

INTERFACE

The monthly magazine published by
the National ZX Users' Club for ZX80,
ZX81 and ZX Spectrum

May 1982, Volume 2, Issue 9



**Contains a host of programs for
Spectrum, ZX81 and ZX80**

Club news

Each month in INTERFACE we feature news and contact addresses for local user groups. Please let us know if you've formed your own ZX80, ZX81 or Acorn Atom/Proton user groups.

The North London Hobby Computer Club has a ZX80/81 users group meeting each Monday night from 6-9 pm. It is held at the North London Polytechnic, Holloway Road, London, N7 (diagonally opposite Holloway Road tube station).

If you'd like to join a London-based Atom/Proton user group, ring C Holt on 01-427 6088 or M Jaffer on 01-429 0842.

Other local groups:

- Roger Pyatt, 23 Arundel Drive, Orpington, Kent (66) 20281.
- Austin Knott, 269 Telegraph Road, Deal, CT14 9EJ.
- Christoph Moeller, Gross Kurfürstenstasse 41a, 4800 Bielefeld 1, Germany.
- Danmarks Nationale ZX80 og ZX81 Club, Skovmosvej 6, 4200 Slagelse Dk Denmark.
- Steve Brumby, 38 Eastfield Road, Messingham, Scunthorpe, Sth Humberside.
- Ken Knight, 22 Mount Street, Aylesbury, Bucks, HP20 2SE (0296 5181).
- David Blagden, PO Box 159, Kingston upon Thames, Surrey, KT2 5YQ.
- Anthony Quinn, Heckenrosenweg 6, 3170 Gifhorn, W. Germany.
- Conrad Roe, 25 Cherry Tree Avenue, Walsall, WS5 4LH.
- Ian Watt, 107 Greenwood Road, Clarkeston, Glasgow.
- J Palmer, 56 Meadowfield Drive, Edinburgh (031-661 3181).
- Leeds Microcomputer Users Group. Meets fortnightly on Thurs eve in Leeds, new members welcome. Contact: Paul O'Higgins, 20 Brudenell Mt, Leeds 6, tel: (0532) 742347 after 6.
- Manchester Atom Users' Group. Meets last Tues monthly during school terms at Abraham Moss Centre, Crescent Rd, Manchester 8. Contact: John Ashurst, 061-370 5121 ext 27 (day), 061-681 4962 (eves).
- Medway Atom Users' Group. Meets last Tues monthly during school terms at St John Fisher School, Ordnance St, Chatham. Contact: Clem Rutter, (0634) 42811 (day).
- Would anyone interested in forming a computer club in the Portsmouth area please contact Dave Cocker on Portsmouth 751156.
- Brunel Computer Club: meets alternate Wednesdays, 1900-2200 hrs at St Werburgh's Community Centre. Contact: Mr R Sampson, 4 The Coots, Stockwood.
- Worle Computer Club: meets alternate Mondays 1900-22.30 at Woodsprings Inn Function Rooms. Contact: S Rabone, 18 Castle Rd, Worle, Weston-Super-Mare, Avon, tel: 0934 513068.
- KAOS—the official 6502 users' group of Australia. Has a range of projects within special interest groups: hardware, software, amateur radio, Pascal, education. Publishes monthly newsletter. Contact: Mr Ian Eyles, 10 Forbes St, Essendon, Victoria, Australia 3040.
- P Compton, 29 North Marine Road, Scarborough, Nth Yorks, YO12 7EY.
- Alan Gunnell, 66 Nursery Road, Hookend, Nr Brentwood, Essex.
- Jonathan Meyer, Vanspaen Straat 22, 6524 H.N. Nymegen, Holland.

Royston H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex, PO21 4UU.
Raymond Betx, Chemin du Moulin 38, 1328 Ohain, Belgium

If you write to us, please allow up to a month for a reply. We get over 130 letters a day now, so the backlog, at times, can be pretty bad. The 44-46 Earls Court Road address is just for mail. There is nobody working there who is associated with the club, so a visit to the address is fruitless.

The North London Hobby Computer Club's ZX81 User Group has printed the first issue of their newsletter which points out that the group feels it is not getting a reasonable share of the larger groups resources, considering the proportion of members involved. A "heavy" committee meeting was proposing to try and rectify the situation. The group also pointed out that they had been given the business card of Chris Robins, CWR Developments, 6 Jackson Road, Islington, N7 6EJ, who does ZX81 repairs. The group has for sale a number of ZX81 dust covers (plastic wallet type) for £2.95. The committee in charge of the group is Harry Binysh, Irving Brand, Dennis Menich and John Maunsell. You can contact the group at the Polytechnic of North London, Holloway Road, London N7 8DB (tel: 01-607 2789).

Paul King has written to INTERFACE from Hassocks, in West Sussex. His group is called the ZX Microcomputer Users Group, and he explains:

We meet in members' houses to save the expense of hiring a hall, which must limit membership to the immediate area, BUT we are more than willing to put folk from other areas in Mid-Sussex in touch with each other if they would care to give me a call (tel: Hassocks 4530). In particular, anyone willing to take on *organising* such groups would obviously be most welcome.

Our aims are mutual assistance, program and literature exchange and the furtherance of the many uses to which these machines can be put. Meetings are informal and at present are held in those members' houses which are capable of accommodating us (which could call for a limit on numbers and/or the formation of a second group).

Membership is free but we leave something—currently 10p per head—for heat and light and any refreshments which may be offered. We try to meet every fourth-week subject to a host being able to offer meeting space. Inability to make such offers is no bar to membership. Members are invited to give their phone numbers and/or addresses for communication to other members, such

information being given on the clear understanding that calls will only be made at reasonable hours with due regard to Sundays and other holidays!

It is also suggested that a register of books, programs, hardware, etc., owned by members be kept, with the prime aim of enabling prospective purchasers to see what is available before buying. With a little luck we shall then all only buy one item of doubtful value which will serve as a warning to others! What must be almost mandatory however, is the labelling of anything you bring along to our meetings, be it your computer, power supply, recorder, cassettes, programs, books, magazines, etc. If everyone does this the sorting out at the end of the meeting should be easy with no problems as to who owns what. We shall try to avoid any "management structure" worth the name, but obviously someone has to co-ordinate the activities, so we have:

Seniors co-ordinator Paul King 25 Fir Tree Way, Hassocks.
Juniors co-ordinator David King Tel: Hassocks 4530.

Our arrangements for meetings must of necessity confine membership to residents of Hassocks and the immediate surrounding area but our co-ordinators would be pleased to put applicants from "foreign parts" in touch with each other. Where possible we use the "young persons" network at the local schools to circulate details of meetings and other activities, with other arrangements as necessary.

Inverclyde

The Inverclyde ZX Users' Club meets fortnightly on Mondays at Greenock in the halls of the Greenock Society for the Deaf, Kelly Street. Robert Watt (tel: 30067 evenings) has full information.

At the last meeting, the Club thought it would be a good idea if Sinclair could be approached to see if a list of contacts could be supplied with machines sold.

(Note from TIM: This is a very good idea. We'll try and put together a list of User Groups and then see what Uncle C thinks about it. Please let me know—even if you are already being mentioned in INTERFACE—about your local club; meeting times, number of members, main contacts and the like, so we can create a good, up-to-date, comprehensive list). Just send this information, plus any other news on your local activities, to: Local Club News, National ZX Users Club, 44-46 Earls Court Road, London W8 6EJ).

George Merrill writes to us from the New Brighton Computer Club, Merseyside, pointing out that the group now has meetings every other Monday evening. Details on 051-639 6712. This club has just been started. New members will be made most welcome.

WHAT CAN I DO WITH 1K?

If your answer is "not much", then you must read the new book from V&H, 'What Can I Do With 1K? (40 programs and routines for the 1K Sinclair ZX81)'.

Here at last are some serious (and some fun!) programs which all run in 1K.

Don't be misled by the titles: 'Roulette' actually analyses gambling systems; 'Chinese Horoscope' reveals your birth sign, month sign, element and ascendant; 'Payroll' handles ALL tax bands. These are not just simple programs.

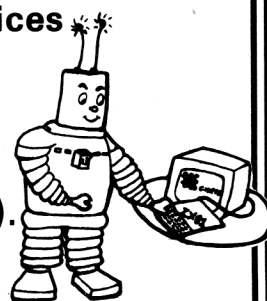
FREE OFFER!!!

A free listing of 'Chess in 1K' is included with all mail-orders mentioning this magazine!

'What Can I Do With 1K?' is available from most bookshops, computer shops, or direct from:-

V&H Computer Services
182c Kingston Rd.
Staines Middx.
Tel: Staines 58041

Price £4.95 (inc. p&p).
Also available on
cassette £4.95.




```

1123 IF PEEK (M-33) <> 128 OR PEEK
(M-33) <> L THEN GOTO 2500
1130 NEXT M
20000 LET Z=Z(INT (RND*6)+1)
20001 IF Z<16514 THEN GOTO 2000
20010 IF PEEK (Z+33)=0 THEN LET A
I=33
20020 IF PEEK (Z+31)=0 THEN LET A
I=31
20030 IF PEEK (Z-31)=0 THEN LET A
I=-31
20040 IF PEEK (Z-33)=0 THEN LET A
I=-33
20050 POKE Z,0
20060 POKE Z+AI,L
20070 RETURN
25000 IF PEEK (M+33)=L1 OR PEEK (
M+33)=L2 AND AI=0 THEN LET AI=33
25010 IF PEEK (M+31)=L1 OR PEEK (
M+31)=L2 AND AI=0 THEN LET AI=31
25020 IF PEEK (M-31)=L1 OR PEEK (
M-31)=L2 AND AI=0 THEN LET AI=-3
I
25030 IF PEEK (M-33)=L1 OR PEEK (
M-33)=L2 AND AI=0 THEN LET AI=-3
I
25035 IF AI=0 THEN NEXT M
25040 LET Z=M
25050 GOTO 2050
30000 LET OC=0
30001 LET XC=0
30002 LET XC=0
30010 FOR M=16514 TO 16913
30020 IF PEEK M=CODE "?" THEN LET
OC=OC+1
30030 IF PEEK M=CODE "O" THEN LET
OC=OC+1
30040 IF PEEK M=CODE "X" THEN LET
XC=XC+1
30050 NEXT M
30060 IF OC<>0 OR XC<>0 OR OC<>0
THEN RETURN
30070 IF XC<0 THEN PRINT "X TEAM
LOSES"
30080 IF OC<0 THEN PRINT "O TEAM
LOSES"
30090 IF OC<0 THEN PRINT "? TEAM
LOSES"

```

```

3100 STOP
4000 PRINT "HERE IS THE GAME OF
3-HANDED"
4010 PRINT "DRAUGHTS. THE COMPUT
ERS MEN ARE"
4020 PRINT "THE O AND THE X. YOU
RS IS THE ?"
4030 PRINT "TO MOVE THE COMPUTER
WILL PRINT"
4040 PRINT "MOVE? FROM-"
4050 PRINT "INPUT THE PLACE YOU
WANT YOUR"
4060 PRINT "? TO BE MOVED FROM.
INPUT THE"
4070 PRINT "LETTER ALONG THE BOT
TOM FIRST"
4080 PRINT "THEN THE LETTER AT T
HE SIDE"
4090 PRINT "PRESS N/L. THEN THE
COMPUTER"
4100 PRINT "WILL PRINT TO-"
4110 PRINT "TYPE IN WHERE YOU WA
NT TO MOVE"
4120 PRINT "TO IN THE SAME WAY A
S THE LAST"
4130 PRINT "INPUT. THEN THE SCRE
EN WILL GO"
4140 PRINT "OUT AND THE COMPUTER
WILL MAKE"
4150 PRINT "MOVE. ARE YOU READY?
PRESS ANY"
4160 PRINT "KEY TO GO"
4170 PAUSE 4E4
4180 RETURN
9900 POKE 30000,33
9910 POKE 30001,130
9920 POKE 30002,64
9930 POKE 30003,126
9940 POKE 30004,254
9950 POKE 30005,23
9960 POKE 30006,200
9970 POKE 30007,215
9980 POKE 30008,35
9990 POKE 30009,195
9991 POKE 30010,51
9992 POKE 30011,117
9993 RETURN

```

MICHAEL ORWIN'S ZX81 CASSETTES

CASSETTE ONE for 1K ZX81

"I had your Invaders React cassette . . . I was delighted with this first cassette."

P. Rubythor,
London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month. Please let . . . into the secret of your first time load every time!"

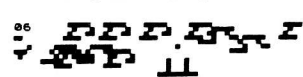
E.H., London SW4

Just two out of over 20 unsolicited testimonials.

INVADERS (1K)



PHANTOM ALIENS



BUG SPLAT



Cassette One 1K machine code programs:
React, Invaders, Phantom Aliens, Maze of Death, Planet Lander, Bouncing Letters, Bug Splat.

1K Basic Programs:

I Ching, Mastermind, Robots, Basic Hangman.

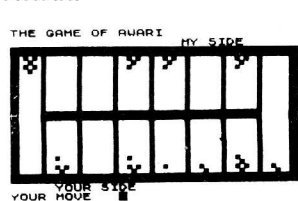
PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16K.

Cassette One costs £3.80.

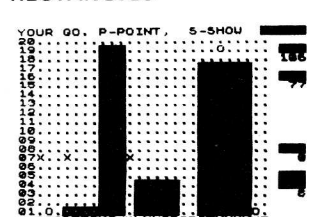
CASSETTE TWO

Ten games in Basic for 16K ZX81

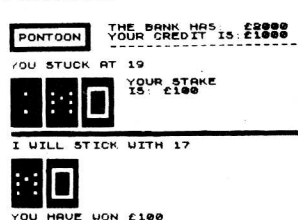
AWARI



RECTANGLES



PONTOON



PENNY SHOOT



Cassette Two contains Othello, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette Two costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Road, Willesden, London NW10 9QL. (Mail order only please)

Print A\$

Dear INTERFACE,

I am pleased with my first copy of INTERFACE (Jan. 82) and hope that you will soon be able to enlarge the monthly issues.

I should like to thank Sinclair Research for solving the problems with my ZX81. Those people, like L. Roffey and W. S. Meadows (see Jan. INTERFACE), who cannot get a response from Sinclair Research should try writing to the Sales Manager, Sinclair Research Limited, 6 King's Parade, Cambridge CB2 1SN.

I think Jeremy Ruston has not understood Jacinta West's problems (see Ruston Replies). If Jacinta understands how the sine wave plotting program on page 119 of "ZX81 BASIC Programming" (ZX81 manual) works then she should be able to understand how this program works:

```
10 FOR N=0 TO 126
20 PLOT N/2, 22 + 20*SIN(N/2/32*PI)
30 NEXT N
```

It is practically the same program but plots a contiguous graph. To explain how it works would require me to do a lot of hard work — I think one can easily intuit how it works by RUNNING the program.

