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5 SINCLAIR VOYANCE The days of amateurism are over and soon the costs of entering the Sinclair market could mean that the days of the small company are numbered.

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NEXT MONTH
Continuing our series of articles on programming, we give some hints on how to write your own chess program and we speak to Bill Matthews, the man who holds the purse strings at Sinclair Research.
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With our ME48 memory expansion add-ons your ZX Spectrum can increase its capacity by up to three times.
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SINCLAIR USER August 1983
Market loses its innocence

For those romantics who used to find the amateurism of much of the Sinclair market appealing, we have some bad news. There are signs that the dreams of being able to write a brilliant program and then make a fortune from it using the garage as business premises may soon be unfulfilled.

The latest signs of the major change are the entry of the record companies into the market. Virgin and K Tel have been the first to take the plunge but no doubt others will follow quickly, bringing with them all the razzamatazz and hype associated with the promotion of pop music.

An example of what to expect was the launch of Virgin Games at the Garden Club, the former roof garden at Derry and Toms. Loud music, large crowds, a Maggie Thatcher impersonator and, almost as an afterthought, the games being shown and their writers wandering around looking a little lost.

That may have been the latest sign but the moves away from the old, friendly, low-key activities of the early market when a few people selling games from wooden desks was considered a big event have been happening subtly for the last year.

The changes in the popular ZX Microfairs have shown what has been happening. Originally it was a small group of companies selling their wares on bare trestle tables, with little thought given to presentation. At the recent fair at Alexandra Pavilion in north London, a number of bigger companies like Quicksilva, dK'Tronics and Kempston had specially-designed stands and more companies are thinking of doing the same thing.

At the same time, Imagine made a name for itself by being the first company not to follow the usual method of steady growth. After the founders broke with Bug-Byte, they announced their presence with colour advertisements throughout the home computer press to establish themselves quickly in a booming market.

It is a move which appears to have been a success, with many of the company’s games featured regularly in the Top Ten software sales.

The effect of all the changes has been to raise the threshold of entering the Sinclair market. It is still possible to follow the ‘amateur’ route of writing a program and to start selling it through small advertisements in Sinclair User. That will no doubt continue to prove profitable but for a program to make really big money it will now need a major launch. Without strong financial backing and a supporting catalogue of other software, that would be impossible.

It would be much easier to go to an established company and let it look after the marketing and to pay you a royalty on the sales. Apart from allowing you to enter the market more quickly, it also removes what can be a major headache.

The eventual change of the market into something more similar to that of records has been mentioned previously a number of times in this column. While many people might feel that it is a change for the worse, it is one which must happen if home computing is to fulfil its promise of becoming a major leisure industry in the next few years.

When the market was new and small, people were more willing to tolerate delays and poor quality because that was to be expected from new and inexperienced developments. As more people have become hooked by home computing, the tolerance level has fallen.

If sales are to continue to grow, the need for tips on how to do many of the basic things in the hobby, such as LOADing and SAVEing, must disappear. No-one expects to buy a record and then find they have to spend half an hour adjusting a music centre before they can play it.

In the same way people should be able to buy a program and have no difficulty LOADing it. The introduction of ROM cartridges is a great help in that, as has already been recognised in the States.

For those who are worried that the ethics of the music industry may be the death-knell of home computing as they know it, it has a number of differences which should ensure that does not happen. For a start, while it is possible to have Top Ten-selling cassettes we are unlikely to have Top of the Cassettes on television and day-long radio programmes promoting the latest releases.

Also, unlike the music industry, it is possible to derive plenty of enjoyment from using a computer without having to buy other people’s programs. It can be costly making your own record but for the computer you have to pay only for the cassette and take time to record your program and, after all your work, you may be able to make a fortune.

Arise, Sir Uncle Clive

We congratulate Sir Clive on his knighthood, even if it presents some problems to his many supporters. Do they call him Sir Uncle Clive or Sir Uncle Clive? We are sure the difficulty will not last for long.

