# VOL 17 No 11 NOVEMBER '88 

ISSN 0262-3617
PROJECTS . . . THEORY . . NEWS COMMENT . . . POPULAR FEATURES

© Wimborne Publishing Ltd 1988. Copyright in all drawings, photographs and articles published in EVERYDAY ELECTRONICS is fully protected, and reproduction or imitations in whole or in part are expressly forbidden.

## Projects

DOORBELL DELAY by Steven Holland
Prevent misuse of the doorbell. Can also be used as a
Prevent misuse of the d
"doorbell" for the deaf
REAR SCREEN ONE-SHOT by T. R. de Vaux-Balbirnie 632
Keep a clear view, without overtaxing your battery
INFRA-RED OBJECT COUNTER by Roger Parsell 635
Programmable counter with digital readout
SEASHELL SEA SYNTHESISER by Andy Flind
Relax to the soothing sounds of the sea
ECG MONITORING INTERFACE 658
Use your BBC Micro to monitor the electrical activity in the body
MICRO ALARM by John Lewis 662
Electronic "guard-dog" for your micro computer

## Series

INTRODUCING DIGITAL ELECTRONICS
by Michael Cockcroft
640
City and Guilds 726/301 Certificate Course
Part Two: Component Identification and Coding
ROBOT ROUNDUP by Nigel Clark 648
Investigating the world of robotics
BBC MICRO by R. A. \& J. W. Penfold 658
Regular spot for BEEB fanatics
ACTUALLY DOING IT by Robert Penfold 664
Mounting control panel components
AMATEUR RADIO by Tony Smith G4FA1 666
New UK Amateur Licence; Voice of the Andes
ON SPEC by Mike Tooley BA 680
Readers' Sinclair Spectrum page

## FequMres

EDITORIAL ..... 629
FOR YOUR ENTERTAINMENT by Barry Fox ..... 650
Satellite D-Day; Technical K.O.
CONSUMER ELECTRONICS by lan Graham ..... 656
A brief report on the UK home entertainment market
SHOPTALK by David Barrington ..... 660
Product news and component buving
CROSSWORD No. 7 ..... 665
Some light-hearted brain teasers
SPECIAL REPORT by Mike Tooley ..... 668
Basic Electronics review ..... 670
A selection of recent releases
DOWN TO EARTH by George Hylton ..... 672
Active Filters; Phase Shift Oscillator
DIRECT BOOK SERVICE ..... 674
Special service to EE readersPRINTED CIRCUIT BOARD SERVICE678
ADVERTISER'S INDEX ..... 684
FREE
GREENWELD 100-page
COMPONENTS CATALOGUE
Readers' Services • Editorial and Advertisement Departments ..... 629

## Introducing DIGITAL <br> ELECTRONICS

## (16) C+G

This exciting new series can lead to a worthwile qualification-and we can supply all the components you need! The first six parts: Everything as listed in the booklet given free last month with EE Just $£ 12.95$ !

Low cost tool kit:
25 Watt mains soldering iron, screwdriver, cutters, snipe nose pliers, wire strippers.

All for $\mathbf{£ 9 . 9 5}$

## NOTICE TO RETAILERS

Greenweld Electronics Ltd. have been appointed Official Wholesalers of Verobloc, Veroboard, Easiwire \& Accessories by Vero. We will be only too happy to supply all your Veroboard requirements at Trade Price. Ring, write or fax us for full information and prices.

## 1989 CATALOGUE FREE with this issue!

However, if someone's beaten you to it, send $£ 1$ straight away for your copy!

* 100 pages of components and equipment
* Low, low prices
* Fast 'by return' service
* Discount Vouchers
* 28 pages of Surplus Bargains
* Only $\mathbf{£ 1}$-send for your now!