If Jacinta needs a routine which connects two points by a "straight" line then she need look no further than page 121 of the ZX81 manual.

I hope the above is of general interest.

Yours faithfully,
SUBHASH M. PARMAR

Dear INTERFACE,

In Easter, I would have had my ZX81 for a year. I have been with INTERFACE since last June. During this time I have seen some tips sent in to magazines which I had thought of, and cursed myself for not sending them in. Well, here is one tip I have never seen anywhere else. By POKEing 16389,76 it cuts off 10 seconds from the SAVEing time by **not** SAVEing the display on a 16K machine. It is already 76 on 1K machine.

One small point is on moving graphics. This program produces a moving dot — with flicker.

```
10 FOR A=0 TO 31
20 PRINT AT 21,A;"*□"
30 NEXT A
```

One familiar BASIC line is:

PEEK (PEEK 16398 + 256*PEEK 16399)

This tells you the CHR\$ at the current print position. I have devised a machine code routine to do this job quicker.

Op-code	Hex-code
LD BC,(16398)	ED4B0E40
LD A,(BC)	0A
LD C,A	4F
LD B,0	0600
RET	C9

If this is poked into a REM statement the BASIC line can be replaced by:
IF USR 16515 = THEN
Why does Toni Baker in his book "Mastering VC" go about POKEing the screen to simulate "PRINT AT" in machine code? There is already a sub-routine in the ROM.

PUSH BC PUSH HL PUSH DE	} }	SAVE THE MAIN REGISTERS
-------------------------------	------------	----------------------------

This is equivalent to "PRINT AT B,C;" NOTE: This only changes to PRINT AT POSITION and does not print a CHR\$.
MARTIN ROSE

Dear INTERFACE,

I am an A-level student in the process of starting a major project that forms one year of my design course. I am hoping to design and make a complete table for the ZX81 and accessories.

I would be extremely grateful if any ZX81 owners would be prepared to send me information on the problems that they have encountered when using their ZX81 and accessories. For example does your computer often crash due to the movement of the RAM pack, do cassettes get littered around the table being used, do you use a monitor or the families' television, does your cassette recorder work itself into awkward positions and any other features which you feel are important?

Please send return letters to: —

JULIAN GILSTRAM,
25, Brander Drive,
Knutsford,
Cheshire,
WA16 8EJ

Dear INTERFACE,

ZX81 ROM

With reference to the letter from Michael O'Donnell published in your January 1982 issue, let me say that I for one would be extremely interested in reading an article on the potential use of the part of ROM in which the character-set is stored.

I would be extremely interested in any article about using **any part** of the ROM. Furthermore, I would be interested to see a continuation of the series you started, twice, on Programming in Machine Code — you got about as far as telling us the decimal codes for INC HL and RET, and that was it!

It seems to me that, loaded down as you must be up there with 16K RAM packs, printers, Acorn Atoms, etc., you have completely lost sight of the fact that a 1K or ZX81 is capable of so very much more if the user programs in Machine Code, making use of ROM sub-routines, rather than in BASIC. Do all our members really go charging off to buy a 16K RAM just as soon as they discover that their 1K ZX81 takes only 35 lines of BASIC with a minimal display?

Would you not be doing members a greater service if, instead of publishing 234-line Othello programs (and guess how this works!!), you published helpful explanatory articles on programming methods and techniques — particularly in the field of Machine Code and disassembly of the ROM, with which the capability of a 1K machine can be increased three — or four-fold?
D. P. RICHARDSON

PASCAL FOR HUMAN BEINGS:

Jeremy Ruston's first book - Pascal for Human Beings - has just been published by INTERFACE. The book contains a 12K compiler, dumped from the BBC Micro, which will run on most microcomputers using Microsoft.

The compiler will convert a Pascal program into its BASIC equivalent.

Contents of this fine new book:

- Simple Pascal programs
- How numbers work
- Variables (simple types)
- CHAR type variables and CONSTANTS
- Ruddyards bit (IF)
- Standard functions
- FOR loops
- REPEAT UNTIL loops

- WHILE loops
- Arrays
- The CASE statement
- The TYPE declaration
- User defined functions
- User defined procedures
- The 12K compiler

You can order PASCAL FOR HUMAN BEINGS using the form inside the back cover.

ZX81 CONSTRUCTION PROJECTS

Another new book from INTERFACE this month is written by Stephen Adams. This book -- 20 SIMPLE ELECTRONIC PROJECTS FOR THE ZX81 -- is the book for you if you hanker to build things to hook onto your computer to extend its usefulness.

Projects include a numeric key pad, score board, thermometer, burglar alarm and light pen. Details inside the back cover.

A new name — and two magazines

With launch of the ZX Spectrum, we've changed our name to the National ZX Users' Group. We've also decided that INTERFACE is getting a little crowded, so from now on there will be two magazines — ZX-INTERFACE for ZX80, ZX81 and Spectrum; and Acorn-INTERFACE for the Atom and the BBC Microcomputer.

We've had many discussions with club members at the last two computer shows. The splitting of INTERFACE is a result of many people's suggestions. As well, we'll try to make INTERFACE more "serious" as time goes on, to better serve the interests of club members who have advanced beyond the simple BASIC program stage. We'd be interested in your views on this.

Recently we reviewed "Byteing Deeper into your ZX81" by Mark Harrison. The publishers (Sigma) and distributors (John Wiley and Sons Ltd.) said the review was wonderful, but were miffed they had not been mentioned. Consider yourself mentioned.

The ZX Spectrum

The big news, of course, is the launch of Clive's new computer, the ZX Spectrum. A little wider than the ZX81, but not so deep, this is the first Sinclair computer which features keys, rather than a touch-sensitive membrane keyboard. It costs just £125 for the 16K version, around £170 for a 48K Spectrum. There is a built-in loudspeaker which is very easy to use (the command is SOUND, 1,2 where the first number is the length of the note in seconds, and the second is the pitch of the note, the higher the number the higher the note) as well as colour, which can be used for the screen, the writing and the border.

First impressions are most favourable, except that the "one key entry" system is getting pretty complicated. You now have two different shift keys, which do different things, and some commands need you to press both at once, then press one of them again, before the command appears.

ZX81 compatibility

ZX81 BASIC is essentially a subset of ZX Spectrum BASIC. The differences are as follows.

FAST and SLOW: the ZX Spectrum operates at the speed of the ZX81 in FAST mode with the steady display of SLOW mode, and does not include these commands.

SCROLL: the ZX Spectrum scrolls automatically, asking the operator "scroll?" every time a screen is filled.

UNPLOT: the ZX Spectrum can unplot a pixel using PLOT OVER, and thus achieves unplot.

Character set: the ZX Spectrum uses the ASCII character set, as opposed to the ZX81 non-standard set.

ZX81 programs may be typed into the ZX Spectrum with very little change, but may of course now be considerably improved. The ZX Spectrum is fully compatible with the ZX Printer, which can now print out a full upper and lower case character set, and the high resolution graphics; using LLIST, LPRINT and COPY. ZX81 software cassettes and the ZX 16K RAM pack will not operate with the ZX Spectrum.

ZX MICROFAIR

New Century Hall, Corporation Street,
Manchester.

29/30 May 1982

Saturday 10.00 - 8.30pm

Sunday 10.00 - 5.30pm

Everything for the ZX80/81. Biggest selection anywhere. Hardware software, books, magazines, the National ZX80 and ZX81 Users' Club.

Admission - Adults - 50p, children 30p
Advance tickets - adults £1, children 50p

Organiser: Mike Johnston, 71 Park Lane,
Tottenham, N17 0HG

The launch

At the press conference to launch the computer, Uncle Clive was in fine form. He first told the press that there had been a lot of argument back at headquarters regarding the name of the new computer. The most popular choice, he said, was "Not the BBC Micro".

The press conference was most impressive. A demonstration program showing a chess board, with user-defined chess pieces, and a teletext-like display, was shown. Also unveiled, but no-one was allowed to touch the thing, was a "Microdrive", a small black box, smaller than a pack of cigarettes, which can hold 100K of program on a disc-like object (which we were not allowed to see). Uncle C announced he would load a program from the Microdrive. It took about 1½ seconds to load a 48K program. The Microdrive will be available at the end of the year, for around £50. Up to eight of them can be connected at any one time.

Manuals

The Spectrum comes with two separate manuals, one for beginners, and a second one (which is not very much more complicated) for those who have previous experience of computing.

Dimensions

Width 233mm
Depth 144mm
Height 30mm

CPU/memory

Z80A microprocessor running at 3.5 MHz. 16K-byte ROM containing BASIC interpreter and operating system.

16K-byte RAM (plus optional 32K-byte RAM on internal expansion board) or 48K-byte RAM.

Keyboard

40-moving-key keyboard with full upper and lower case with capitals lock feature. All BASIC words obtained by single keys, plus 16 graphics characters, 22 colour control codes, and 21 user-definable graphics characters. All keys have auto repeat.

Display

Memory-mapped display of 256 pixels × 192 pixels; plus one attributes byte per character square, defining one of eight foreground colours, one of eight background colours, normal or extra brightness and flashing or steady. Screen border colour also settable to one of eight colours. Will drive a PAL UHF colour TV set, or black and white set (which will give a scale of grey), on channel 36.

Sound

Internal loudspeaker can be operated over more than 10 octaves (actually 130 semitones) via basic BEEP command. Jack sockets at the rear of computer allow connections to external amplifier/speaker.

Graphics

Point, line, circle and arc drawing commands in high-resolution graphics. 16 pre-defined graphics characters plus 21 user-definable graphics characters. Also functions to yield character at a given position, attribute at a given position (colours, brightness and flash) and whether a given pixel is set. Text may be written on the screen on 24 lines of 32 characters. Text and graphics may be freely mixed.

Colours

Foreground and background colours, brightness and flashing are set by BASIC INK, PAPER, BRIGHT and FLASH commands. OVER may also be set, which performs an exclusive — or operation to overwrite any printing or plotting that is already on the screen. INVERSE will give inverse video printing. These six commands may be set globally to cover all further PRINT, PLOT, DRAW or CIRCLE commands, or locally within these commands to cover only the results of that command. They may also be set locally to cover text printed by an INPUT statement. Colour-control codes, which may be accessed from the keyboard, may be inserted into text or program listing, and when displayed will override the

globally set colours until another control code is encountered. Brightness and flashing codes may be inserted into program or text, similarly. Colour-control codes in a program listing have no effect on its execution. Border colour is set by a BORDER command. The eight colours available are black, blue, red, magenta, green, cyan, yellow and white. All eight colours may be present on the screen at once, with some areas flashing and others steady, and any area may be highlighted extra bright.

Screen

The screen is divided into two sections. The top section — normally the first 22 lines — displays the program listing or the results of program or command execution. The bottom section — normally the last 2 lines — shows the command or program line currently being entered, or the program line currently being edited. It also shows the report messages. Full editing facilities of cursor left, cursor right, insert and delete (with auto-repeat facility) are available over this line. The bottom section will expand to accept a current line of up to 22 lines.

Cassette interface

The ZX Spectrum incorporates an advanced cassette interface. A tone leader is recorded before the information to overcome the automatic recording level fluctuations of some tape recorders, and a Schmitt trigger is used to remove noise on playback.

All saved information is started with a header containing information as to its type, title, length and address information. Program, screens, blocks of memory, string and character arrays may all be saved separately.

Programs, blocks of memory and arrays may be verified after saving to confirm successful saving.

Programs and arrays may be merged from tape to combine them with the existing contents of memory. Where two line numbers of variables names coincide, the old one is overwritten.

Programs may be saved with a line number, where execution will start immediately on loading.

The cassette interface runs at 1500 baud, through two 3.5 mm jack plugs.

Expansion port

This has the full data, address and control busses from the Z80A, and is used to interface to the ZX Printer, the RS232 and NET interfaces and the ZX Microdrives.

IN and OUT commands give the I/O port equivalents of PEEK and POKE.

Mathematical operations and functions

Arithmetic operations of $+$, $-$, \times , \div , and raise to a power. Mathematical functions of sine, cosine, tangent and their inverses; natural logs and exponentials; sign function, absolute value function, and integer function; square root function, random number generator, and pi.

Numbers are stored as five bytes of floating point binary — giving a range of $+3 \times 10^{-39}$ to $+7 \times 10^{38}$ accurate to $9\frac{1}{2}$ decimal digits.

Binary numbers may be entered directly with the BIN function. $=$, $>$, $<$, $>=$, $<=$ and $<>$ may be used to compare string or arithmetic values or variables to yield 0 (false) or 1 (true). Logical operators AND, or and NOT yield boolean results but will accept 0 (false) and any number (true).

User-definable functions are defined using DEFFN, and called using FN. They may take up to 26 numeric and 26 string arguments, and may yield string or numeric results.

There is a full DATA mechanism, using the commands READ, DATA and RESTORE.

A real-time clock is obtainable.

String operations and functions

Strings can be concatenated with $+$. String variables or values may be compared with $=$, $>$, $<$, $>=$, $<=$, $<>$ to give boolean results. String functions are VAL, VAL\$, STR\$, and LEN. CHR\$ and CODE convert numbers to characters and vice versa, using the ASCII code.

A very powerful string slicing mechanism exists, using the form a(x TO y)$.

Variable names

Numeric — any string starting with a letter (upper and lower case are not distinguished between, and spaces are ignored).

String — A\$ to Z\$.

FOR-NEXT loops — A-Z.

Numeric arrays — A-Z.

String arrays — A\$ to Z\$.

Simple variables and arrays with the same name are allowed and distinguished between.

Arrays

Arrays may be multi-dimensional, with subscripts starting at 1. String arrays, technically character arrays, may have their last subscript omitted, yielding a string.

Expression evaluator

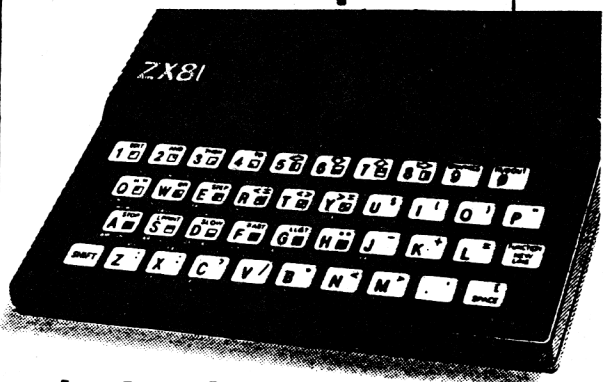
A full expression evaluator is called during program execution whenever an expression, constant or variable is encountered. This allows the use of expressions as arguments to GOTO, GOSUB, etc.