There can be no doubt that he has done a great job for the British computer industry and has made the sector one of the few bright lights in the general gloom of British manufacturing. That has been achieved on the success of only one good idea, the cheap home computer.

That resulted in a rapid rise to fame and fortune. It also engendered a belief that he can be seen as a saviour of British industry and that only stimulates growing pressure—increased by the news that he has an option on the factory of that former saviour of Northern Ireland, John de Lorean.

The more honours Sir Clive receives, the more the pressure grows and the more difficult it will be to live up to expectations.
ZX KEYBOARD FOR USE WITH 81 SPECTRUM

Our new cased keyboard has 52 keys, 12 of which are used for the numeric pad. The numeric pad offers useful features, you can cursor with one hand and it will be a boon for anyone who enters a lot of numeric data. The pad is a repeat of the 1-9 keys, it also has a full stop and a shift key. The numeric pad keys are red in colour, the normal keyboard keys are grey, with the case being black, which results in making the keyboard very attractive. The keyboard case dimensions are: 15½” x 9½” x 2½”.

The computer (either 80/81 or Spectrum), fits compactly inside.

You will have to remove the computer from its original case, it is then screwed to the base of the case. The case has all the bosses already fitted and the screw holes are marked. Also fitted inside the case is a motherboard (81 model only) which allows 16K, 32K and 64K to be fitted in the case. All connectors are at the rear of the case i.e. Power, Mic, Ear, T.V. and the expansion part. The case is large enough for other add-ons also to be fitted inside. One of these could be the power supply then you could very quickly fit a mains switch or a switch on the 9V line. This means you have a very smart contained unit. This case does not stop you from using any other add-ons that you may have eg Printer etc. We are convinced that this is the best keyboard available at present. It offers more keys and features than any other keyboard in its price range.

NOTE...

The case can be purchased separately with the keyboard aperture uncut, therefore if you possess one of our early uncased keyboards, or in fact, any other suppliers' keyboards these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute task and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX81 or Spectrum case.

SPECTRUM MODEL

This is supplied with Spectrum legends, and a slightly different base for fitting the Spectrum inside, again, all the connectors are at the rear of the case and there is plenty of room for the power supply (and other add-ons). Should you wish to change, we can supply both the Spectrum legends and details of updating your case which will enable modification from the ZX81 to Spectrum. PLEASE specify on your order whether you require the ZX81 or Spectrum inside.

MEMORY FOR ZX 81

16K Memory £22.95
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SPECTRUM MEMORY
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ONLY £10
SPECTRUM/81 TOOLKIT BOTH AT ONLY £6.95
This is the toolkit which won acclaim in the feature in the August 1982 issue of Sinclair User. “It is the most impressive program, fast in execution with clear and full instructions and it stands out from the rest of the field”. The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER, AND VERIFY.
The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K Spectrum.

4K GRAPHICS ROM £24.95
This module unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built fully tested and complete with a 4K graphic ROM. This will give you an unbelievable number of extra pre-programmed graphics. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders, graphics and that only accounts for about 50 of them, there are still approximately 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