The UK Distributor for the Standard Toroidal Transformers

* 106 types available from stock
* Sizes from 15VA to 625VA
* Dual 120 v primaries allowing $110 / 120 \mathrm{v}$ or $220 / 240 \mathrm{v}$ operation


| TYPE | SERIES NO. | SEC VOLTS | PMS CURREN | Trex | SEPGES | SEC VOLTS | RMS CURREN |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 15VA | 03010 | $6+6$ | 1.25 | T82V- | 5951! | 9-9 | 8.89 |
|  | 03011 | 9+9 | 0.83 |  | 83012 | $12+12$ | 6.66 |
| £9.15 | 03012 | $12+12$ | 0.63 | $£ 16.10$ | ctile | $15+15$ | 5.33 |
|  | 03013 | $15+15$ | 0.50 |  | 31016 | $18+18$ | 4.44 |
|  | 03014 | $18+18$ | 0.42 |  | 37015 | $22+22$ | 3.63 |
|  | 03015 | $22+22$ | 0.34 |  | 51.18 | $25+25$ | 3.20 |
|  | 03016 | $25+25$ | 0.30 |  | 671017 | $30+30$ $35-35$ | 2.66 |
|  | 03017 | 30+30 | 0.25 |  | Exele | 35-35 | 2.28 |
| 30VA | 13010 | ${ }^{6}+6$ | 2.50 |  | 58010 | 40.40 | 2.00 1.45 |
| £10.35 | 13011 | $9+9$ | 1.66 |  | 65073 | 110 220 | 1.45 0.72 |
| E10.35 | 13012 | 12+12 | 1.25 |  | 87079 | 240 | 0.65 |
|  | +13013 | $15+15$ $18+18$ | 0.83 | 225vi- | (5) 21 | 32+12 | 9.38 |
|  | 13015 | 22+22 | 0.68 | 59760 | 0.015 | S5-15 | 7.50 |
|  | 13016 | 25+25 | 068 | $\pm 17.60$ | E3alz | ¢8+18 | 6.25 |
|  | 13017 | 30+30 | 0.50 |  | Elots | 22-22 | 5.11 |
| 50VA | 23010 | 6+6 | 4.16 |  | ¢ 5015 | 25,25 | 4.50 |
| f11.55 | 23011 | 9+9 | 2.77 |  | ¢0915 | \$0 $=30$ | 3.75 |
| £11.55 | 23012 | 12+12 | 2.08 |  | Enate | 35-35 | 3.21 |
|  | 23013 | $15+15$ | 1.66 |  | Exars | 20- 50 | 2.81 |
|  | 23014 | $18+18$ | 1.38 |  | Sayst | -5-25 | 2.50 |
|  | 23015 | 22+22 | 1.13 |  | S3513 | 570 | 2.25 |
|  | 23016 | $25+25$ | 1.00 |  | 58026 | 219 | 204 |
|  | 23017 | 30+30 | 0.83 |  | Exars | 82 | $\begin{aligned} & 1.02 \\ & 0.93 \end{aligned}$ |
|  | 23028 | 110 | 0.45 |  | - 120 | - |  |
|  | 23029 | 220 | 0.22 | TOCVA | 73213 | 75-15 | 10.0 |
|  | 23030 | 240 | 0.20 | £19.20 | 730 | 18-68 | 8.33 |
| 80VA | 33010 | 6+6 | 6.66 | 119.20 | 73018 | 22-22 <br> $25-25$ | 6.82 6.00 |
| £12.90 | 33011 | $9+9$ | 4.44 3.33 |  | 72017 | $25-25$ $30+30$ | 6.00 5.00 |
|  | 33073 33012 | $12+12$ $15+15$ | 2.66 |  | 780:8 | 35-35 | 4.28 |
|  | 33014 | $18+18$ | 2.22 |  | 2706 | - $0+40$ | 3.75 |
|  | 33015 | 22+22 | 1.81 |  | 23005 | $45+45$ | 3.33. |
|  | 33016 | $25+25$ | 1.60 |  | 73033 | $50+50$ | 3.00 |
|  | 33017 | $30+30$ | 1.33 |  | 73028 | 110 | 2.72 |
|  | 33028 | 110 | 0.72 |  | $\begin{aligned} & 13029 \\ & 13030 \end{aligned}$ | 220 240 | 1.36 1.25 |
|  | 33029 | 220 | 0.33 | 0 |  | 240 25 |  |
|  | 33030 | 240 | 0.32 |  | 320:6 | $25+25$ $30+30$ | 10.0 <br> 8.33 |
| VA | 43010 | $6+5$ | 10.8 | $\because 25.35$ | 53018 | $35+35$ | 7.14 |
| f13.70 | 43011 | $9+9$ $12+12$ | 6.65 500 |  | 33026 | $40+40$ | 6.25 |
|  | 43013 | $15+15$ | 4.05 |  | -3025 | $45+45$ | 5.55 |
|  | 43014 | 18+18 | 3.35 |  | ミ3033 | $50+50$ | 5.00 |
|  | 43015 | $22+22$ | 2.7\% |  | 83042 | 55+55 | 4.54 |
|  | 43016 43017 | $25+25$ $30+30$ | 28 |  | 83028 83029 | 110 | 4.54 2.27 |
|  | 43018 | $30+30$ $35+35$ | 17 |  | 83030 | 240 | 2.27 2.08 |
|  | 43028 | 110 | 105 | 5250. | 93017 | $30+30$ | 10.41 |
|  | 43029 | 220 | 054 | \$27.95 | 93018 | 35+35 | 8.92 |
|  | 43030 | 240 | 0.5 | $\pm 27.95$ | 93026 | $40+40$ | 7.81 |
|  |  |  |  |  | 93025 | $45+45$ | 6.94 |
|  |  | vis |  |  | -3042 | $55+55$ | 5.68 |
|  |  |  |  |  | 93028 | 110 | 5.68 |
|  |  |  |  |  | 93029 | 220 | 2.84 |
| Prices | include | AT and | carriege |  | 93030 | 240 | 2.60 |