It also operates on commands allowing the ZX Spectrum to operate as a calculator.

20

SIMPLE ELECTRONIC PROJECTS FOR THE ZX81

and other computers



by Stephen Adams

20 SIMPLE ELECTRONIC PROJECTS FOR THE ZX81 AND OTHER COMPUTERS

Make the most of your micro with this great book of construction projects.
Projects include: a numeric keypad; giant seven-segment display; score board; light pen; thermometer; shift lock; computerised voltmeter; and an 'unbeatable' burglar alarm.

Spectrum programs

```

1 REM _____Simon_____
5 LET a$=""
10 FLASH 1
20 PAPER 7
30 FOR a=1 TO 7
32 PRINT AT 10,10;"Please stan
d by"
35 BORDER AND*7
40 LET a$=a$+STR$ (INT (RND*4)
+1)
45 PAUSE 5
50 NEXT a
55 FLASH 0: CLS
60 LET x=1
70 FOR q=1 TO x
72 LET l=4*(CODE a$(q)-48)
73 LET t=VAL a$(q)
75 BEEP .05,10*t
80 PRINT AT l,7; INK t;" ";
;"a$(q);AT l+1,7;" ";AT l-1,7;
;" "
85 BORDER AND*7
90 PAUSE 20-x
100 PRINT AT l,7; INK 6;" ";
AT l+1,7;" ";AT l-1,7;" ";
102 PAUSE 4
105 CLS
110 NEXT q
120 FOR b=1 TO x
122 IF INKEY$<>" " THEN GO TO 12
2
123 LET t$=INKEY$
124 IF CODE t$=0 THEN GO TO 123
125 CLS
126 LET y=4*(CODE t$-48)
130 PRINT AT y,7; INK y/4;" ";
t$;AT y-1,7;" ";AT y+1,7;" "
145 BEEP .04,2.5*y
146 IF CODE t$<>CODE (a$(b)) TH
EN GO TO 300
147 PAUSE 7
148 CLS
150 NEXT b
155 IF x=7 THEN PRINT "You win!
": BORDER RND*7: PAPER RND*7: GO
TO 155
160 LET x=x+1
165 PAUSE 50
170 GO TO 70
300 PRINT "You scored ";x-1
310 BORDER RND*7
320 PAPER RND*7
330 CLS
335 BEEP .02,RND*30
340 GO TO 300

```

```

1 REM Greyhound
2 REM © Gourlay,Hartnell 1982
5 RANDOMIZE
7 GO SUB 200
10 FOR x=1 TO 22
20 PRINT INK 4;TAB 30;" "
30 NEXT x
35 PRINT AT 0,6;"You bet on nu
mber ";w
40 DIM a(9)
50 FOR x=1 TO 9
60 PRINT AT 2*x,a(x);" "
70 LET a(x)=a(x)+RND*2
80 PRINT AT 2*x,a(x); INK x/2;
x
85 BEEP .01,3*x
90 IF a(x)>30 THEN GO TO 115
100 NEXT x
110 GO TO 50
115 FOR g=1 TO 50 STEP 2
120 PRINT AT 18,6; INK RND*7;x;
" is the winner!"
123 BEEP .02,g
125 IF w=x THEN PRINT AT 20,3;
INK RND*7;"And you are the winne
r too!!"
130 FLASH RND
140 NEXT g

```

```

145 FLASH 0
150 RUN
200 BORDER 0
205 PRINT AT 3,1; INK 2;"Welcom
e to the greyhound track"
210 PRINT AT 5,6; INK 4;"There
are nine dogs."
220 INPUT ( INK 2;"Place your b
et for a win ");w
230 IF w<1 OR w>9 THEN GO TO 22
0
235 BORDER 2
240 CLS : RETURN

```

```

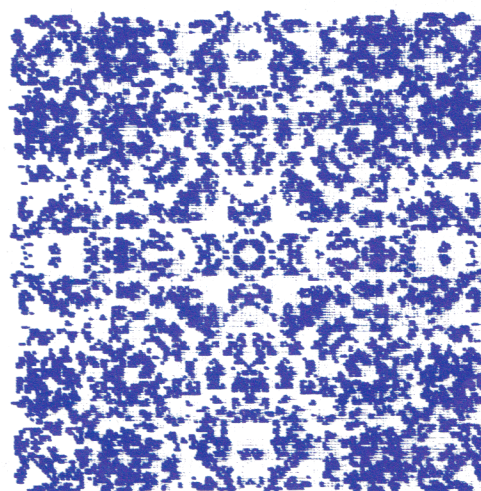
10 REM Tesseract
12 REM © Gourlay, Hartnell
15 BORDER 1+RND: PAPER 7: CLS
20 RANDOMIZE
25 LET p=85: LET s=45
30 LET x=RND*p: LET y=RND*p
35 INK RND*6
37 FOR g=1 TO RND*30
40 PLOT p+x+s,p+y
50 PLOT p+y+s,p+x
60 PLOT p-x+s,p+y
70 PLOT p+y+s,p-x
80 PLOT p-x+s,p-y
90 PLOT p-y+s,p-x
100 PLOT p+x+s,p-y
110 PLOT p-y+s,p+x
120 LET x=x+RND+RND-1
130 LET y=y+RND+RND-1
135 NEXT g
140 IF RND<.2 OR ABS x>p OR y>p
THEN GO TO 40
150 IF RND<.01 THEN GO TO 25
160 GO TO 30
190 RUN

```

```

10 REM Galaxy
20 PAPER 0: BORDER 0: CLS
30 LET c=255: LET d=175
40 INK RND*7
50 LET a=c*RND
60 LET b=d*RND
70 PLOT a,b: PLOT a,d-b
80 PLOT c-a,b: PLOT c-a,d-b
90 IF RND>.5 THEN GO TO 60
95 INK RND*7
100 GO TO 50

```



PERSONAL BANKING SYSTEM -
 ENHANCED VERSION INCORPORATING
 UNIQUE LOAD/SAVE DATAFILES AT
 DOUBLE-SPEED, ALSO AUTOMATIC
 STANDING ORDERS (M.O.A.). MANY
 FEATURES, MULTIPLE ACCOUNTS.
 EXTREMELY EASY TO USE. SEND
 £9.95 FOR CASSETTE AND MANUAL TO
 J P GIBBONS A.I.B. 14 AVALON
 ROAD, ORPINGTON, KENT. (OR
 AVAILABLE FROM BUFFER SHOP.)

Amateur radio

Here's a program which enables a ZX80 (with new ROM) or ZX81 to work out the distance between stations, score for contests to print out a log on the printer, keeping an updated record of the best (dx) long distance contact. It comes from John Anthony, G4NNG, of Bedford.

```

1 REM "CONTEST SCORE PROGRAM
2 3.JULY 1981"
3 LET D6=0
4 LET D7=0
5 LET D8=0
6 LET D3=0
7 LET CU=0
8 LET DX=0
9 PRINT "PLEASE INPUT YOUR QR
A CODE"
10 LET J$="0"
11 INPUT L$
12 LPRINT "C/S QRA PO
INTS";TAB 25;"BEST DX"
13 LPRINT "-----"
20 GOSUB 900
25 GOSUB 800
26 CLS
29 PRINT "MY LOCATOR.....";L$
31 PRINT "LAT";L1;" LONG ";L2
40 LET O1=L1
45 LET O2=L2
49 PRINT
50 PRINT "-----*****"
51 PRINT
52 PRINT "ENTER CALLSIGN"
53 INPUT I$
54 PRINT "ENTER OTHER L
OCATOR"
55 INPUT L$
56 CLS
60 GOSUB 900
65 GOSUB 800
68 PRINT L$
69 PRINT
70 PRINT "LAT";L1;" LONG ";L2
71 PRINT
75 GOSUB 700
76 LET D=INT D
77 PRINT "DIST=";D;" KMS"
78 PRINT
79 PRINT "R.S.G.B. SCORE:- ";
80 GOSUB 977
81 PRINT D5
82 LET D6=D6+D
83 LET D7=D7+D
84 LET D8=D8+D5
85 PRINT
86 PRINT "-----*-*-*-*-*"
87 PRINT
88 PRINT "TOTALS SO FAR "
89 PRINT "-----"
90 PRINT "I.T.U. ";D6;" R.S.G.
B. ";D8;
91 PRINT
93 PRINT
95 PRINT "DISTANCE ";D6;" KM."
96 PRINT
97 LET CU=CU+1
98 PRINT "NO.OF.CONTACTS ";CU
99 LET G$=""
110 IF D>DX THEN LET J$=L$
111 IF D>DX THEN LET G$="*+"
115 IF D>DX THEN LET DX=D
116 LPRINT I$;TAB 10;L$;TAB 20;
D5;TAB 28;G$
120 PRINT "BEST DX ";DX;
130 PRINT " KMS TO QRA ";J$
150 GOTO 50
600 GOTO 10
705 LET Z1=O1*PI/180
710 LET Z2=O2*PI/180
715 LET Z3=L1*PI/180
720 LET Z4=L2*PI/180
725 LET Z=COS (Z1)*COS (Z3)*COS
(Z4-Z2)
730 LET Z=Z+(SIN (Z1)*SIN (Z3))
735 LET D=60*ACS (Z)*180/PI

```

```

740 LET D=D*1.850
750 RETURN
805 LET A$=L$( TO 1)
810 LET B$=L$(3 TO 4)
815 LET C$=L$(5 TO 5)
820 LET L2=0
825 IF A$>"T" THEN GOTO 840
830 LET L2=L2-2*(CODE (A$)-38)
835 GOTO 845
840 LET L2=L2+2*(91-(CODE (A$)+
27))
845 LET Z=VAL (B$)-1
846 LET Z1=INT (Z/10)*10
850 LET L2=L2-((Z-Z1)*.2)
855 IF C$="F" THEN GOTO 895
860 IF C$="G" THEN GOTO 895
865 IF C$="H" THEN GOTO 895
870 LET L2=L2-.2/3
875 IF C$="E" THEN GOTO 895
880 IF C$="J" THEN GOTO 895
885 IF C$="A" THEN GOTO 895
890 LET L2=L2-.2/3
895 RETURN
905 LET A$=L$(2 TO 2)
910 LET B$=L$(3 TO 4)
915 LET C$=L$(5 TO 5)
920 LET L1=40
925 LET L1=L1+(CODE (A$)-65+27)
930 LET L1=L1+(7-INT ((VAL (B$)
935 IF C$="F" THEN GOTO 975
940 IF C$="E" THEN GOTO 975
945 IF C$="D" THEN GOTO 975
950 LET L1=L1+.125/3
955 IF C$="G" THEN GOTO 975
960 IF C$="J" THEN GOTO 975
965 IF C$="C" THEN GOTO 975
970 LET L1=L1+.125/3
975 RETURN
977 LET D5=1
978 FOR W=50 TO 10000 STEP 50
979 IF D<=W THEN RETURN
980 LET D5=D5+2
985 NEXT W
990 REM ZX80+8K ROM/ZX81 QRA PR
OGRAM FOR CONTESTS COPYRIGHT
J.ANTHONY G4NNG QTHR
999 STOP
1000 SAVE "NFG"
1001 GOTO 1
9999 PRINT PEEK 16404+256*PEEK 1
6405-16509

```

Dear INTERFACE,

With regard to the letter from Switzerland concerning programs for radio-amateurs, I enclose the address of a UK organisation devoted to ZX81 applications for radio-amateurs:

S.A.R.U.G.,
Paul Newman G4INP,
3 Red House Lane,
Leiston,
Suffolk IP16 4JZ,
England.

Yours sincerely,
IAN WOOLLER,
G8NMQ.

Dear INTERFACE,

In answer to Herr(?) Jürg Tüscher's letter in the February 1982 issue of INTERFACE, there has been a two-part article on satellite tracking in "Wireless World" (August and September 1981) and also in "Practical Computing" (March 1982).

The "Wireless World" articles contain a schematic of a Computer-Aerial Rotator Interface plus machine code and Burp programs for the "Wireless World" scientific computer.

The "Practical Computing" article is a program in what looks like BASIC or BURP but is not unfortunately ZX81 BASIC. I have no doubt that it could be used as a starting point for somebody who is a ZX81 addict.

"Wireless World":

Satellite Tracking by Home Computer — By N. Kyriazis.
Part 1, Aug. 81, Vol. 87, No. 1547 (Page 44 to 46).

Part 2, Sept. 81, Vol 87, No. 1548 (Page 66 to 68).

"Practical Computing":

Satellite Tracker Scans the Skies — Vol. 5, Issue 3 (Page 104/05).

R. HUTCHINSON,
West Yorkshire.

£3,500 prize

Keith Purkiss, who developed the first colour board for the Sinclair ZX81, has won the £3,500 top prize in the Daily Express Philishave Get Up and Go Awards scheme.

Nineteen-year-old Purkiss was chosen for his Haven Hardware, set up last July to design and market computer hardware products. These include a programmable character generator, rotating key module, input-output port, memory expansion and full size keyboard for the Sinclair ZX80 and ZX81.

The awards were open to 16 to 21-year-olds with a workable business idea or project.

Purkiss, from Workington in Cumbria, plans to spend his money on expanding his computer business.

Letters to hard facts

Replies by Stephen Adams

N. Draper, 40 Northcliffe, Blackburn, Lancashire, saw an advert for a firm producing a kit to improve the LOAD on a ZX81 and wants to know where he can contact the firm. — The firm is GWYNED COMPUTER SERVICES, Tel: 0248-810748 BUT the product is advertised for the ZX80, not the ZX81. It costs £9 if you are still interested, plus £3 for fitting if you send your machine to them.

D. Gomer, Pontypridd, Mid Glamorgan, wanted to know how to connect up his tape recorder, which has two pin DIN sockets up to the 3.5mm sockets on

the ZX81. — No connection should be made from any cassette recorder which uses a voltage greater than 12 volts (except portable tape recorders) otherwise it can damage the ZX81. Also, the volume control must be kept well down for the same reason. If it is safe then use the circuit below.

P.L.D. Grove, Leamington Spa, Warwickshire, wanted to know if the 16K RAM packs advertised are better than Sinclair's. — YES, the ones on sale for about £35 or less in black plastic boxes are very good value as they do not HUM or suffer from "whiteouts".

Miss D.A. Watkinson, Southsea, Hampshire, wanted to know if there are any "good buys" in ZX81 hardware. — Most of the companies producing hardware for the ZX81 give good value for money, ZX81 users insist on it! Keyboards and the Memotech extra memory being good examples.