SPECTRA-SOUND
The so called speaker in your Spectrum is really only a ‘buzzer’. With the DK Tronics “SPECTRA SOUND” you can generate fully amplified sound through the speaker on your T.V. set. SPECTRA SOUND is a very simple but highly effective add-on. This means that you no longer have a faint beep but a highly amplified sound, which can be adjusted with the TV volume control.
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The pen enables you to produce high resolution drawings on your own T.V. screen. The controlling software supplied with the light pen has 16 pre-defined instructions. These are chosen from a menu positioned at the bottom of the screen next to the pen.
You can utilise the menu for changing colour (Border, Paper, Ink). Drawing circles, arcs, boxes, lines. You are also able to fill any object with any colour, and insert text onto the screen at any chosen place. Of course you can also draw freehand. There is a feature to retain the screens and animate. On the 48K Spectrum you can retain 5 screens.
You can also use the machine code on it's own in your own programs, for selecting out of a menu etc. The software provided will return with the X, Y, cords for it's position on the screen.
The light pen is supplied with a control interface in order to adjust the sensitivity/pen alignment.
This simply plugs into the ear socket on your spectrum.
Should you require further details please send a S.A.E.
ZX81 RAM-PACKS FLAP
and when RAM packs flap, programs crash because of edgy connectors (so children! keep off!).
Now East London Robotics offer a unique product:-
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Introducing the MAXIMEM ZX81. A ZX81 with 32k or 64k RAM fitted INSIDE the case (children come back!)
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32k-£39 PLUS ONE USED
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The MAXIMEM 32 and 64k is a modified ZX81 and not just a RAM pack. We give a six month guarantee on the computer, regardless of the age of your trade-in ZX81. The extra memory uses only a quarter of the power consumption of a 16k plug-in memory, and does not interfere with any standard add-ons, such as printers, RS232 or other interfaces.
Trade in your ZX81 by post or over the counter at our premises. (Phone first to check current delivery).
Trade-in ZX81s must be clean and in working order. Send and receive the computer only, without manuals, power supplies etc.
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Loads ZX81 tapes into your Spectrum. A recent letter describes it best.
Dear Sir. Just a line about your excellent Slowloader.
I bought it because I was nearing the completion of a project which uses practically everything in 16k RAM including a string array (DIM 629,7) which took 4 hours hard graft to bash in. I really did not fancy doing it all again.
SLOWLOADER twice found a tape-loading error. So I SAVED again onto a short, high-quality tape – and this time it went straight in. Two minutes to take out the SLOW and FAST lines, to renumber the PEEKs and POKEs, 20 to add some colour and a few BEEP s, and the thing was ready to SAVE again. What a little masterpiece!

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A revolution in computer games control, for one to eight players simultaneously. See our demonstration at the 8th ZX Microlair on 20th August at Alexandra Palace.

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SINCLAIR USER August 1983
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There are two types of accounts preparation programs for both machines. The Sole Trader/Partnership program deals with the accounts of a company which has up to four partners. The second program deals with a limited company’s accounts. For all games enthusiasts we are offering new games from Mikro-Gen and Saturn Developments.

The offers are open only to members, although members enrolling this month can take advantage of the offers by including orders with registration forms. Existing members should send cheques to: Hestacrest Ltd, PO Box 19, Leighton Buzzard, Beds LU7 0DG.

Saturn Developments, Dept PK, 37 Heol Durlais, Birchgrove, Swansea, SA7 9LT.

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Special fee for former National ZX User members

Welcome offer to Nationals

FOLLOWING the ending of the National ZX Users’ Club, the Sinclair User Club is now the largest club for users of Sinclair computers. It began less than 10 months ago and now has more than 1,100 members.

We would like to welcome former members of the national club who still wish to take advantage of all the benefits of belonging to a large organisation. As a special offer to them we are willing to offer for a limited period a special membership fee.

For only £11 they can have the benefits of joining the Sinclair User Club and joining the many others who have already seen what we have to offer.

The benefits include special exclusive discounts on most of the leading items of software and hardware. This month’s offer can be seen on this page. Examples from recent months include the full range of software from Quicksilva and the Digital tracer from RD Laboratories.

To keep members in touch with what is happening in the club, two pages in Sinclair User are devoted to club news and there is a special cassette news-letter which is published every two months.

It includes news of the club, programming hints, programs and the number of the telephone advice service. That service has proved very popular and is available to members at most times for immediate help with any of their problems.

The club now has members throughout the world, including most parts of Europe, many in Africa, and one in Papua New Guinea.

Unfortunately we have to place a time limit on this special offer, the final date being August 31. We shall also need some proof of membership of the National ZX Club. The title page of a recent issue of Interface, complete with the date would be sufficient.

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name

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Which computer do you own?

ZX-81 [ ] Spectrum [ ]

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ.