Quantity prices available on request
Write or phone for free Data Pack
Jaytee Electronic Services
143 Reculver Road, Beltinge. Herne Bay, Kent CT6 6PL Telephone: (0227) 375254 Fax: 0227365104


## TMOCREAT



## ...N ONE GREAT KIT!

The K5000 Metal Detector Kit combines the challenge of DIY Electronics assembly with the reward and excitement of discovering Britain's buried past.
THE KIT - simplified assembly techniques require little technical knowledge and no complex electronic test equipment. All stages of assembly covered in a detailed 36 page manual

THE DETECTOR -- features Analytical Discrimination \& Ground Exclusion, backed by the proven pedigree of C-Scope, Europe's leading detector manufacturer.
A comprehensive instruction book is available @ $£ 5$ (deductable from order) Ask at your local Hobby/Electronics shop or contact C-Scope for a copy of a published Field Test Report.

[^0]
## CIRCUIT BOARD ASSEMBLY/REPAIR JIG

It May Be A Little 'Lo-Tech'-But It's Incredibly Handy

Adjustable, rotating heads hold p.c.b.'s firmly but safely for easy assembly or repair. Insert components and simply flip over to solder leaves both hands free for a better job. Supplied with earthing lead for use with CMOS.
Interchangeable heads for holding many other items available.

Each jig hand made for a lifetime of use.

Mini-jig
takes any board
Mini-jig-
£21.50 inc. p \& p Standard jig-
dard jig takes any board
£24.50 inc. p \& p. Cheque or P.O. only please:
EVERETT WORKSHOP ACCESSORIES
5 Railway Terrace, Henllan, Llandyssul,
Dyfed, SA44 5TH, Wales



## PROJECT KITS

Magenta supply Full Kits: Including PCB's (or Stripboard), Hardware, Components, and Cases (unless stated). Please state Kit Reference Number, Kit Title, and Price, when ordering. REPRINTS: If you do not have the issue of E.E. which includes the project, you will need to order the instruction reprint as an extra: 80p each. Reprints are also available separately-Send $\mathbf{£} 1$ in stamps.