John Lomax wants a circuit that will connect up a ZX81 to a 32 character LCD display. — I know only that the display is obtainable from AMBIT INTERNATIONAL, 200 Service Road, Brentwood, Essex CM14 4SG. The price is £45.45 + VAT and postage. It could be memory mapped like a port as it has CS, RD and WR connections, but as it only gives a display to ASCII codes software will have to be written to do the conversion.

C.J. Medway, Bitterne, Southampton, wants to know how the screen on the ZX81 works and if it was possible to alter the interrupt lines to change the graphics. — The U.L.A. accesses the ROM during the REFRESH cycle using the character as one part of the address, the interrupt register 1 as another and a line counter as last part. This collects the required byte from the ROM containing the dots needed loading it into a SHIFT register within the U.L.A., so that it can be put out on to the screen one dot at a time.

The interrupt line is used to output only 32 characters and so should not be disconnected from address line A6. Any use of this line could result in the crash of the system, so no interrupts can be done on ZX80's or ZX81's.

EXPLOSIVE GAMES FOR THE ZX81

This new 140 page book has listings for every game we thought you might want, including GALACTIC INTRUDERS, BREAKOUT, DRAUGHTS/CHECKERS, STAR TREK, DEATH MAZE and 4-IN-A-ROW. As well, there are a host of new games, and adaptations of old favourites. Many of the programs will run in just 1K, including a simplified SPACE INVADERS-type program.

Some of the games are based on chance and others depend on skill, both yours and the computers. But we've tried to ensure that each and every program contains programming techniques which you'll be able to adapt for your own programs.

**MOST PROGRAMS ARE DUMPED FROM THE PRINTER, SO THEY ARE
GUARANTEED TO RUN...**

Here's what you get in this great, new book:

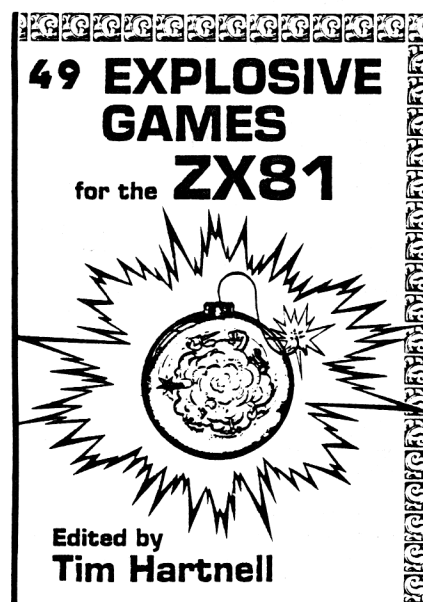
DEATH MAZE ASTER-DIVE *STAR TREK* DODGEM *GALACTIC INTRUDERS* 18TH HOLE
CHECKERS/DRAUGHTS MAHOGANY *BREAKOUT* CONEY ISLAND *DALI* PEEK-A-BOO,
POKE-A-BOO *HUAMBO* HAPPY CHAPPY *NIM* BUGBITE *MOONBASE* SHOWOFF *MUSIC*
MENACE *MAGIC SQUARE* TWENTY-ONE *TOWER* HANGPERSON *AVOID* BOMBER *RALLY*
LIFE *MIRROR LIFE* 4-IN-A-ROW *SANDOWN* DEMON *DEMONSTRATIONS AND SUBROUTINES
(triangles, missile, solid sine)* HOW LONG HAVE I GOT? *RUSSIAN ROULETTE*
JUPITER LANDER *MINIVADERS* SMUGGLERS BOLD *SIMON* GRAND MASTER (perpetua,
snowflake, pea pod, scarsdale, blip blip) *WARPO* BOWLING *SPEEDWAY (racer,
brands hatch, wise-man)* SNAP *HADYN* UFO *SQUASH*

More than half of the games will fit a 1K ZX81. Many feature real time interaction and moving graphics.

Order form for 49 EXPLOSIVE GAMES FOR THE ZX81 is inside the back cover

Explosive games include:

- INVADERS
- BREAKOUT
- SQUASH
- DRAUGHTS
- DEATH MAZE



Young stuff

This month we are going to look at simulating READ and DATA on the ZX81 (or the ZX80 new ROM). There are 6 separate programs which I will explain separately. These Read and Data programs will work on the 1K machines but be careful not to define a lot of memory.

Unfortunately the other program is for users with the RAM pack, as it is very hard to write a PONTOON program in 1K — I would say, virtually impossible. (By all means accept this as a challenge!)

The result of the competition will be coming out in the June issue. I hope you can wait that long!

Read and data

The 1st program, called Read And Data enables you to read in strings and puts this string into the array B\$.

```
1 REM : FRED: PAUL: SIMON: PETER:
JOHN:
10 LET A$=""
20 DIM B$(5,10)
30 LET B=1
40 LET X=16514
50 LET A$=A$+CHR$(PEEK X)
60 LET X=X+1
70 IF PEEK X=14 THEN GOTO 95
75 IF PEEK X=128 THEN GOTO 120
80 GOTO 50
95 LET B$(B)=A$(2 TO )
100 LET B=B+1
105 LET A$=""
110 GOTO 50
120 FOR B=1 TO 5
130 PRINT B$(B)
140 NEXT B
```

The data, which must be in the form of a REM statement coming first in the program, is separated by a colon (:). This tells the computer that it is the beginning of a new item of data, or the end of the previous one. The inverse space at the end of the line tells the computer that it is the end of the data.

Line 70 looks for the colon

Line 75 looks for the inverse space

When the computer gets to the inverse space, it then jumps to a routine that prints out all the data — already stored in the array B\$. You could replace line 120 onwards with the rest of your program if desired.

The 2nd program works in the same way, but by reading numbers into A\$ and then assigning the VAL(A\$) to array B. (To get the 2nd program just change the appropriate lines.)

```
1 REM :1:2:3:4:5:
20 DIM B(5)
95 LET B(B)=VAL A$(2 TO )
130 PRINT B(B)
```

The 3rd program has an added benefit — you can put data on separate REM lines, as long as you end the last item of data with a colon, inverse space and then an inverse colon. Explanation — when the computer gets to an inverse

```
1 REM : FRED: PAUL: SIMON: PETER:
JOHN:
2 REM : DAVID: MARK: JULIE:
3 REM : JANE: CLAIRE:
20 DIM B$(10,10)
75 IF PEEK X=128 THEN GOTO 500
95 LET B$(B)=A$(2 TO )
120 FOR B=1 TO 10
130 STOP
500 LET X=X+1
510 IF PEEK X=142 THEN GOTO 120
520 IF PEEK X=14 THEN GOTO 105
530 GOTO 500
```

space, it goes to a routine that looks for the next colon and then, when this has been found, goes back to the original program. BUT, if it comes to an inverse colon, the computer will print out the data. This program obviously takes longer than the 1st one.

```
1 LET A$="FRED PAUL
SIMON GREGORY . INTERFACE ."
10 DIM B$(5,10)
20 FOR B=1 TO 5
30 LET B$(B)=A$(2 TO 10)
40 LET A$=A$(11 TO )
50 NEXT B
60 FOR B=1 TO 5
70 PRINT B$(B)
80 NEXT B
```

The 4th program does not put the data into a REM statement but stores it in a string variable. There is no need to separate the data with a colon but, as in this program, put the data in lengths of 10 characters, using spaces to fill up each item. Explanation — The computer takes A\$X, assigns the first 10 characters to the array B\$ and then strips A\$ of the first 10 characters.

The 5th program does exactly the same thing, but puts the data in lengths of 5 characters.

```
1 LET A$="FREDAPPAUL SIMON"
10 DIM B$(3,5)
20 FOR B=1 TO 3
30 LET B$(B)=A$(2 TO 5)
40 LET A$=A$(6 TO )
50 NEXT B
60 FOR B=1 TO 3
70 PRINT B$(B)
80 NEXT B
```

The 6th and last program uses the same method as described in program 4 and 5 above, but the data is numeric, using preceeding 0's instead of spaces.

```
1 LET A$="0001201234000030067
812345"
10 DIM B(5)
20 FOR B=1 TO 5
30 LET B(B)=VAL A$(2 TO 5)
40 LET A$=A$(6 TO )
50 NEXT B
60 FOR B=1 TO 5
70 PRINT B(B)
80 NEXT B
```

Next month there will be a program using a READ and DATA program.

Pontoon

This program simulates the game of PONTOON like the machines found at the fair. It is self-explanatory to use and the computer does not cheat, so there is a 50/50 chance of you winning.

The computer is banker and you start off with £1 (mean, isn't he?). The good thing is, though, that you can go into debt (e.g. -£4). To win you must beat his score and to get maximum money you must get pontoon, which is an ACE and a 10, JACK, QUEEN or KING.

An ace can take the value of a 1 or 11, and you will be asked to make your decision during the game. (NB: once you have made the decision you cannot go back on it.) Beneath are a list of all the inverse letters used and variables.

Line 610 — "(6 inverse £) (inverse you win with pontoon) (5 inverse £)"
Line 620 — "(4 inverse £) (inverse you win with a 5 carder) (4 inverse £)"
Line 630 — "(12 inverse £) (inverse you win) (13 inverse £)"
Line 640 — "(12 inverse £) (inverse you lose) (12 inverse £)"

Line 1015 to 1050 is:

inverse A — inverse T

inverse B — inverse J

inverse C — inverse Q

inverse D — inverse K

inverse I — inverse A

Lines 1070 to 1100 is inverse H, C, D, S.

Variables Used

Z — amount of money

a\$ — separating hands on screen

B\$ — 1st 2 of player's cards

D — player's score

F — computer's score

G — no. of cards the player has got

H — no. of aces each time the player has got

I — no. of cards the computer has got

c\$ — value of card

D\$ — type of suit

E — used for printing new cards on the screen

T — used in a loop for line no. in PRINT AT

Z — used to hold value whether the player wants his ace to be 1 or 11

*****PONT00N*****

```
10 PRINT TAB 9;"PONT00N"
20 PRINT AT 2,0;"*****I AM
THE BANKER*****"
30 PRINT AT 4,0;"YOU MUST BEAT
THE SCORE OF MY CARDS TO WIN.
I PAY AS FOLLOWS : "
40 PRINT AT 7,0;"YOUR SCORE GR
EATER THAN MINE-£1"
50 PRINT AT 9,0;"YOU GET A 5 C
ARD TRICK-£3"
60 PRINT AT 11,0;"YOU GET PONT
00N-£5"
```

```

70 PRINT AT 13,0;"I WILL ASSUM
E THAT YOU HAVE PLACED A £1
BET"
80 PRINT AT 20,0;"TYPE ANY KEY
TO CONTINUE"
90 IF INKEY$="" THEN GOTO 90
101 LET Z=1
102 LET A$="
103 LET B$="
104 LET D=0
105 LET F=0
106 LET G=2
107 LET H=0
108 LET I=0
109 CLS
110 PRINT AT 0,0;"YOU HAVE £";Z
120 PRINT A$
130 PRINT AT 2,0;"*****M
Y CARDS*****"
140 FOR T=1 TO 7
141 PRINT B$;B$,,
142 NEXT T
150 PRINT AT 10,0;A$
160 PRINT "*****YOUR CARD
S*****"
170 FOR T=1 TO 7
171 PRINT B$;B$,,
172 NEXT T
180 PRINT A$
181 PRINT AT 20,0;"ANY KEY TO T
URN YOUR CARDS OVER"
182 IF INKEY$="" THEN GOTO 182
190 GOSUB 1000
195 IF C=11 THEN LET H=1
200 PRINT AT 12,0;C$;TAB 4;D$
210 PRINT AT 18,0;D$;TAB 4;C$
215 LET D=D+C
220 GOSUB 1000
225 IF C=11 THEN LET H=H+1
230 PRINT AT 12,6;C$;TAB 10;D$
240 PRINT AT 18,6;D$;TAB 10;C$
250 LET D=D+C
252 IF D=21 THEN GOTO 500
253 IF H=1 OR H=2 THEN GOSUB 20
00
255 LET E=0
260 PRINT AT 21,0;"(5) STICK (C
) CARD
280 IF INKEY$="" THEN GOTO 280
290 IF INKEY$="S" THEN GOTO 500
300 FOR T=12 TO 18
310 PRINT AT T,12+E;B$
320 NEXT T
330 GOSUB 1000

```



```

340 PRINT AT 12,12+E;C$;TAB 16+
E;D$
350 PRINT AT 18,12+E;D$;TAB 16+
E;C$
360 LET D=D+C
365 IF C=11 THEN GOSUB 2000
370 LET E=E+6
375 LET G=G+1
377 IF D>21 THEN GOTO 601
378 IF E=18 THEN LET E=12
380 GOTO 260
500 LET E=0
511 IF F=21 AND I=2 THEN GOTO 6
40
512 IF D=21 AND I=2 THEN GOTO 6
06
515 IF F>=D THEN GOTO 605
520 FOR T=3 TO 9
530 PRINT AT T,E;B$
540 NEXT T
550 GOSUB 1000
555 IF C=11 THEN GOSUB 3000
560 PRINT AT 3,E;C$;TAB E+4;D$
570 PRINT AT 9,E;D$;TAB E+4;C$
580 LET F=F+C
590 LET E=E+6
595 LET I=I+1
596 IF E=30 THEN LET E=24
600 GOTO 510
601 LET D=-1
605 IF F>21 THEN LET F=0
606 PRINT AT 20,0;"
610 IF D=21 AND G=2 THEN PRINT
AT 21,0;"*****CLIPPING LET F=0
*****"
620 IF D>F AND G=5 THEN PRINT A
T 21,0;"*****CLIPPING LET F=0
*****"
630 IF (D>F AND G<>2 AND G<>5)
OR (D>F AND D<>21 AND G<>5) THEN
PRINT AT 21,0;"*****CLIPPING LET F=0
*****"
640 IF F>=D THEN PRINT AT 21,0;"
*****CLIPPING LET F=0 *****"
650 IF D=21 AND G=2 THEN LET Z=
Z+5
660 IF D>F AND G=5 THEN LET Z=Z
+3
670 IF (D>F AND G<>2 AND G<>5)
OR (D>F AND D<>21 AND G<>5) THEN
LET Z=Z+1
680 IF F>=D THEN LET Z=Z-1
690 PAUSE 150
700 GOTO 104
1000 LET A=INT (RND*12)+29
1001 LET C=A-26
1002 IF C>10 THEN LET C=10
1003 IF A=29 THEN LET C=11
1010 LET C$=CHR$ (A+128)
1015 IF C$=" " THEN LET C$=" "
1020 IF C$=" " THEN LET C$=" "
1030 IF C$=" " THEN LET C$=" "
1040 IF C$=" " THEN LET C$=" "
1050 IF C$=" " THEN LET C$=" "
1060 LET B=INT (RND*4)+1
1070 IF B=1 THEN LET D$=" "
1080 IF B=2 THEN LET D$=" "
1090 IF B=3 THEN LET D$=" "
1100 IF B=4 THEN LET D$=" "
1110 RETURN
2000 PRINT AT 21,0;"1 OR 11
(FOR 11 KEY 2)"
2005 IF INKEY$="" THEN GOTO 2005
2010 LET Z=VAL INKEY$
2020 IF Z=2 THEN GOTO 2040
2030 LET D=D-10
2040 LET H=H-1
2050 IF H=1 THEN GOTO 2000
2060 RETURN
3000 IF F+11<=21 OR (F+11)>=D AND
F+11<=21) THEN RETURN
3010 LET C=1
3020 RETURN

```

One last point — it is possible to have more than 5 cards, the last card is just printed over again. HAPPY PONTOONING!