Cheques should be made payable to Sinclair User Club.
Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (0184 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon Microcomputer Club: Roger Sims, Wickford 63032, after 6.30pm. Meetings every other week on Tuesdays from 7.30 to 10pm at Healey Management Services, The Hemmels, Laindon, Essex.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Pretygate Road, Colchester CO3 4EE.

Doncaster and District Micro Clubs: John Woods, 60 Dunlas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3RJ.

Edinburgh ZX Users' Club: J Palmer (031 661 3183) or Ken Mitchell (031 334 8483). Meetings: second Wednesday of the month at Clarendon Hotel.

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenland Road, Clarkston, Glasgow G76 7LE (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4350).

Inverclyde ZX-81 Users' Club: Robert W, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of The Deaf, Kelly Street, Greenock.


Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeping Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Dracoll, 53 Melville Road, Bootle, Merseyside L20 4NE; 051-922 3163.

Micro Users' Group: 316 Kingstone Road, Ewloe, Epsom, Surrey KT19 OSY.

National ZX-80 and ZX-81 Users' Club: 44-46 Earl Court Road, London W8 6EJ.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0737 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibbon, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.


Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPher- son, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Seventhorpe ZX Club: C P Hazleton, 26 Milestone Place, Bottesford, Scunthorpe (0724 63466).

Sheffield ZX Users' Club: A W Moore, 1 Ketton Avenue, Sheffield S8 8PA, Yorkshire. Annual subscription 10, monthly newsletter and cassette.

Sittingbourne: Anurag Vidyarthi (0795 731449). Would be interested to hear from anyone who wants to start a club near the Medway towns.


Swindon ZX Computer Club: Andrew Bartlett, 47 Gowersean Road, Swindon, Wilts SN1 41L; (0793) 3077. Monthly meetings and library.

Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include see. Meetings twice monthly.

ZX Guarantees: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kensington-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glissen, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymont Bets, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468). Belgian User Group for Sinclair owners (BUGS); Op de Breek, Patrick, Drabstraat 14, 2510 Mortsel. Micro-Europe Club; R Bertz, chemin du Moulin B1328, Ohain, Belgium. Telephone: CCP 000 0846556-37.


Nlcle-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathan Meyer, Van Spaeen Straat 22, 6254 H.N. Nijmegen; (080) 223411.

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk.

Hamburg, Postfach: D 3250 Hamburg, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J Wijaya, PO Box 20, Juag, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3 (3310340).

Italy: Sinclair Club, Via Molimpe Vecchio soF, 40026 Imola, Italy. Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.


Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Looi Hill Road, Singapore.

South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoestch SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: Lennert E Fisher, PO Box 61446, Marshallstown, Johannesburg.


ZX Club Spain; C Benito PO Box 3283, Madrid, Spain.

Swedish ZX-club: Sinclair Dauorklubben, Box 1007, S-122, 22 Ens- kede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451 (617 456 3967).
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SLOWLOADER twice found a tape-loading error. So I SAVEd again onto a short, high-quality tape and this time it went straight in. Two minutes to take out the SLOW and FAST lines, 10 to renumber the PEEKS and POKEs, 20 to add some colour and a few BEEP's, and the thing was ready to SAVE again. What a little masterpiece!

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Electric car is now closer

TWO MAJOR STEPS have been taken by Sir Clive Sinclair towards fulfilling his ambition of manufacturing the first mass-produced electric car. He has negotiated an option on the De Lorean car plant at Dunmurry, Ulster and has created a new company, Sinclair Vehicles Project.

Sinclair Research is quick to point out that this is Sir Clive’s venture and has nothing to do with it. The new company has taken complete control of the car manufacturing idea.

The team which runs the company says that De Lorean’s former factory would be ideal for manufacturing. It is one of the most advanced plants in the country and has the proper assembly-line equipment to produce the electric car. It contains equipment for plastic welding, which would be ideal.

Sir Clive has talked to the Industrial Development Board of Northern Ireland about the use of the facilities at Dunmurry.