| $\begin{aligned} & \text { REF } \\ & \text { NO. } \end{aligned}$ | KIT-TTLE | PRICE | $\begin{aligned} & \text { REF } \\ & \text { NO. } \end{aligned}$ | KIT-TITLE | PRICE |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 32 | SOLDERING IRON TEMPERATURE CONTROLER Oct 88 | 89.50 | $\begin{aligned} & 548 \\ & 546 \end{aligned}$ | ELECTRONIC SCARECROW July 86 PERCUSSION SYNTH June 86 | $\begin{gathered} 68.87 \\ \hline 50.43 \end{gathered}$ |
| 790 | EPROM ERASER Oct 88 | 504.95 | $54$ | PERSONAL RADIO June 86 | $E 11.53$ |
| 791 | breaking glass alarm Sept 88 | ¢17.51 | 543 59 | WATCHDOG June 86 mini Strobe May 96 | $\underset{\text { E13.86 }}{ }$ |
| 7 | AMSTRAD PIT Sept 88 <br> TMME SWTCH Aug <br> 8 | ¢17.61 | 528 | PA AMPLIFER May 86 | ${ }^{726.95}$ |
| 717 | SPIKEATER July 88 | 53.99 | 523 | STERED REVERB APr 86 | F26.4. |
| m | UNINERSAL MICAD CHARGER July 88 | ${ }^{\text {E65 }} \mathbf{4} 51$ | ${ }_{523}$ | VERSATLIE PSU Apr FREELOAOER Apr 86 | c8. |
| 10 | ISOLuxk July 88 | [04.51 | 513 | ${ }_{\text {BBC }}$ MIOL INTERACACE Mar 86 | E27.94 |
| ${ }^{m}$ | VIDEO WIPER July 88 | ${ }^{633.59}$ | 514 | INTERVAL TIMER Mar 86 | c18.87 |
| ${ }_{72}^{103}$ | HEADUGHT REMINDER UUne 88 |  | 515 | STEREO H1-F PRE-AMP | E49.19 |
| M | SUPER SOUND EFFECTS |  | 512 | MANS TESTER \& PUSE FINDER Mat 86 | ${ }_{68}^{68.82}$ |
|  | GENERATOR May 88 | [12.99 | 503 | PUNCTION GENERATOR Feb | ${ }_{6} 8.62$ |
| \% | CABLE \& PPE LOCATOR April 88 | c15.35 |  |  | c18.72 |
| \% | STEREO MOISE GATE April 88 | ${ }_{\text {E2763 }}$ | 433 | digital capactiance meter dec 85 | C41.55 |
| m | INDUCTVE PROXIMITY DET. Aprii 88 |  | 481 | SOLDERING IRON CONTROUER Oct 85 | E5.47 |
| $\underset{m}{m}$ | SEMICONDUCTOR TESTER Mar 88 | ${ }_{623.51}$ | 473 | R.IAAA, PRE-AMP Sept 85 | C16.74 |
| $\pi$ | Le detector Mar 88 | f11.80 | 4 |  | 511.68 |
| 775 | EEVELOPE SHAPER Mar 88 | ${ }_{5} 11.99$ |  | 1035 STEPPER MOTOR EXTRA | c14.50 |
| 74 | SOS ALERT Mat 88 | 9.36 |  | OPTIOMAL POWER SUPPLY PARTS | 55.14 |
| \% |  | E49.73 | 461 | CONTINUITY TESTER July 85 | $\mathrm{EF20}^{20}$ |
|  | CAR LIMP CHECKING SYST. Feb 88 | 77.10 | 459 | AMSTRAD USER PORT July 85 | 817.67 |
| 76 | GAME TIMER FED 88 | ¢14.32 | 45 | ELECTRONIC DOORBEL June 85 | S6 |
| 76 | QuIzMaster Jan 88 | ¢18.96 |  | GRaphic equalser june 85 | ${ }_{\text {c1958 }}$ |
| 77 | TMaNSISTOR CURVE TRACER (BBC) | ${ }_{\text {ctilis }}$ | 42 | GAMES TIMER Jan 85 | f9.11 |
| 78 | AUdio Sigmal generator Dec 87 | ${ }^{113.64}$ |  | SPECTRUM AMPUFIER Jan 85 | 6.91 |
| ${ }_{73} 7$ | DUAL MANNS UGHTS RLASHER Oec 87 | \%20.98 | 417 | DOOR CHIME Dec 84 | ¢18.78 |
| ${ }_{7}^{73}$ | ACCENTED BEAT MEIRONOME Nov 87 | 20.95 | 392 | bbC micro audio storage sco |  |
| 74 | ACOUSTIC PROBE Nov 87 (less bolt \& probe) | f16.26 |  | INTERFACE Nov 84 | ${ }^{236} 25$ |
| 741 | bBC SIDEWAYS RAMROM Nov 87 | 527.53 | 39 | Proximity alarm Nov 84 |  |
| 74 | VIDEO CONTROUER Oct 87 | $\underline{29.14}$ | 501 | DRIII SPEED CONTROUER Oct | ${ }_{\text {f8, }} 88$ |
| 745 | TRANSTEST Oct 87 | E9.70 | ${ }^{381}$ | dilitar head phowe Amplifer Se |  |
| ${ }^{74}$ | AUTOMATIC PORCH UGHT 0ct 87 | E17.17 | 350 | VARICAP AM RLDIO May 84 | E13.15 |
| ${ }_{75}^{73}$ | caravan faidge alert Oct 87 | 5.4 | 363 | EXPERIMENTAL POWER SUPPIY M | ¢23.58 |
| ${ }_{73}^{78}$ | STATIC MONTTOR Oct 87 | ${ }^{6} 8.66$ |  | SIMPLE LOOP BURGLAR ALARM | ¢17.16 |
| ${ }_{728} 7$ | Electronic multimeter Sept 87 | 446.96 | 358 | FISEDIODE CHECKER APr 84 | 64.35 |