Please send any questions, tips or programs you have to me, at:

High Street,
Kingston Blount
Oxford OX9 4SJ.

DAVID HARWOOD.

ZX82

Suffering as I do from quite unwarranted megalomania (big-headedness) I have long felt a bit sad that Uncle Clive hasn't come crawling to EZUG for assistance with the design of ZX82.

Late in winter when rumours of imminent ZX82 became particularly frequent, I sent a letter expressing that sadness. The response was immediate — if I want to say what ZX82 ("whatever that may be") should be like, why not?

Here, then, are some points from my reply. The views are largely the result of huge volumes of correspondence from the teachers, parents and pupils who have joined the Educational ZX Users' Group. They are coloured too, by my being a teacher, with educational needs uppermost in my mind. Still, teachers' needs do not differ much from the needs of real people — we all hope for increased facilities and improved reliability for a reduced price, don't we?

Assuming that a ZX82 (whether produced by Sinclair or by someone else) does appear, what new features do we need? We can look at these under the headings of BASIC, Memory and Peripherals.

BASIC

Some people feel that BASIC is not the best modern general-purpose language in existence. A few dislike the Sinclair dialect. Me? I love the Sinclair dialect — it is, I think, uniquely easy for children and adult beginners and even in sophisticated programming, offers a great deal of value. There are none of its special features that I would be happy to lose. However, there are features of some other BASICs that EZUG members would particularly welcome in ZX82. They include (in no special order):

- * a REPEAT key/facility;
- * integral RENUMBER (preferably partial);
- * DELETE (= partial NEW);
- * ELSE with IF... THEN...;
- * multiple statements on a line;
- * other loop structures like WHILE... DO, DO... UNTIL.

Some of these are not much more than cosmetic; others would greatly improve the ZX programmer's power. Here too, we must note the need to extend the accessible character set — lower case characters are essential (especially in teaching) and we would like other symbols (vertical line, exclamation point, apostrophe and so on, as well as specialist ones) and a few user-definable characters would be a lovely bonus.

Memory

The minimal "1K" of the ZX81 is great for keeping the price down — but it should be raised in the ZX82 to at least a (true) 2K. 16K would be better (of course) and should be incorporated at rock-bottom price.

My major plea here is for a socket for (EP)ROMs carrying programs and routines. We are used to this with Atari video games; "real" computers — including Sorcerer, Atom and BBC — have this invaluable facility too. ROM sockets are surely the way of the future; no more tiresome lengthy LOADING!

Peripherals

ZX82 must have an OLDLOAD instruction — it must be able to accept ZX81 programs for editing even if not for running. The whole LOAD/SAVE business still needs some general improvement (but few machines are 100% reliable in this context). Colour in the basic model is not necessary, but the generation of a few simple sounds for the video speaker would be useful and should not be difficult. A range of short tones plus white noise would suffice. It is time to say "Goodbye" to the famous Sinclair screen flicker — the screen display should be maintained in FAST and when using the printer. (But FAST/SLOW is worth keeping.)

As far as the printer is concerned it would be nice to have an ECHO command (which reflects keyboard entries automatically to printer). Of course we still want the printer bugs to be eradicated...

Whether ZX disc systems become common or not, the cassette SAVE/LOAD procedures can still do with some improvement. It would be nice to have, in addition, VERIFY (a command to check that what's on tape matches what's in memory), cassette control and a screen display of file-name and perhaps block number, during LOADs.

Conclusion

Few of these suggestions would present much difficulty to Sinclair in developing a cheap powerful successor to the ZX81. I am convinced that the ZX80-ZX81-ZX82 route is the right path to a future of effective personal computing for all. Indeed, unless Tim tells me to shut up, I'll take another break from Education next month and describe my fantasies of the ZX92.

ERIC DEESON,
Highgate School,
Birmingham 12.

(Note from TIM: I shall most certainly not tell Eric to shut up. As you've probably guessed, all the foregoing was written before the ZX Spectrum was launched. It is pleasing to see how many of the features which Eric thought were important have, in fact, been incorporated into the ZX Spectrum. We look forward to Eric's predictions for the ZX92.)

ZX81 cassette control unit

If you are fed up with swapping and changing leads around when you are SAVEing and LOADing programs on your ZX81, then for about £4.50 you can easily build yourself this cassette control unit.

You will need the following items. These can all be obtained from Maplin

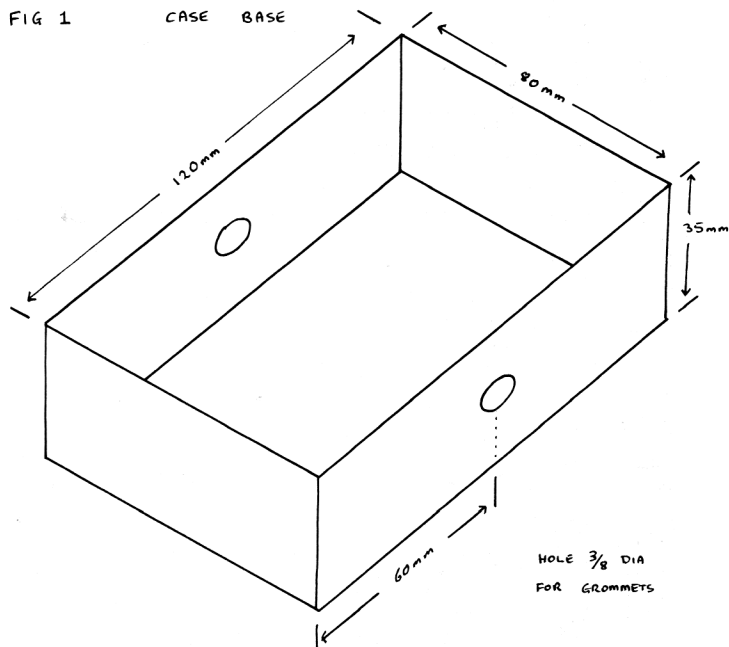
Electronic Supplies:

- 1 Case. Vero type 303. Part 202-21390D
- 2 Small PVC Grommets

- 1 64 ohm Miniature loudspeaker
- 1 2-pole 6-way Rotary switch
- 1 Metre single screened cable
- 1 Standard slide switch
- 4 Stick-on feet
- 2 3.5mm Jack plugs, black body
- 2 3.5mm Jack plugs, silver body
- 1 2.5mm Jack plug, black body
- 1 Pointer control knob to fit rotary switch
- 2 Size M3 screws for slide switch

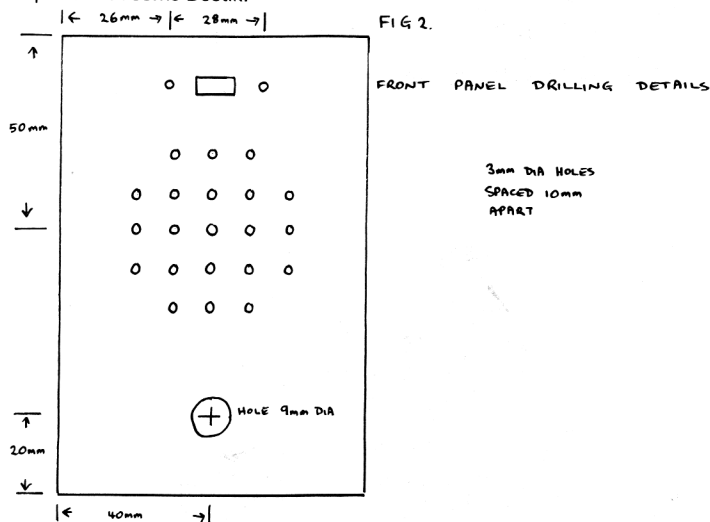
Rub down lettering or Dymo Tape for front panel lettering

Begin by removing the lid from the case and drill two holes of $\frac{3}{8}$ ths diameter either side for the grommets as shown in Figure 1. Stick the 4 feet on to the underside of the case, one in each corner.



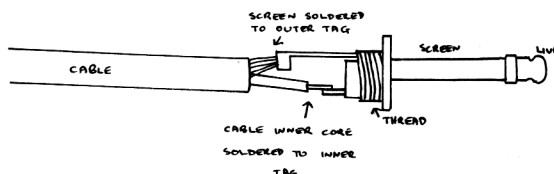
Next you must drill and prepare the lid as shown in Figure 2. The spindle of the rotary switch will need to be cut to about 1cm in length to accommodate the knob. Ensure that the locking washer, if fitted, on the rotary switch is in the correct position to allow four positions out of the possible six available.

The side switch is held in place by two small bolts (size M3). If you wish you can cover the loudspeaker holes with a small piece of cloth before gluing the LS in place with some Bostik.



Now cut the length of screened cable into five equal lengths and strip and tin each end ready for use. Solder one jack plug to each length of wire as shown in Figure 3. Two different types of 3.5mm plug are used to aid with identification when connecting the unit up. Black type for SAVE, silver type for LOAD. You don't need screened cable for the pause switch but it saves having to buy a separate length of two core wire.

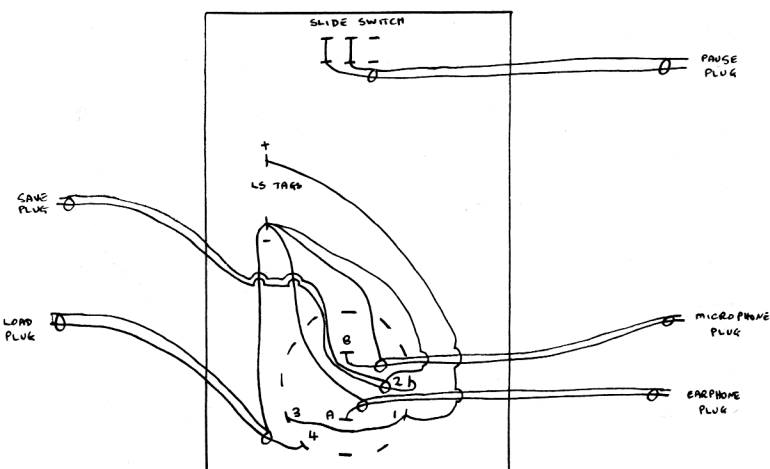
FIG 3 PLUG CONNECTING DETAILS



Insert one each of the 3.5mm leads plus the 2.5mm lead through the left side grommet and the other two leads through the right grommet ready for wiring up.
Now solder the leads up as shown in the diagram in Figure 4. The lid of the case with items fitted is drawn face down.

FIG 4

WIRING DETAILS



NOTE - LOOPED WIRE DEMOTES SCREEN
USE LG -VE AS ONLY EARTH POINT

When complete the lid can be screwed back onto the case and the unit is then ready for use. As a reminder make a small label as shown in Figure 5 and sellotape this to the underside of the case. You then have a permanent record of which lead goes where, should you forget.

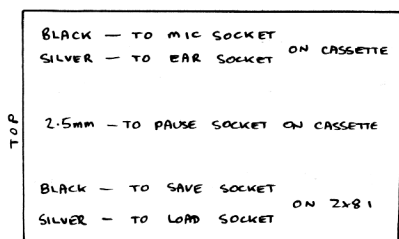


FIG 5

Label the lid with Dymo tape or Letraset rub down lettering as detailed in Figure 6.

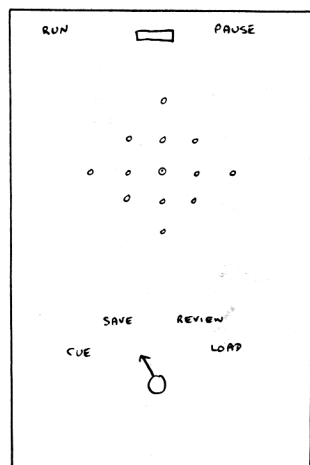


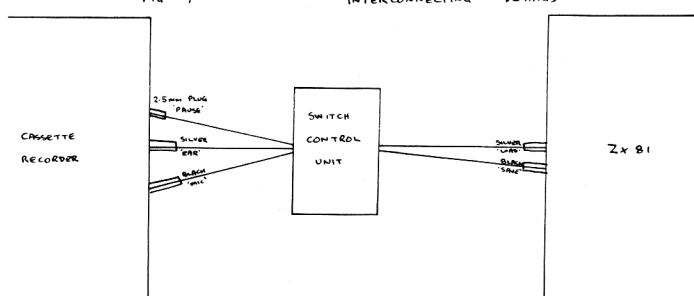
FIG 6 LID LETTERING DETAILS

Finally connect the unit between your cassette recorder and the ZX81 as shown in Figure 7. To use the unit it is a simple matter of switching through the range from cue to load:

- 1 CUE Cassette on record. Speak the name of the program. The unit loudspeaker is acting as a microphone.

FIG 7

INTERCONNECTING DETAILS



- 2 SAVE Press the save key on the ZX to record the program onto cassette.
- 3 REVIEW After cassette rewind, enables you to hear the recording you have just made.
- 4 LOAD To play back the program to load back into the computer.

All this can be done of course without disconnecting any of the leads at all. Between stages the tape can be stopped or started with the aid of the pause switch. This has the effect on most machines of stopping the cassette motor. It is included for those who do not have a pause switch on their recorder, as it takes the place of the microphone pause switch.

M. SMALL,
Aylesbury.

Hard facts

Sinclair 4K and 8K BASIC for your ZX80 and ZX81

By Stephen Adams

The first thing to obtain is a ROM, a 4K one for a ZX81 or an 8K for a ZX80 (YES, it does work!) The other items required are a 24 pin I.C. socket, some wire, craft knife, double-poled changeover switch, soldering iron and solder etc. A start must be made by removing the ZX80 or ZX81 from its case — BUT no work should be done while any power is still connected!

ZX80

Push up the centre pins of ALL the case fasteners, including the ones holding the keyboard down. Take the top off and with a pair of pliers holding the fastener, push the fastener down through and out the bottom of the case. This should release the P.C.E. when all three fasteners are removed.