Ally is pally

THE EIGHTH ZX Microfair is to be held at Alexandra Palace, London on August 20 from 10am to 6pm. The previous show at that venue in June was the most successful to date. It attracted more than 8,500 people, according to organiser Mike Johnston, compared to the show held last August which attracted almost 7,000 visitors.

Johnston expects an even bigger attendance at the next show and hopes that the Microdrives and RS232 will be on display.

Advance tickets can be obtained from Mike Johnston, ZX Microfair, 71 Park Lane, Tottenham, London, N17 0HG.

Knighthood for Clive

SIR CLIVE SINCLAIR received a knighthood in the Queen’s birthday honours. He continues to be a leading figure in the world of computing and microelectronics and his company has sold more than one million computers world-wide.

At present his company is developing a flat-screen television and an electric car.

The names for the honours list are submitted to the Queen by the Prime Minister, who selects outstanding figures in industry and the arts. Margaret Thatcher is known to be an admirer of Sir Clive’s enterprising ability.

She presented the Japanese Premier with a Spectrum on her tour of Japan last year.

Sir Clive is very happy about the award and says: “The award of a knighthood is a truly great honour and one I value very highly. It was completely unexpected and a wonderful surprise. More than ever I feel committed to achieving success, in and for Britain.”

Telesoftware gets security device

A NEW SECURITY system has been introduced on Micronet 800, the database system to which users of microcomputers can link by telephone.

The system will enable Micronet to select which software can be listed or copied once it has been downloaded on to a user’s computer.

It will mean that some programs can be run on a computer, such as the Spectrum, but cannot be SAVED. Robin Wilkinson, a spokesman for Micronet, says:

“Users will be able to download a game on to a Spectrum by telephone but will not be able to LIST it or COPY it on to tape. It will be like paying 20 pence for an arcade game every time you want to play it. When you switch off the computer the game will be lost.”

Several software companies are interested in putting software on to Micronet but will not consider such a move until some form of protection is given.

One such company is Silversoft and Douglas Berne, a spokesman for the company says:

“We would not consider putting software on to Micronet unless we could be given a guarantee that the software would be protect-ed.”

Chess prize

INTELLIGENT Software and Sinclair Research are offering a prize of £5,000 to the first person who can write a chess program to beat the Cyrus-IS Chess in a series of games.

Sinclair Research has acquired the game recently for its Spectrum software library. The program is based on Cyrus chess which won the second European Microcomputer Chess Championship.

Its features include cursor movement of pieces, replay and take-back options and the ability to function as a normal two-player game board. A spokesman for Sinclair Research says:

“We have made no plans for matches yet. We are waiting for people to contact us.”

National club run ends

THE NATIONAL ZX Users’ Club, run by Tim Harrison, has been disbanded after two years of operation. The reason, according to Liz North, an organiser of the club, was “because of the rising number of computer publications on the market.”

Another reason was that the club was providing difficulties for the organisers because of its size.

The club used to send a magazine, Interface, to its members but because of the number of machine-specific computer publications on the market recently, Interface no longer served a useful purpose. North said:

“Interface was the first specialist magazine for Sinclair computers. Now Sinclair User and ZX Computing have started and our magazine is no longer as useful as it was.”

The club had a membership of thousands. The members were informed of the closure by a letter in Interface and those who still had outstanding subscriptions were offered books from a range of Interface publications.

• Sinclair User Club offer for former ZX Users’ Club members, page 9.
JRS finds a winner

The JRS Award for Programming has gone to David Prigmore of Alverston, Derbyshire. The winning entry was a ZX-81 game called Star Defence which JRS Software is marketing.

Its author is studying for A levels which include computer science. He hopes to enter the computer industry when he leaves school. John Stubbs of JRS says of the competition: "We were looking for games, utility and business programs. Star Defence was by far the best piece of software submitted."

Home coursing

Computer Courses with a difference are being held in and around Western supermarts. The courses are given by Dr Roger Stenner and can be taken at the home of the student or at a centre.

Group or individual tuition is available and fees range from £4 to £7.50 an hour. For more information, 0934 417606.