| 728 | moise gate sept 87 | $\underline{23.25}$ | 356 | OUASI STEREO ADAPTOR Apr 84 | 513.73 |
| 780 | PERSOMAL STEREO AMP Sept 87 | ¢14.31 |  | SIGMAL TRACER Feb 84 |  |
| ${ }_{74}$ | bunst-rite mains controuler Sept 87 | 113.57 | 337 | BIOLOGICAL AMPLIFIES Jan 84 | [24.14 |
| ${ }_{718}$ | SUPER SOUND ADAPTOR Aug 87 | E38.39 | 334 | CONTINUITY TESTER Dec 83 | 112.59 |
| ${ }_{718}$ | 3 BAMD 1.6-30MHz RADIO Aug 87 | E26.53 | 332 | CHILDREN'S DISCO UGHTS Oec 83 | ¢10.48 |
| 71 | BUCCANEER I.B. METAL DEEECTOR inc. coils | £26.45 | 333 | Novel egc timer dec 83 inc. case | $\underline{12.90}$ |
| 720 | DIGITAL COUNTEMFREQ METER (10MHz) |  | 301 | STORAGE 'SCOPE INTERFACE FOR | 934 |
|  | inc.case July | c67.07 |  | HEL POWER IETEREACE BOARD |  |
| ${ }_{72} 7$ | monomix July 87 | 52.00 | 299 |  | 12.99 |
| 711 | FERMOSTAT Julyb | 512.14 | 292 | USER PORT VO BOARD |  |
| 711 | visual gutiar tuner jun 87 | f22.98 |  | less cable +old | c132 |
| 715 700 |  | f512 | 293 | USER PORT CONTROL BOARD July 83 |  |
| 700 |  |  |  | cable + | 31.67 |
| 107 | EQUAUZER (IONISER) May 87 | ¢15.53 | 277 | mW PERSONAL RADIO less case,May 83 |  |
| ${ }_{7} 7$ | EULP LFE EXTENDER April 87 (less case) | E524 | 278 | MOISTURE DETECTOR May 83 | c6.88 |
| 703 | EXP. SPEECH RECOGNTION APTil 87 | ¢20.98 | 270 | novelt egh timer April 83less case | ${ }^{\text {c6.91 }}$ |
| 700 | active vr burglar alarm Mar 87 | f33.65 | 263 | Buzz Off March 83 |  |
| 51 | VIdeo guard feb 87 | $\mathrm{flg}_{9} 3$ | 262 | PUSH BIIEE ALARM Feb 83 |  |
| 50 | CAR VOLTAGE MONTIOR Feb 87 | ${ }^{\text {f12.58 }}$ | 285 | 2. WAY LINTERCOM July 82 no cas | E5.69 |
| 54 | SPECTRUM SPEECH SYNTH. (no caf Fob 87 | f20.92 | 24 | 2. WA INIERCO Huly b2 no case |  |
| 57 | SPECTRUM VO PORT loss case. Feb 87 | ${ }_{5}^{59.45}$ | 243 | REGG TIMER June 82 | ¢6.96 |
| 579 | STEPPING MOTOR BOOSTER (tor abova)feb 87 |  | 237 | CAR LED VOLTMETER less case. May 82 | c4.00 |
| 53 | HANDS-OF INTERCOm (per station) |  | 235 | CAMERA OR FLASH GUN TRIGGER |  |
|  | inc. cmajan 87 | E10.49 |  | Mar 82 less tripod bushes | ¢1720 |
| 59 | car alarm oec b6 | 512.47 | 205 | SUSTAIN UNIT OCt 81 |  |
| 51 | RANDOM Number generator 0ec 86 | 515.72 | 206 | TAPE NOISE UMITER Oct 81 |  |
| 504 | bBC 16K SIDEWAYS RAM 0ec 86 | 512.97 | 207 | HEADS AND TAILS GAME OCt ${ }^{\text {Pl }}$ | E4.79 |
| 54 | CAR FLASHER WARMING Nov 86 | $\underline{9} 937$ | 211 | PHIZZ BOX 0 ct 81 | 05 |
| 50 | 200MHz OIG. PREQUENCY METER Nov 86 | E62.98 | 197 | 0 O-12V POWFR SUPPLY Sept 81 | $\underline{54.55}$ |
| 52 | 10 WATI AUDIO AMPLIFIER Oct 86 | ${ }_{563} 70$ | 119 |  |  |
| 561 | IIGHT RIDER LAPEL BADGE Oct 86 | E1020 | 149 | GUITAR PRACTICE AMPLIFIER Nov 80 | f27.95 |
| 560 | UGGTT RIDER DISCO YERSION | ${ }_{\text {E19,62 }}$ |  | SOUND TO UGHT Nov 803 channel | c29.38 |
|  | LGGT RIDER 16 LED VERSION | ${ }_{\text {cis }}^{513.54}$ | 124 | SPRING UNE REVERE UNIT Jan 80 | ¢3.27 |
| ${ }_{5}^{556}$ |  | ${ }_{\text {c323, }}$ | 12 | Uniboard burglar alarm dec 79 | 8.38 |
| ${ }_{5} 55$ | PREEZER FAILURE ALARM Sept 86 | ${ }_{615.50}$ | 118 | datkroom timer july 79 | ${ }^{4} 1.03$ |
| 554 | CAA TIMER Sept 86 | 68.72 | 113 | MICROCHIME DOORBEL FEb 79 | f21.98 |
| 53 | batteny tester Aug 86 | ¢7.19 | 111 | SOUNO TO UGHT Sept 78 | \% |
| 54 | tilt Alanm July 86 | E7.82 | 106 | IN STIU TRANSISTOR TESTOR Uun 78 | 57.8 |
| 545 | caravan batierr monitor july 86 | ${ }_{\text {fil }}$ | 101 | ELECTRONIC DICE Mar 77 | 66.26 |