ZX81

Remove the three rubber feet covering up the screws. These are the top left and bottom two looking at the underside of the ZX81 with the keyboard towards you. There should now be five screws exposed and these should be removed with a cross-headed screwdriver. Save the screws for putting it back together later. Unscrew the two screws holding the P.C.B. to the case and turn it over, leaving the keyboard "tails" attached to the P.C.B.

Remove the ROM carefully by levering it up with a screwdriver first at one end, then the other, so as not to bend the pins. Bend the pins 20 and 24 of the 4K ROM out by 45°. The pins are numbered from the dot on the top of the ROM, which is pin 1. Pin 24 is on the opposite side to pin 1 and pin 20 is the fifth pin down on that side. Solder on two wires to these pins, make them different colours if you can. Now solder the 24 pin I.C. socket on top of the 4K ROM, all except pins 20 and 24. Solder two more wires, different colours again, on to the I.C. sockets pins 20 and 24. Now put some insulator between the I.C. sockets pins 20 and 24 and the ROM, a piece of paper will do. The ROM should now look like Figure 1.

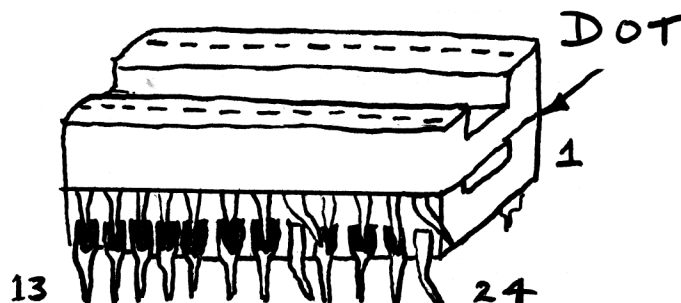


Fig 1

Insert the 4K ROM back into the socket, leaving pins 24 and 20 hanging over the outside. Now solder yet another two wires to pins 20 and 24 of the ROM socket on the printed circuit board. These two wires go to the centre positions of the changeover switch shown in Figure 2.

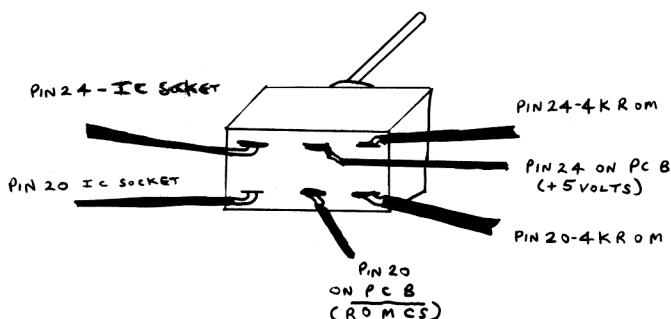


Fig 2

The other wires from the I.C. socket go to one side of the switch and the 4K ROM wires the other side. This switch is used to change over the power supply +5 volts and NOT CHIP SELECT LINE. This line is used to turn on the ROM when the correct address is detected by the Sinclair Computer Logic (U.L.A.). It is required to go to Binary 0 at this time and Binary 1 on any other. As it works to a Binary 0 it is written as CS. The reason the power supply is changed over, is that Sinclair's power pack could not cope with the power drain caused by running two ROMs at the same time.

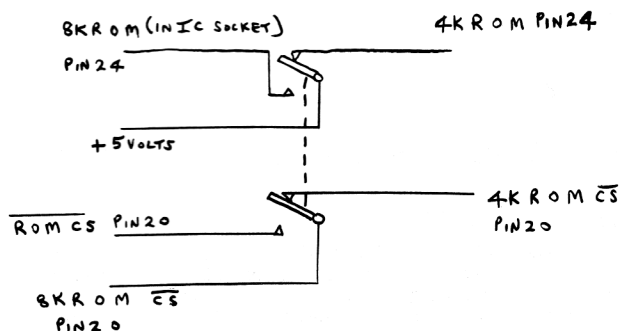


Fig 3. Circuit Diagram

The leads to the switch should be kept fairly short and the switch mounted on the top of the case for the ZX80, in front of the video modulator. The ZX81 switch should be fitted to the side of the ZX81 in a convenient position. After all the soldering has been done and CHECKED for solder bridges between the pins, the switch should be operated so as to connect up the 4K ROM.

On replacing the jack plug from the power pack, the inverse "K" should appear. If not, check your connections again and make sure none of the wires touch the printed circuit board. The power should now be removed again and the 8K ROM placed in the I.C. socket. Switch the switch to the 8K ROM, this should ONLY be done when the power is switched off. If this is done while the power is ON, the program will not only crash but it might damage the ROM.

Apply the power again and the inverse "K" should again appear but this time if a key is pressed the symbol might be different. Again check the connections if this does not happen. This will not give the ZX80 a "SLOW" mode!

You now have a choice of BASIC a full floating point 8K one or an INTEGER only RAM saving BASIC. There are advantages in both not least if which is that the ZX81 can now use 4K ROM software as long as it does not operate the "SLOW" mode which the 4K ROM cannot cope with.

ZX81 programs Invoice

INVOICE PROGRAM DESCRIPTION.

THIS INVOICE PROGRAM PRINTS OUT A FORMATTED INVOICE FOR CUSTOMERS OF MY MAIL-ORDER XMAS CATALOGUE AGENCY. BECAUSE OF MEMORY CONSTRAINTS ALL DATA HAS TO BE INPUT FOR EACH INVOICE, AND INVOICE DETAILS ARE NOT STORED IN MEMORY. THE PROGRAM TOTALS THE INVOICE, AND WORKS OUT A BREAKDOWN OF THE COMMISSION ON EACH ORDER.

45-70 INPUTS VARIABLE INV = INVOICE NUMBER. THE NO. OF THE LAST INVOICE PRINTED IS INPUT AT START OF EACH RUN.

90-170 INPUT OF DATE TO APPEAR ON INVOICES.

180 VARIABLE "COUNT" = NO. OF INVOICES PRODUCED THIS RUN.

190 CCT= CARD COMMISSION TOTAL

200 GCT= GIFT COMM. TOTAL.

240 CT= CARD TOTAL.

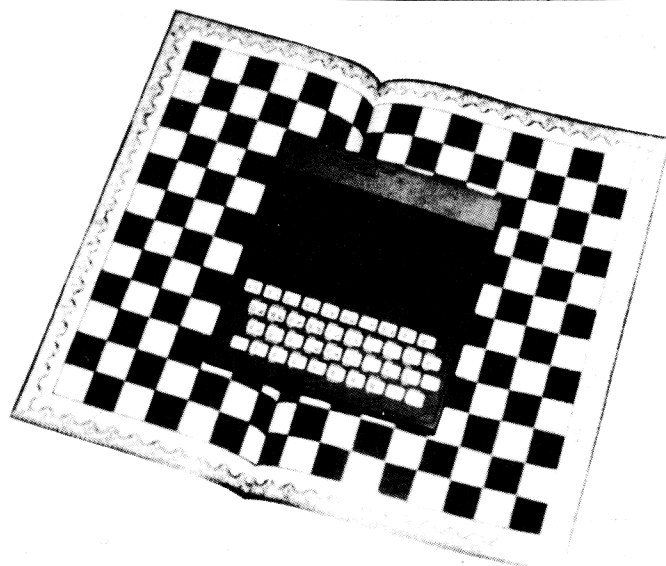
250 GT= GIFT TOTAL.

350 CC= CARD COMM. (ON CURRENT INVOICE.

34 Amazing Games for the 1K ZX 81

By Alastair Gourlay

This incredible collection of tested games programs shows just how flexible and exciting the 1K ZX81 can be. If you have no additional memory, you need this great new book from Alastair Gourlay, a member of the users' club from Scotland.



Programs include SUICIDE MISSION, NIAGARA, CHARIOTEER, ICBM, STOCKMARKET, OUTLAW, ALONG THE WIRE, BREAKOUT, SQUASH AND SPACE AMBUSH. As well there is information on making the most of 1K, scrolling, keyboard reading from machine code, how to emulate ON GOTO and ON...PRINT, and selective string assignment.

```

270      GO= GIFT COMM. (AS CC)
290-370 ENTER CUSTOMER NAME.

390-580      INVOICE      HEADER
LPRINTED

600-925      ROUTINES TO INPUT ONE
LINE      OF      DATA (CAT.NO.;
QUANTITY; DESCRIPTION; PRICE);
PRINT IT TO SCREEN THEN LPRINT
IT IN A STANDARD FORMAT.

930-970      UPDATE      CARD AND GIFT
TOTALS

980-1010     GOTO INPUT ROUTINE
IF ANY MORE ITEMS.
1020-1080     LPRINT TOTAL      FOR
CURRENT INVOICE.

1100-1170     LPRINT      INVOICE
TRAILER.

1190-1400     PRINT      BREAKDOWN OF
COMMISSION ON      INVOICE: GARD
COMM. (25 0/0) ; GIFT COMM. (10
0/0); TOTAL      COMM. ON CURRENT
INVOICE; TOTAL CARD AND GIFT
COMMS. ON ALL INVOICES PRINTED
THIS RUN; AVERAGE COMM/INVOICE
THIS RUN.

1410-1450     CHOICE: LPRINT COMM.
FOR CURRENT INVOICE; START WITH
NEW CUSTOMER; END THIS RUN.

1455-1527     LPRINT COMM. DATA ON
CURRENT INVOICE.

1550-1570     LOAD AND      RUN
ROUTINE.

```

ACE INVOICE PROGRAM

```

1 REM      NAME
5 REM      C- R. A. WOODWARD
10 REM      30-12-81
15 REM      2-81-181-1-PRINTER
20 REM
30 LET A$="ACE INVOICE PROGRAM
..
35 LET B$="-----
..
40 LET F$="INVOICE NO."
45 PRINT AT 3,6;A$;AT 4,6;B$
50 PRINT AT 10,0;" INPUT LAST
INVOICE NO. ";
55 INPUT INV
60 PRINT INV
65 FOR Z=1 TO 30
70 NEXT Z
80 CLS
90 REM      INPUT DATE
100 PRINT AT 3,6;A$;AT 4,6;B$
110 PRINT AT 8,5;" INPUT DATE
DATE";TAB 9;" (AS "12/89/81
")
120 INPUT U$
130 IF U$="" THEN GOTO 120
140 IF LEN U$<>8 THEN GOTO 120
150 PRINT AT 11,11;" ";U$
160 FOR Z=1 TO 30
170 NEXT Z
180 LET COUNT=0
190 LET CCT=0
200 LET GCT=0
210 CLS
220 LET COUNT=COUNT+1
230 LET INV=INV+1
240 LET CT=0
250 LET GT=0
260 LET CC=0
270 LET GC=0
280 PRINT AT 3,6;A$;AT 4,6;B$
300 PRINT AT 6,9;F$;INV
310 PRINT AT 7,9;"-----
320 PRINT AT 10,5;" ENTER NEXT
NAME"

```

```

330 PRINT AT 12,5;" "
340 INPUT C$
350 PRINT AT 12,5;" ";C$
360 FOR Z=1 TO 40
370 NEXT Z
380 CLS
390 REM      INVOICE HEADER
400 LPRINT "
410 LPRINT "
420 LPRINT "
430 LPRINT "
440 LPRINT "
450 LPRINT "
460 LPRINT "
470 LPRINT "
480 LPRINT "
490 LPRINT "*****";F$;INV;"
*****"
500 LPRINT "*****INVOICE DATE "
U$;"*****"
510 LPRINT
520 LPRINT TAB 5;"AGENT- ROY A.
WOODWARD"
530 LPRINT
540 LPRINT TAB ((21-LEN C$)/2);
"CUSTOMER-";C$
550 LPRINT
560 LPRINT
570 LPRINT "CAT.NO.";TAB 8;"QTY
";TAB 13;"ITEM";TAB 27;"PRICE"
580 LPRINT " ";TAB 8;"
";TAB 13;" ";TAB 27;" "
590 CLS
600 REM      INPUT ROUTINE
610 PRINT AT 4,4;" INPUT CATALOGUE
NUMBER"
620 INPUT N$
630 IF N$="" THEN GOTO 610
640 IF LEN N$=5 THEN LET C=1
650 IF LEN N$=6 THEN LET C=0
660 IF C=1 THEN PRINT AT 10,13;
N$;AT 12,4;"-THIS ITEM IS FROM T
HE";AT 13,6;"ACE GARD CATALOGUE.
"
670 IF C=0 THEN PRINT AT 10,13;
N$;AT 12,4;"-THIS ITEM IS FROM T
HE";AT 13,6;"ACE GIFT CATALOGUE.
"
680 FOR Z=1 TO 40
690 NEXT Z
700 CLS
710 PRINT AT 4,4;" INPUT QU
ANTITY"
720 PRINT AT 11,0;"CAT.NO.";TAB
8;"QTY";TAB 13;"ITEM";TAB 27;"P
RICE"
730 PRINT AT 12,0;" ";TAB
8;" ";TAB 13;" ";TAB 27;" "
740 PRINT AT 13,0;N$;
750 INPUT Q
760 PRINT TAB 9,0;
770 PRINT AT 4,4;" INPUT ITEM
NUMBER"
780 INPUT D$
790 PRINT AT 4,4;" INPUT PRICE
"
800 PRINT AT 13,12;D$;
810 INPUT P$
820 IF Q>1 THEN PRINT TAB 24;Q,
"X";
840 IF VAL P$<10 THEN PRINT TAB
26;"£";
845 IF VAL P$>10 THEN PRINT TAB
26;"£";
850 IF VAL P$<1 THEN PRINT "0";
855 PRINT P$
860 FOR M=1 TO 30
870 NEXT M
880 LPRINT
890 LPRINT N$;TAB 9,0;TAB 12;D$
900 IF Q>1 THEN LPRINT TAB 24;Q
"X";
910 IF VAL P$<10 THEN LPRINT TA

