium Wave Loudspeaker Radio.
- ★ Electronic Noise Generator

**£6.55** P & P + Ins. 80p.



**To RADIO EXCHANGE LTD**  
 61A HIGH STREET, BEDFORD MK40 1SA  
 Tel: 0234 52367

**ALL PRICES INCLUDE VAT** Reg. No. 788872  
 ★ Callers side entrance "Lavelle's" Shop.  
 ★ Open 10-1, 2.30-4.30. Mon-Fri. 9-12 Sat.

I enclose £.....  
 for .....  
 Name .....  
 Address .....

PW/977

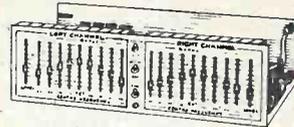
# MAPLIN

## ELECTRONIC ORGAN

The only organ you can build in stages and tailor to your requirements as you go along—and at each stage you'll have a fully working instrument! We haven't got the gimmicks (yet—they're coming soon), but we have got the most beautiful sounds—you won't find them on any organ less than twice our price. So get our MES50 series leaflets now! 65p buys the three available so far.

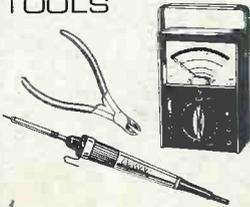


## GRAPHIC EQUALISER



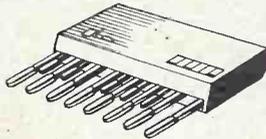
This high quality Graphic Equaliser will enhance even the most sophisticated system at a fraction of the cost of a ready-made equaliser of equal quality. You can get all the parts from us (except woodwork) including drilled and printed metalwork. Construction details in our leaflet: 15p.

## TOOLS



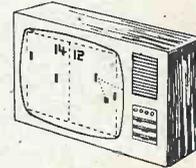
We stock an excellent range of tools especially for the electronics enthusiast. From miniature wiring tools to multimeters including soldering irons and desoldering tools, screwdrivers, cutters, pliers, strippers, miniature electric drills for p.c.b.'s, transistor tester etc. Full details on catalogue pages 167 to 176.

## PEDAL UNIT

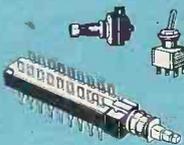
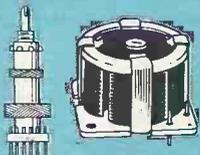


A completely self-contained pedal unit. 13-note, 2-octave range, 4 organ stops. It can be added to any organ! A really unusual extra is the bass guitar stop which uses four envelope shapers to give a real bass guitar sound. A must for the solo guitarist. Full construction details in our catalogue—post the coupon below now!

## T.V. GAME



Play fascinating games NOW on your own tv. in your own living room. The kids will think it's magic when the scores pop up on the screen. Lay your bets—anyone could win—with Maplin's prices everyone can win. Complete kit to play four games only £24.50. Add 35p for copy of construction details. See our June newsletter for details of rifle kit.



Our bi-monthly newsletter keeps you up to date with latest guaranteed prices — our latest special offers (they save you pounds) — details of new projects and new lines. Send 30p for the next six issues (5p discount voucher with each copy).

## MAPLIN ELECTRONIC SUPPLIES

P.O. BOX 3 RAYLEIGH ESSEX SS6 8LR

Telephone: Southend (0702) 715155

Shop: 284, London Road, Westcliff-on-Sea, Essex

(Closed on Monday) Telephone: Southend (0702) 47379

## IT'S A FANTASTIC BESTSELLER!

216 big (11" x 8") pages! Over a thousand illustrations! Over 30 pages of complete projects to build!

Thousands and thousands of useful components described and illustrated! No wonder it's a bestseller!

**DON'T MISS OUT! SEND 60p NOW!**

### POST THIS COUPON NOW FOR YOUR COPY OF OUR CATALOGUE PRICE 60p

Please rush me a copy of your 216 page catalogue by return of post. I enclose 60p, but understand that if I am not completely satisfied I may return the catalogue to you within 14 days and have my 60p refunded immediately.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

PWS