## MAGENTA ELECTRONICS LTD.

## SHOP NOW

OPEN-CALLERS WELCOME
EE70, 135 HUNTER STREET, BURTON-ON-TRENT STAFFS. DE14 2ST.
0283 65435, Mon-Fri 9-5
Access/Barclaycard (Visa) by phone or post.
24 hr Answerphone for credit card orders.
Our prices include VAT

ADD £1 P\&P TO ALL ORDERS PRICES INCLUDE VAT.
SAE ALL ENQUIRIES
OFFICIAL ORDERS WELCOME OVERSEAS: Payment must be sterling
IRISH REPUBLIC and BFPO. UK PRICES.
EUROPE: UK PRICES plus $\mathbf{1 0 \%}$ ELSEWHERE: write for quote SHOP HOURS: 9-5 MON-FRI.

## TOP KITS

## MOSFET VARIABLE BENCH 25V 2.5A POWER SUPPLY



A superb design giving $0-25 \mathrm{~V}$ and $0-2.5 \mathrm{~A}$. Twin par meters indicate Voltage and Current. Voltage is ve able from zero to 25 V .
Current-Limit control allows Constant Current cha ing of NICAD batteries, and protects circuits from ovi load. A Toroidal transformer MOSFET power outf device, and Quad op-amp IC design give excellent p: formance.

## OUR KIT REF. 769 £49.73

## COMPONENTS, KITS, BOOKS, TOOLS, MOTORS, GEARS, PULLEYS, OPTICAL FIBRES, ROBOTICS, AND MUCH MUCH MORE-IN OUR <br> NEW CATALOGUE $£ 1.00$

## INTRODUCING DIGITAL ELECTRONICS

COMPONENT PACK E13.99
DES BREADBOARD AND BATTERY
MOTOR-GEARBOX ASSEMBLIES
Miniature gearboxes complete with quality electric motor. Variable ratios by fitting 1 to 6 gears. $1.5-4.5 \mathrm{v}, 3-2200$ rpm. Long 3 mm shaft. ideal for robots and buggies.