```



```

B 26; "£ ";
915 IF VAL P$ < 1 THEN LPRINT "0"
;
920 IF VAL P$ > 10 THEN LPRINT TA
B 26; "£ ";
925 LPRINT P$
930 REM UPDATE TOTALS
940 IF C=1 AND 0 <= 1 THEN LET CT
=CT+VAL P$
950 IF C=0 AND 0 <= 1 THEN LET GT
=GT+VAL P$
960 IF C=1 AND 0 > 1 THEN LET CT=
CT+(0*VAL P$)
970 IF C=0 AND 0 > 1 THEN LET GT=
GT+(0*VAL P$)
980 PRINT AT 19.8; "ANY MORE IF
YES"; AT 20.2; "IF SO JUST PRESS
NEWLINE"
990 INPUT G$
1000 CLS
1010 IF G$="" THEN GOTO 590
1020 REM PRINT TOTALS
1025 LPRINT
1030 LPRINT TAB 7; "TOTAL-----
-----£"; FT
1040 LET FT=CT+GT
1050 IF FT < 10 THEN LPRINT " "; FT
1060 IF FT >= 10 THEN LPRINT FT
1070 FOR Z=1 TO 40
1080 NEXT Z
1090 CLS
1100 REM PRINT INVOICE TRAILER
1110 LPRINT
1120 LPRINT TAB 3; "THANKYOU FO
R YOUR ORDER"
1130 PRINT AT 10.0; "PRESS ""NEWL
INE"" ONLY TO PRINT"; TAB 5; "XMAS
TRAILER."
1140 INPUT I$
1150 IF I$ <> "" THEN GOTO 1180
1160 LPRINT
1170 LPRINT TAB 7; "*****
*****"; TAB 7; "MERRY CHRISTMAS";
TAB 7; "*****
*****"
1180 CLS
1190 REM PRINT COMMISSION
1200 PRINT "COMMISSION ON THIS O
RDER-"
1210 PRINT "-----
-----"
1220 PRINT
1230 LET CC=(INT (CT*25))/100
1240 LET CCT=CCT+CC
1250 PRINT "CARD COMMISSION= £";
CC
1260 LET GC=(INT (GT*10))/100
1270 LET GCT=GCT+GC
1280 PRINT "GIFT COMMISSION= £";
GC
1290 PRINT
1300 PRINT "-----
-----"
1310 PRINT
1320 PRINT "COMMISSION ON "; COUN
T; " ORDER";
1330 IF COUNT > 1 THEN PRINT "S"
1340 PRINT TAB 0; "-----
-----"
1350 PRINT "TOTAL CARD COMMISSIO
N = £"; CCT
1360 PRINT "TOTAL GIFT COMMISSIO
N = £"; GCT
1370 PRINT "AVERAGE COMMISSION/O
RDER= £"; (INT (((CCT+GCT)/COUNT)
*100))/100
1380 PRINT
1390 PRINT "-----
-----"
1400 PRINT AT 16.0; "TO PRINT TOT
ALS AND COMMISSION ON THIS ORDE
R PRESS ""P""
1410 PRINT AT 16.0; "PRESS ""N""
FOR NEWLINE"; TAB 6; "PRESS ""
1420 PRINT AT 20.0; "TO END THIS
RUN PRESS ""S"" ONLY"
1430 IF INKEY$="" THEN GOTO 1430
1440 IF INKEY$=CHR$ 118 THEN GOT
O 210
1450 IF INKEY$="S" THEN STOP
1455 LPRINT
1457 LPRINT

```

```

1460 LPRINT "*****"; F$; INU; "
*****"
1470 LPRINT
1480 LPRINT TAB ((21-LEN C$)/2);
"CUSTOMER-"; C$
1490 LPRINT
1500 LPRINT TAB 6; "TOTAL-----
-----£"; FT
1520 LPRINT TAB 4; "TOTAL COMMISS
ION = £"; CC+GC
1525 LPRINT
1527 LPRINT
1530 CLS
1540 GOTO 210
1550 STOP
1560 SAVE "AC"
1570 GOTO 30

```

Homer

Dear INTERFACE,

I hope you enjoy my listing overleaf for "Homer", and I would be very grateful if you could find space to print it in the next issue.

The program just squeezes into 1K of ZX81. The game consists of 3 dots. The one at the centre remains stationary, and is the "booby-trap" bomb.

The player is one of the other two dots and the malevolent "Homer" (homing device), the other. The identity of each quickly becomes apparent.

The "Homer" chases after the player; the player moves in whichever direction he inputs commands (5, 6, 7, & 8). The player moves twice as fast as the Homer, but this is partially made up for, by the fact the "Homer" moves diagonally. If the "Homer" catches the player, the player loses.

The only way for the player to win is to lure the chasing "Homer" into the "booby-trap" bomb in the centre, (not as difficult as it sounds but not easy either!)

An added hardship is that, as the Homer gets near the player (five "plot-spaces") it's speed increases to match the player.

For those with more than 1K; the listing has been left open at line 97 (if the player hits the "booby-trap" bomb) and a suitable PRINT statement can be made at 500.

TREVOR LAWFORD
Middlesex

```

1 REM "HOMER"
10 LET D=0
20 LET A=INT(RND*64)
30 LET B=INT(RND*44)
40 LET X=INT(RND*64)
50 LET Y=INT(RND*44)
60 CLS
70 PLOT A,B
80 PLOT X,Y
90 PLOT 31,22
95 IF A=31 AND B=22 THEN GOTO 300
97 IF X=31 AND Y=22 THEN GOTO 500
100 IF X=A AND Y=B THEN GOTO 400
110 IF ABS(X-A) OR ABS(Y-B) <= 5 THEN LET S=2
120 IF ABS(X-A) OR ABS(Y-B) > 5 THEN LET S=1
130 IF INKEY$="5" THEN LET X=X-2
140 IF INKEY$="6" THEN LET Y=Y-2
150 IF INKEY$="7" THEN LET Y=Y+2
160 IF INKEY$="8" THEN LET X=X+2
170 IF A < A THEN LET A=A-S
180 IF X > A THEN LET A=A+S
190 IF Y < B THEN LET B=B-S
200 IF Y > B THEN LET B=B+S
205 LET D=D+1
210 GOTO 60
300 PRINT AT 20.2; "YAHOO, YOU DESTROYED THE HOMER"
310 STOP
400 PRINT AT 20.0; "YOU'RE DEAD, AND IN ONLY"; D/2; "DAYS"
410 STOP

```

Alphabet

Hans Meier from Rustenburg, South Africa sent the club this fine program:

A PROGRAM THAT COMPUTES THE NUMBER OF TIMES A LETTER OCCURS IN A TEXT. IT WILL ALSO PRINT A GRAPH IF DESIRED. THE SCREEN WILL FLASH AND GO BLACK DURING THE PROGRAM. THIS IS NORMAL. TO CONTINUE AT ANY TIME PRESS NEWLINE. FOR HARD COPY ENTER A C WHEN A "C" IS DISPLAYED. PRESS NEWLINE WHEN READY THE SCREEN WILL CLEAR AND YOU CAN THEN ENTER THE TEXT. WHEN TEXT IS COMPLETE PRESS NEWLINE AGAIN.

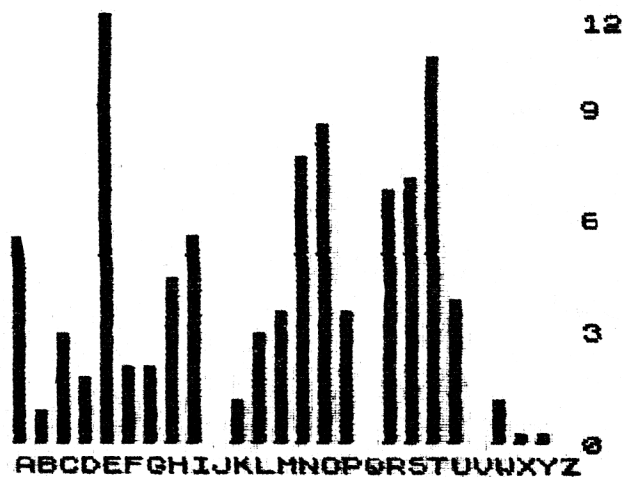
```

100 H.O.MEIER 1981
110 DIM D(26)
120 LET M=0
130 PRINT AT 0,11;"ALPHABET"
140 PRINT AT 1,11;"===== "
150 PRINT AT 3,0;"A PROGRAM THA
T COMPUTES THE NUMBER OF TIM
ES A LETTER OCCURS IN A TEXT."
160 PRINT AT 6,0;"IT WILL ALSO
PRINT A GRAPH IF DESIRED."
170 PRINT AT 8,0;"THE SCREEN WI
LL FLASH AND GO BLACK DURING
THE PROGRAM.THIS ISNORMAL."
180 PRINT AT 11,0;"TO CONTINUE
AT ANY TIME PRESS NEWLINE.FOR
HARD COPY ENTER A C WHEN A ""
" IS DISPLAYED."
190 PRINT AT 14,0;"PRESS NEWLIN
E WHEN READY THE SCREEN WILL
CLEAR AND YOU CAN THEN ENTER T
HE TEXT.WHEN TEXT ISCOMPLETE PRE
SS NEWLINE AGAIN."
200 INPUT H$
210 CLS
220 FAST
230 INPUT A$
240 IF A$="" THEN GOTO 230
250 CLS
260 LET LEN=LEN A$
270 SLOW
280 LET LG=LEN
290 FOR L=1 TO LEN
300 PRINT A$(L);
310 LET V=CODE A$(L)
320 IF V<=37 THEN LET LG=LG-1
330 IF V<=37 THEN GOTO 360
340 LET U=V-37
350 LET D(V)=D(V)+1
360 NEXT L
370 INPUT H$
380 IF H$="C" THEN COPY
390 IF H$="C" THEN LPRINT
400 CLS
410 FOR L=1 TO 26
420 LET P=(INT (D(L)/(LG)*10000
)/100
430 IF D(L)>M THEN LET M=D(L)
440 PRINT CHR$(L+37);"=";D(L);
" ";P
450 NEXT L
460 INPUT C$
470 IF C$="C" THEN COPY
480 IF C$="C" THEN LPRINT
490 CLS
500 FAST
510 FOR D=.01 TO 200 STEP .01
520 IF M/D<=40 THEN GOTO 540
530 NEXT D
540 SLOW
550 FOR B=1 TO 26
560 PRINT AT 21,B;CHR$(B+37)
570 NEXT B
580 LET P=(INT (M/LG*100))
590 PRINT AT 1,27;P;AT 5,27;P;
75;AT 10,27;P/2;AT 15,27;P*.25;A
T 20,27;"0"
600 FOR B=1 TO 26
610 LET G=INT D(B)/D
620 FOR L=1 TO G
630 PLOT (B)*2,L+2
640 NEXT L
650 NEXT B
660 INPUT C$
670 IF C$="C" THEN COPY
680 STOP
690 SAVE "ALPHABET"
700 GOTO 110

```

THE COMPUTER WILL IGNORE SPACES, NUMBERS AND PUNCTUATION MARKS. THE LENGTH OF THE TEXT IS LIMITED TO WHAT ONE CAN GET ON A SCREEN.THIS SHOULD BE ENOUGH FOR MOST PURPOSES.THIS PROGRAM WILL NOT FIT INTO 1K.AS YOU CAN SEE IT MAKES USE OF THE PRINTER FOR A PERMANENT RECORD.

A=13	6.04	B=2	0.93
C=7	3.25	D=4	1.86
E=26	12.09	F=5	2.32
G=5	2.32	H=10	4.65
I=13	6.04	J=0	0
K=3	1.39	L=7	3.25
M=8	3.72	N=17	7.9
O=19	8.63	P=6	3.72
Q=0	0	R=15	6.97
S=16	7.44	T=23	10.69
U=9	4.16	V=0	0
W=3	1.39	X=1	0.46
Y=1	0.46	Z=0	0



ZX80

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As reviewed in 'YOUR COMPUTER' March 1982

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Line renumber - you state starting number and increment value

Search and replace - changes every occurrence of a character as you require.

Free space - tells you how many free bytes you have left

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode - graphics never seen on a ZX81 before

Open - instantly sets up as many empty print lines as you require. (1K version only)

Fill - used in conjunction with OPEN fills your screen instantly with your specified character.

Reverse - changes each character on your screen to its inverse video.

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Search for and list every line containing specified character.

16K VERSION

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22 exciting MACHINE CODE routines that give you control over your screen as never before!

(ZX81 - 16K RAM ONLY)

DRAW/UNDRAW draws or deletes your multi-character shape which is defined in a REM statement. You may define as many different shapes as you like and draw or undraw each at will at whichever screen position you choose.

BACKGROUND ON/OFF use this to 'protect' existing characters on your screen. When on new shapes will appear to slide behind and re-emerge from other shapes.

BORDER/UNBORDER Draws a border round the edges of your screen area. Edit lines can be used if required. Your border is protected when foreground is on.

FILL Fills any number of lines you specify, starting at any line you specify, by your chosen character.

REVERSE Converts all characters to their inverse video, control as in FILL.

PRINT POSITION CONTROLS

UP DOWN LEFT RIGHT } After your next PRINT position in the direction indicated

EDIT/PRINT Moves next PRINT position to first edit line

SCROLL facilities

UPSCROLL DOWNSCROLL RIGHTSCROLL LEFTSCROLL } Scroll your screen in the direction indicated

ONSCREEN/OFFSCREEN turns your screen on or off

BACKGROUND ON/OFF Fills your screen by your specified character. When foreground is on existing information is unaffected and shapes will appear to pass in front of your background, without deleting it

SEARCH AND REPLACE will search the screen for every occurrence of the character you specify and replace it with your new character.

SQUARE draws a square or rectangle from your specified co-ordinates

ALL these routines are in machine code for SUPER-FAST response! Simply load GRAPHICS TOOLKIT, which repositions itself at the end of your RAM, and then your own program (or key in a new one). GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmers TOOLKIT described above (16K RAM version)

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ZX80 programs

24 hour clock

This program comes from Brian Theasby of Hartlepool. It can easily be converted to run on a ZX81.

```

10 DIM A(4)
20 PRINT "24 HOUR TIME INTO A.M. OR P.M."
30 PRINT
40 PRINT "INPUT TIME IN 24 HOUR MODE (01.05) OR PN/L FOR
   COMMAND MODE"
50 PRINT
60 FOR A=0 TO 5
70 PRINT
80 INPUT A$
90 PRINT A$;"*HOURS=";
100 IF A$="P" THEN LIST
110 FORB=0TO5
120 LET A(B)=CODE(A$)-28
130 LET A$=TL$(A$)
140 NEXT B
150 LET H=A(0)*10+A(1)
160 LET M=A(3)*10+A(4)
170 IF H<13 THEN LET B$="*A.M."
180 IF H=12 AND M=0 THEN LET B$="*NOON"
190 IF H=12 AND M>0 OR H>12 THEN LET B$="*P.M."
200 IF H=24 OR H=0 AND M=0 THEN LET B$="*MIDNIGHT"
210 IF H>12 THEN LET H=H-12
220 IF M>9 THEN PRINT H;" ";M;B$
230 IF M<10 THEN PRINT H;"0";M;B$
240 NEXT A
250 PRINT
260 PRINT
270 PRINT "PRESS N/L"
280 INPUT C$
290 RUN

```

© B. THEASBY, 1982

Progress

"Progress" is a financial game for the 1K. The program will just about fit on the 1K memory; variants on it may be made with greater memory. The first thing the computer will do, when you run the program, is print: "OBTAIN £X"

X may be £2000, £3000, or £4000. This is your goal and you must obtain it within 15 fiscal years. In each fiscal year it will print "PROPERTY?" and you must enter your choice of 10 properties, each one being £50 more than the last e.g. 1 > £50, 2 > £100, 3 > £150, etc. Bear in mind, though, that the computer will more probably land on the middle numbers than the extremes e.g. more likely 4, 5, or 6 than 1 or 10. When the computer lands on one of your properties you will receive its value. If you do not want any property input 0.