Timex reveals upgrade plans

Timex has revealed its plans for two new microcomputers, the 1500 and 2048, in the States. The specifications of the new computers were shown for the first time at a computer show in Chicago.

The 1500 will be an upgraded version of the TS-1000, the U.S. version of the ZX-81, which has attracted some criticism in the States.

The upgrade will have a keyboard which resembles that of the Spectrum.

Unlike the ZX-81, the 1500 will have 16K RAM as standard and an extra 32K RAM module can be fitted to provide 48K. A software cassette, similar to the Horizons tape which is included with Spectrums, will be supplied with each package.

The TS-2048 is the Timex version of the Spectrum. The specifications show the machine to be slightly superior to the Spectrum, although nobody has yet been able to bench test it.

There are extra commands on the machine according to the specifications. They include FREE, which usually checks memory size; STICK, to control two joysticks; ON ERR, to cope with errors in a program without making it crash; and SOUND, which is like BEEP in every respect except that the volume can be controlled.

The computer is longer than the Spectrum and seems to incorporate a cartridge port into which ROM cartridges can be slotted. No firm release date has been given for the machines but it is hoped that they will appear by the end of the summer.

Software sold on hard disc

Several record companies have moved into the software business by including microcomputer programs on their latest record releases.

The move was started by EMI when it produced a single called Camouflage, while side B contains the ZX-81 programs. A spokesman for EMI says: "You could say that the state of play at the moment is healthy. We have had a very encouraging response from dealers."

Another computer single has been released by record company Mainframe. It has put programs on side B of the disc. The programs on the record are for the ZX-81, Spectrum, BBC microcomputer and Apple II.

Genetic Records Ltd has put a Spectrum program on to a new album, called XLI, by Peter Shelley. The program needed five months to perfect and will work on a 48K Spectrum.

The album was released in June and features 10 musical tracks as well as the program. The graphics displayed on the screen by the computer are synchronised with the music.

One difficulty which has arisen about the use of the records occurs when people try to record the computer tracks on to tape using a stereo system. The reproduction of computer programs using stereo is not good because of phasing problems. It is recommended that only one channel of a stereo is used and the other should be turned down.

EMI says that no complaints have been made about reproduction difficulties, although no information about the use of the computer tracks has been given on record sleeves. The company will, however, be examining the problem closely.
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Letters

Picking out variables

THE FOLLOWING tip may be useful. I at any rate had not realised the particular capacity of Sinclair Basic in question until recently. The ZX-81 is able to read a variable name out of a string and then evaluate the variable; and that may enable instructions to be passed to subroutines more compactly.

For example:

100 LET A$ = "DGH"
110 GOSUB AS 900

100 LET A$ = "XHY"
320 GOSUB AS 900


The bug search goes on and on

I READ with some interest the letter in the June issue about the bug in Hungry Horace — one which we discovered in January. I thought you may be interested in a bug in the Psion Planetoids which enables one to amass a limitless score without losing any ships.

Shoot all the asteroids except one and then manoeuvre the ship into the top right corner of the screen. With care, it is possible to position the ship so that a small piece appears in each corner. That, coupled with the fact that the ship seems mysteriously to turn yellow in that area, makes one immune to destruction. It is possible to fire from all corners of the screen.

Our high score using the technique stands at slightly more than 224,000. Also the game does strange things when pressing thrust and hyperspace simultaneously; try it. Surely it is possible to test games thoroughly for severe bugs like this?

James Randall, Surrey.

Drawing-in more critics

I AM WRITING to give my support to J Johnson, whose letter in the June issue criticised the illustrations which accompany the program listings.

It is easier to assimilate information if it is in a pleasant format, you say, but I am afraid that, like Johnson, I find nothing attractive about this particular format; it simply irritates me as it serves no useful purpose, adds nothing to the program listing, and wastes space which could be put to better use.

Also, I fail to see how a program listing without the comic characters and silly remarks would be impossible to enter. All that is really required is an interesting, well-written program printed with clarity and accuracy.