## SMALL (MGS) £3.49 LARGE (MGL) £3.98

## ADVENTURES

## WITH ELECTRONICS

An easy to follow book suitable for all ages. No soldering, uses an S DEC breadhoard. Lots of clear diagrams and instructions to build 16 projects. Component pack includes S DEC and all components for the projects.

## LEGO Technic Sets

TEACHERS WE ARE STOCKISTS OF THE WHOLE RANGE. CONTACT US FOR BROCHURES. VERY COMPETITIVE PRICES AND QUICK DELIVERIES

## STEPPING MOTORS 12 VOLT

 OPTICAL FIBRES TRIAL PACK OF 10 METRES. Nine assorted types \& data.
## 028365435

## FROM MAGENTA

## A SELECTION OF OUR BEST PROJECT KITS

As usual these kits come complete with printed circuit boards, cases, all components, nuts, screws, wire etc. All have been tested by our engineers (many of them are our own designs) to ensure that you get excellent results.
INSULATION TESTER
An electronic High Voltage tester for mains appliances and wiring. An inverter circuit produces 500 volts from a PP3 battery and applies it to the circuit under test. Reads insulation up to 100 Megohms. Completely safe in use.
OUR KIT REF 444 £19.58


## DIGITAL CAPACITANCE METER

Simple and accurate ( $1 \%$ ) measurements of capacitors from a few pF up to 1,000 uF. Clear 5 digit LED display indicates exact value. Three ranges $-\mathrm{pF}, \mathrm{nF}$ and UF. Just connect the capacitor, press the button and read the value.

## £41.55

OUR KIT
REF 493


## 3 BAND SHORTWAVE RADIO

Covers $1.6-30 \mathrm{MHz}$ in 3 bands using modern miniature coils. Audio output is via a built-in loudspeaker Advanced design gives excellent stability, sensitivity and selectivity Simple to build.
OUR KIT REF 718 £25.27

## DIGITAL FREQUENCY METER

## 200 MHz

An 8 digit meter reading from A.F up to 200 MHz in two ranges. Large $0.5^{\prime \prime}$ Red LED display. Ideal for AF and RF measurements, Amateur and C.B. frequencies.
KIT REF 563 £62.98

## 'EQUALISER' IONISER

sgavauser

A mains powered loniser that produces a breeze of negative ions in the air. A compact, safe, simple unit that uses a negligible amount of electricity
KIT REF $707 £ 15.53$


SUPER SOUND -EFFECTS GENERATOR
 A wide range SN76477 sound effects board giving: Bird Chirps, Sirens, Helicopters, Explosions, Phaser Guns Steam Train sounds, and more. Sup plied without a case.
KIT REF 781 £12.99


From the ERTsilioule

## TEACH-IN 88/89 BOOK £2.45

## PRIORITY ORDER FORM

 A complete City and Guilds Certificate Course for 726/303 Introductory MicroprocessorsWritten by Mike Tooley B.A. this course can lead successful readers to a City and Guilds Certificate. Everything you need to know is included-even Pre-test papers, etc. Make sure of your copy, send in the priority order form with your payment now.

Send to Direct Book Service, 33 Gravel Hill, Merley, Wimborne, Dorset BH21 1RW.


The Magazine for Electronic \& Computer Projects VOL. 17 No. 11

## November '88

## MAIL ORDER

AS I write this we are in the middle of a postal strike-hopefully by the remind us just head it the strike will be over! It does, however, serve to and also for
The strike has had a tremendous effect on the mail order companies that supply components-our own p.c.b., back numbers, binders and book service has ground to a halt and we are also unable to get copy to some authors and advertisers for checking. The office FAX is working overtime and so is the 'phone but they do not solve all the problems.

## RIGHTS

The mail order supply of almost anything has become a way of life and this method of supply is usually quick and efficient. A recent incident at home made me realise that for younger readers a few pointers might be helpful.

My son had ordered some parts for his skateboard-when they came he was not happy with the quality and felt he had wasted his money. I pointed out that if he sent them back quickly, undamaged, he could get a full refund of his money. He had not realised that he was entitled by law to such a refund if he was not happy with the goods. Your rights as a consumer are well protected by the law in the U.K. and you should have no hesitation in ordering by mail-postmen permitting.