The computer will then print "shares > 0". This asks you if you want any shares put in how many, if not put in 0. The shares cost £50 each. In the next fiscal year the 0 will change to the number of shares you have bought.

The computer will then decide whether it landed on your property and print your bank account. It will then work out shares (you don't receive any money unless you have 2 shares or more).

At the end of the 15 fiscal years it will tell you whether you've won or not depending on your bank balance.

```

1 CLEAR
2 LET T=0
3 LET H=0
4 RANDOMISE
5 LET M=(RND(4)+2)*50
10 DIM D(10)
30 LET A=(RND(75)+25)*10
40 PRINT "PROGRESS"
50 PRINT
55 LET K=(RND(2)+2)*1000
60 PRINT "OBTAIN £";K
70 PRINT
80 GOSUB 1100
90 GOSUB 1200
100 INPUT B
110 IF B=0 THEN GOTO 190
120 LET D(B)=B
130 LET A=A-(B*50)
140 CLS
150 GOSUB 1100
160 GOTO 90
190 CLS
200 IF A=0 OR A<0 THEN GOSUB 1300
205 GOSUB 1100
210 PRINT "PROPERTIES"
220 FOR F=1 TO 10
230 PRINT D(F);" ";
240 NEXT F

```

```

270 PRINT
400 PRINT "SHARES> ";H
410 INPUT G
420 IF G=0 THEN GOTO 600
430 IF A<(G*50) THEN GOSUB 1300
440 LET A=A-(G*50)
450 GOSUB 1100
460 LET H=H+G
600 LET Z=Z+1
605 PRINT Z
610 IF Z=15 THEN GOTO 1000
615 LET M=(RND(4)+1)
620 LET A=A+M
630 PRINT "SALLARY $";M
640 GOSUB 1100
650 LET I=RND(4)+RND(5)+1
660 IF D(I)=I THEN GOTO 700
665 LET N=RND(50)*(H/2)
670 LET A=A+N
695 PRINT "SHARES" GIVE £";N
680 GOSUB 1100
690 GOTO 90
700 PRINT "LANDED ON";I
710 LET A=A+IX50
720 GOSUB 1100
730 GOTO 665
1000 IF A>K THEN PRINT "YOU'VE WON"
1010 IF A<K+1 THEN PRINT "YOU'VE LOST"
1020 STOP
1100 PRINT "£";A
1110 PRINT
1120 RETURN
1200 PRINT "PROPERTY?"
1210 PRINT
1220 RETURN
1300 PRINT "OUT OF CASH"
1310 STOP

```

Card shuffle, bingo call

Dear INTERFACE,

Here are a couple of programs. Both are similar nature and principle.

They are simpler and much quicker than the usual "card shuffle" type program and work by string manipulation.

Only the absolute minimum random numbers are required as every one is used.

```

10 REM CARD SHUFFLE
20 LET A$=""
30 FOR N=1TO52
40 LET A$=A$+CHR$(N)
50 NEXT N
60 RANDOMISE
70 LET R=52
80 FOR N=1TO52
90 LET A=INT(RNDXR+1)
100 LET B$=A$(A)
110 SCROLL
120 PRINT "CARD - ";N, CODE B$
130 LET C$=A$(1TOA-1)
140 LET D$=A$(A+1 TO LEN A$)
150 LET A$=D$+C$
160 LET R=R-1
170 NEXT N

```

Lines 30-50 put all 52 cards in a string, as characters.

Lines 90-100 selects a random card from the pack.

Lines 120 displays the selected card, as a number.

Lines 130-150 reduce the number of cards left in the pack by taking out the selected card and cutting the pack each time.

Line 160 reduces the maximum random number to the number of cards left in the pack.

In this way every random number is used.

Program can be further expanded by converting the numbers into named cards.

```

10 REM BINGO CALL
20 LET A$=""
30 FOR N=1 TO 99
32 LET B=N
35 IF B>63 THEN LET B=B+64
40 LET A$=A$+CHR$(B)
50 NEXT N
60 RANDOMISE
70 LET R=99
80 FOR N=1 TO 99
90 LET A=(RNDXR+1)
100 LET B$=A$(A)
110 SCROLL
112 LET B=CODE B$
115 IF B >= 128 THEN LET B=B-64

```

```

120 PRINT "CALL-";N,B
130 LET C$=A$(1 TO A-1)
140 LET D$=A$(A+1 TO LEN A$)
150 LET A$=D$+A$
160 LET R=R-1
170 NEXT N

```

This is similar to CARD SHUFFLE but puts 99 characters into the string store.
L. F. SINFIELD

Space Invader

```

1 LET B=0
2 LET J=3
3 LET D=11
4 LET I$="" "(8 SPACES)"
5 RANDOMISE
6 LET Y$=""
8 CLS
10 LET A$="" "(20 SPACES)"
50 LET K$=A$
20 FOR L=1 TO 999
40 LET D$="*" (MULTIPLICATION SIGN)
50 IF L>15 AND L<30 THEN LET D$=CHR$(148)
60 FOR O=1 TO RND(5)
70 LET A$=TL$(A$)
80 IF A$="" THEN LET A$=K$
85 NEXT O
88 IF L=1 THEN GOTO 100
90 INPUT Y$
100 IF Y$="S" THEN STOP
110 CLS
115 PRINT B," _ INVADERS _"
118 PRINT
120 IF A$=I$ AND Y$="F" THEN GOSUB 400
130 PRINT A$;D$
135 IF NOT A$=I$ AND Y$="F" THEN GOSUB 800
138 IF D=0 THEN PRINT,"INVASION"
139 IF D=0 THEN 210
140 FOR U=1 TO D
150 IF A$=I$ AND NOT Y$="F" THEN PRINT,"."
153 IF NOT I$=A$ AND NOT Y$="F" THEN PRINT
155 IF Y$="F" THEN PRINT,":"
158 NEXT U
160 IF I$=A$ AND NOT Y$="F" THEN GOSUB 300
161 PRINT,CHR$(174)
163 FOR R=1 TO J
164 PRINT CHR$(174);
166 NEXT R
170 PRINT
171 PRINT

```

```

172 PRINT "F TO FIRE,N/L:S TO STOP"
180 NEXT L
210 INPUT G$
240 GOTO 1
300 PRINT,"BOOM"
310 LET J=J-1
315 IF J=0 THEN PRINT,"DESTRUCTION"
318 IF J=0 THEN GOTO 210
320 RETURN
400 PRINT,"EXPLOSION"
410 LET B=B+20
420 IF L>15 AND L<30 THEN LET B=B+80
430 RETURN
800 LET D=D-1
810 RETURN

```

© JAMES ATKINSON, 1982

Vertical Graph of RND (20)

```

10 DIM A(9)
20 FOR B=1 TO 21
30 LET D=22-B
40 PRINT "(shift Q)";
50 FOR E=0 TO 9
60 IF D=21 THEN LET A(E)=RND(20)
70 LET F=A(E)
80 IF F=D-1 THEN PRINT F;"*";
90 IF F=D-1 AND F<10 THEN PRINT " ";
100 IF F=D THEN PRINT "(shift A) (shift A) (shift Q)";
110 IF F<D-1 THEN PRINT "(3 spaces)";
120 IF F=D THEN LET A(E)=F-1
130 NEXT E
140 PRINT
150 NEXT B
160 CLEAR
170 FOR G=1 TO 30
180 PRINT CHR$(131);
190 NEXT G
200 INPUT A$
210 CLS
220 GOTO 10

```

TO USE THIS PROGRAM:—

ENTER RUN (and in a few seconds the graph will appear)

This short program produces a graph of ten columns, where each column represents a random number between 1 and 20. Each of the ten columns has its Random number value displayed on top of its individual column. The reason for the CLEAR instruction on line 160 of the program is to make space in the RAM for the Printing of line 180.

R. M. SMITH,
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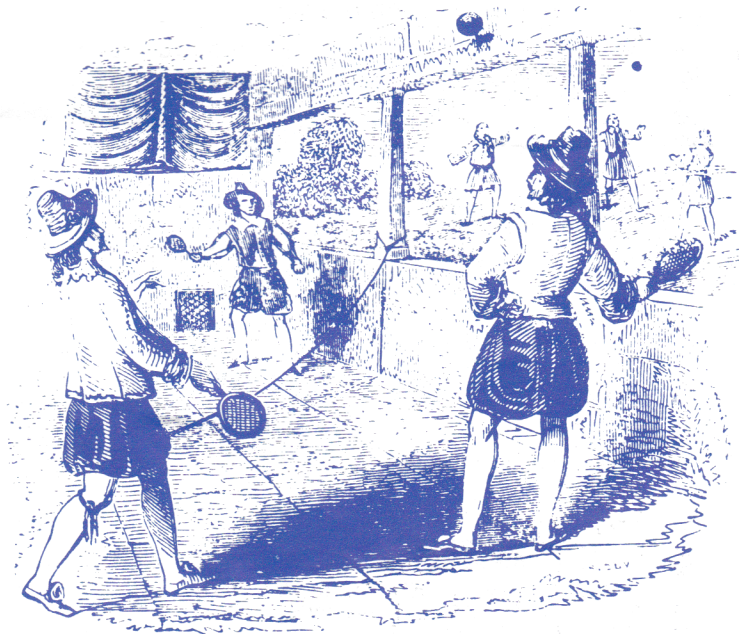
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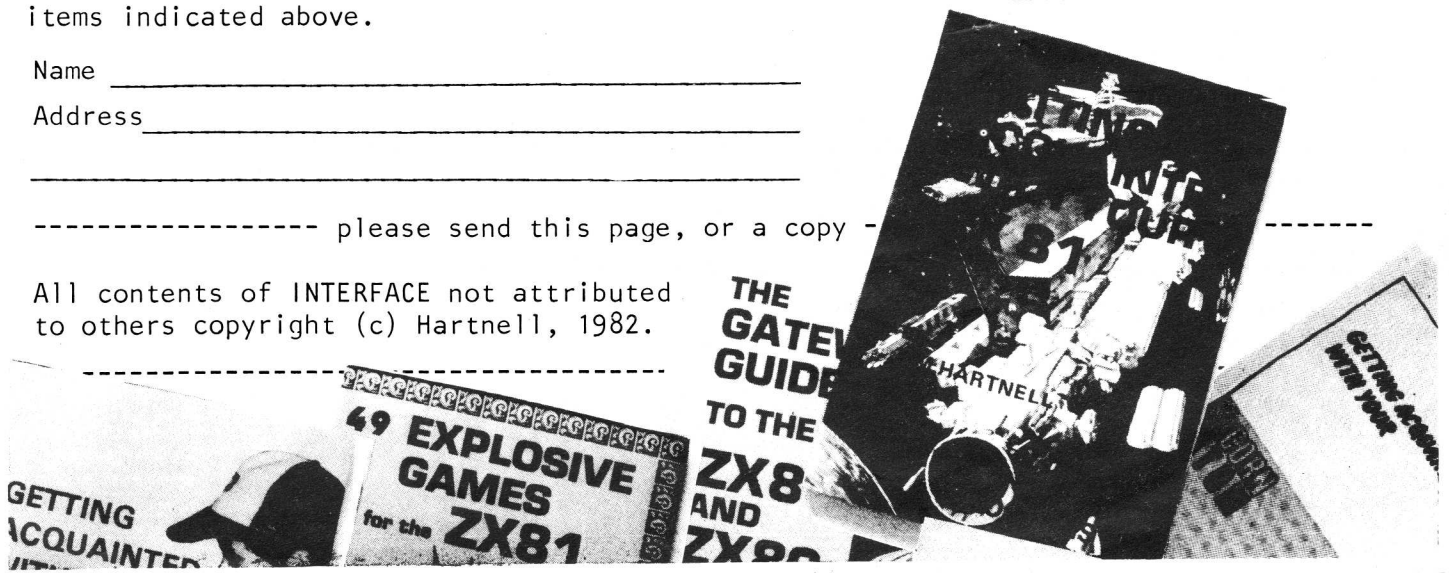
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WHAT IS THE NATIONAL ZX80 AND ZX81 USERS' CLUB?

WHAT DOES IT DO? HOW CAN IT HELP ME?

The National ZX80 and ZX81 Users Club was set up in April 1980 to help ZX80 (and later ZX81) users get the most out of their machines. And from the mail we get, we think we are doing just that.

Each month we print the magazine INTERFACE, which gives at least six programs each for both the ZX80 and the ZX81, plus hints and tips, letters from other members, book, software and hardware reviews, and contact addresses of local ZX80 and ZX81 user groups. The national club acts to co-ordinate the local clubs, helping them with publicity or anything else they request.

If you're having problems with your computer, we can probably help, or at least can put you in touch with someone who knows the answer to your particular question.

If you want to make the most of your Sinclair computer, you need to join the National ZX80 and ZX81 Users' Club.

Full details on the back of this sheet. Here's a 1K program for the ZX81 you might like to try:

```
SIMON - COPY THE SEQUENCE OF NUMBERS
5 LET A$=""
10 LET M=7
20 LET Z=M/M
30 FOR A=Z TO M
40 LET A$=A$+STR$(INT (RND*4) +Z)
50 NEXT A
60 LET X=Z
70 FOR Q=Z TO X
75 LET L=4*(CODE A$(Q)-29)
80 PRINT AT L,M;A$(Q)
90 FOR J=Z TO 20-X
100 NEXT J
102 PRINT AT L,M;"■"
103 LET K=RND*AND
105 CLS
110 NEXT Q
120 FOR B=Z TO X
122 IF INKEY$(">") THEN GOTO 122
124 IF INKEY$="" THEN GOTO 124
125 CLS
130 PRINT AT 4*(CODE INKEY$-29),M;INKEY$
140 IF CODE INKEY$(>CODE (A$(B) THEN GOTO 300
150 NEXT B
155 IF X=M THEN PRINT "YOU WON"
160 LET X=X+Z
162 CLS
165 FOR U=Z TO M+M
166 NEXT U
170 GOTO 70
300 PRINT "YOU SCORED ";X-Z
```