The present style of presentation may appeal to a minority of readers, perhaps to some of those in the under-16 age group. You should, however, bear in mind the results of the survey in your March issue which showed that only 29 percent of your readers are in that particular age-group, so please have some consideration for the rest of your readers.

Incidentally, why not conduct another survey asking readers what they like and dislike about Sinclair User? I think I have already made it clear what I dislike most. As for my favourite part of the magazine, that is undoubtedly the Andrew Hewson column, for which two pages are not sufficient. If all the space saved from the comic bits were given to Hewson, then Sinclair User would be worth twice the price.

J A Burgess, Knutsford, Cheshire.

Quarts into pint pots

I OWN a 1K ZX-81 and look forward to your publication every month. I have noticed in the last few months that some of the programs for the 16K ZX-81 will work on the 1K. That is mainly because, when compiling the programs, various byte-saving techniques have not been used, e.g., SGN PI to equal 1 or not PI to equal 0 and so on.

So much so that the following programs, from your June issue, will in fact run on the 1K — Heavens Above, Codes, Space Supplies and Paranoid. Users of 1K should not give up because of a small memory. Check the listings of the 16K programs and re-write them slightly, maintaining all the important information.

David Hamby, Ilford, Essex.
Tight fit is better

I WISH to reply to Chris Powell’s letter in the May edition. I do not know what he means by ‘the misuse of the Basic language’. First, any use other than an introduction to computing is strictly a misuse and, second, misuse or otherwise, I found it very useful.

It has improved my programs because I can fit in much more. His saying the tips are bad habits is ridiculous, because anything which improves programs can only be good and so long as the inexperienced programmer knows what he is doing, nothing can go wrong.

I do not agree that the ZX-81 is ‘cheap and easy’ to expand to 16K. I had enough trouble getting the ZX-81. You have only to look at Sinclair Programs and the program pages in Sinclair User to see how many 1K ZX-81 owners there are.

Simon Brunning,
London SW17.

Programming blind

READERS may be interested to learn that there is a way of programming the Spectrum without showing the listing.

The blanking-out of the listing can be achieved by having the line as in one’s program:
1 inverse video PRINT true video " " ENTER (Then Edit)

When the line has come back for EDITING
1 true video CAP/SPLIT 8 once inverse video PRINT " " ENTER

One will notice that on the edited version, when using inverse video just before the PRINT statement, a beep can be heard, which means it is operative.

D S J Crompton,
Bristol.

Random expansion is not repeated

I AM SURE many readers will have found Andrew Hewson’s solution to Stephen Malby’s problem — April issue — useful and educational. Unfortunately Hewson stuck to the strict terms of Welby’s problem of picking five random whole numbers between 1 and 10 without repetition and so restricted the elegance of what might have been a much more comprehensive routine.

Anyone who tried Hewson’s routine would have found it impossible to use for more than 50 percent of solutions. I would be pleased if you would publish my solution which will randomise all whole random numbers from 1 to N without repetition.

The principle is to make a selection initially from N possibilities. This value, a (r) is put to the “back” of the array, in place of a (n) which is stored temporarily as S; a (t) can then be replaced by what was A (n) on the second pass through the loop contained in lines 50 to 90, a selection is made from n=r possibilities which is exchanged with A (n-t) and so on. The important difference from Hewson’s solution is the progressive restriction of choice, as previous selections are ‘stacked’ from back to front of the array “a”. Hewson attempts to make all elements of the array interchangeable which can obviously only be 50 percent successful.

Tony Rickwood,
Ilford, Essex.

Tape pirates kill market

HAVING OWNED a Spectrum for several months, I feel that I must write on the topic of illegal tape copying.

Since buying a Spectrum, I have encountered only a few fellow-users and more than several of them have offered to copy any tapes I would like for my own use.

If that small cross-section of users is typical of users nationwide, I feel that something should be done to suppress the illegal activity.