## BE PATIENT

The aftermath of a postal strike gives the mail order companies even more problems, with an unprecedented amount of mail being delivered. Following a period of little or even no work they then have more than they can cope with. Please be patient if you are waiting for goods-there is no way of knowing when a particular letter will eventually find its destination and, therefore, how quickly the company can despatch the goods.


## SUBSCRIPTIONS

Annual subscriptions for delivery direct to any address in the UK: $£ 14.50$. Overseas. $£ 17.50$ ( $£ 34$ airmail). Cheques or bank drafts (in

f sterling only) payable to Everyday Electronics and sent to EE Subscriptions Dept., 6 Church Street, Wimborne, Dorset BH21 1 JH . Subscriptions can only start with the next available issue. For back numbers see below.

## BACK ISSUES AND BINDERS

Certain back issues of EVERYDAY ELECTRONICS are available price $£ 1.50$ ( $£ 2.00$ overseas surface mail) inclusive of postage and packing per copy. Enquiries with remittance, made payable to Everyday Electronics, should be sent to Post Sales Department, Everyday Electronics, 6 Church Street, Wimborne, Dorset BH21 1JH. In Church Street, Whailability remittance will be the event of non-availabity 28 days for delivery. (We returned. Please allow Sept., Oct., \& Nov. 85, have sold out of Sept., Jan., Feb., April, April, May \& Dec. March \& April 88.)

Binders to hold one volume (12 issues) are available from the above address for $£ 4.95$ (fy 00 overseas surface mail) inclusive of $p \& p$. Please allow 28 days for delivery.
Payment in $£$ sterling only please.

Editorial Offices
EVERYDAY ELECTRONICS EDITORIAL,
6 CHURCH STREET, WIMBORNE,

## DORSET BH21 1JH

Phone: Wimborne (0202) 881749
FAX: (0202) 841692
See notes on Readers' Enquiries below-we reget that lengthy technical enquiries cannot be answered over the telephone
Advertisement Offices
EVERYDAY ELECTRONICS ADVERTISEMENTS
HOLLAND WOOD HOUSE, CHURCH LANE,
GREAT HOLLAND, ESSEX CO 13 0JS. Clacton (0255) 850596

Editor MIKE KENWARD
Secretary PAMELA BROWN
Deputy Editor
DAVID HARRINGTON

## Editorial Assistant

COLETTE McKENZIE
Editorial: WIMBORNE (0202) 881749

## Advertisement Manager

PETER J. MEW Clayton (0255) 850596

## Classified Advertisements

Wimborne (0202) 881749

## READERS' ENQUIRIES

We are unable to offer any advice on the use, purchase, repair or modification of commercial equipment or the incorporaion or modification of designs published in the magazine. We regret that we cannot provide data or answer queries on articles or projects that are more than five years old. Letters requiring a personal reply must be accompanied by a stamped self-addressed envelope or a selfaddressed envelope and international reply coupons.

All reasonable precautions are taken to ensure that the advice and data given to readers is reliable. We cannot, however, guarantee it and we cannot accept legal responsibility for it.
COMPONENT SUPPLIES
We do not supply electronic components or kits for building the projects featured, these can be supplied by advertisers.

## OLD PROJECTS

We advise readers to check that all parts are still available before commencing any project in a back-dated issue.

We regret that we cannot provide data or answer queries on projects that are more than five years old.

## ADVERTISEMENTS

Although the proprietors and staff of EVERYDAY ELECTRONICS take reasonable precautions to protect the interests of readers by ensuring as far as practicable that advertisements are bona fides, the magazine and its Publishers cannot give any undertakings in respect of statements or claims made by advertisers, whether these advertisements are printed as part of the magazine, or are in the form of inserts.
The Publishers regret that under no circumstances will the magazine accept liability for non-receipt of goods ordered, or for late delivery, or for faults in manufactore. Legal remedies are available in respect of some of these circumstances, and readers who have complaints should address them to the advertiser or should consult a local trading standards office, or a Citizen's Advice Bureau, or a solicitor.

## TRANSMITTERS

We would like to advise readers that certain items of radio transmitting equipment which may be advertised in our pages cannot be legally used in the U.K. Readers should check the law before using any transmitting equipment as a fine, confiscation of equipment and/or imprisonment can result from illegal use.

The law relating to this subject varies from country to country; overseas readers should check local laws.


[^0]:     Wotton Road, Ashford, Kent TN23 2LN. Telephone: 023329181.