The video industry has already experienced pirate videos and it seems that the software industry has a similar fate in store. The video industry has already taken steps against illegal copiers — heavy fines and imprisonment — and I hope those actions will not be necessary in the software industry.

Copiers must realise that what they are doing is not only illegal, contravening copyright, but also is killing the industry from which they are feeding. They are stealing from software houses and from the original writer, who will have spent many hours perfecting a program and will expect to profit from such work.

Problems not exceptional

T LAYCOCK, of Fleet — letters June, — is not one-in-a-million. I have just returned my Spectrum, which failed to work with 48K programs despite spending a month at W H Smith’s service department. My neighbour had three machines, all failing, and in disgust bought a BBC micro which works perfectly. I shall try once more but if that one fails — goodbye Sir Clive.

J Grabinar,
Bromley, Kent.

Signals from space

HAVING JUST become a 16K Spectrum owner and being a licensed radio amateur I would like to know if any of your readers has any idea or suggestion of how to achieve programming of computer-enhanced signals from deep space? I am thinking the easiest might be to enhance CW Morse signals.

On another front, having just obtained a printer, it strikes me that it must surely be usable as an ordinary recorder, such as for temperature, and a host of other applications where a record has to be kept of voltage or resistance changes — ECG, EEG, observations in plant physiology spring to mind.

An instrumentation amplifier would be required and the motor would have to be speed-controlled. I wonder has anybody done any work on this, such as doctoring the O/P or the Spectrum.

H C Graepel,
Kinsale, Co. Cork, Ireland.
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**INTERFACES for MODEM**

Interfaces for most popular home computers which do not have RS232 ports will be available shortly. An interface for the ZX81 that includes a complete Machine Code Communications Program is available. Order As LK08J (ZX81 Modem Interface Kit). Price £24.35.

Spectre has good electronic drawing power

good Electronics drawing program for the 48K Spectrum. It contains all the symbols to allow you to design a digital or analogue circuit and COPY it on the printer. There are 62 symbols and each covers the area of one print square.

The program or circuit on its own may be SAVED to tape to allow you to resume at any time where you left off. An interesting feature is that the program can activate the circuit. That checks and indicates the path of the 0V and the power supply round the circuit. It does not give voltages but checks for continuity, using the symbols as gates through which the current will or will not flow.

The supply current flow is shown in red and the 0V connections in green PRINT squares.

It is very slow — five to 10 minutes — but it can give a good indication if you have omitted some part. All the character set is re-programmed so if you BREAK the program you might find the listing a little difficult to follow.

It is a very useful program which could be enhanced with machine code to improve its abilities.

Electronics is the name of the program and the Spectre agent is at 2 Mull Close, Oakley, Basingstoke, Hampshire. The Spectre head office is in Hongkong.

Electronics will be sent anywhere in the world airmail at a cost of £6.95 and includes a money-back guarantee and technical advice.

Educational keyboard eases understanding

A VERY USEFUL device for young children is a Tactile keyboard which fits over the Spectrum keyboard. A plastic cover with a flexible top, the Tactile keyboard allows you to design a layout to fit a program. Being a flat sheet, pictures or numbers can be placed over certain sections of the keyboard, so that children can be asked to "press the PEAR" and the like. The keys pressed can then be checked to see if the correct response has been given.

A piano keyboard is supplied already fixed to the keyboard and children find it fascinating as well as educational.

Programming tips are included so that a range of keys may be checked using Basic or machine code. Designs are made easier by the fact that a clear film can be used with overhead projector pens to trace pictures of objects direct from books and magazines. Early Learning Opportunities is producing software using the keyboard and a tape with a piano and a typewriter program is available from Tactile at £92.95. It is an important device for teaching children to use a computer.

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Camel expands its store of memories

THE CAMEL range by Cambridge Microelectronics has been expanded by three new ROM-type packs for the ZX-81. ROM-81 allows you to plug-in up to 8K of EPROMs into the two sockets provided — 2716 or 2732 types. The memory area covered is selected by soldered straps inside the black plastic box. The Dream 81 has 64K of RAM plus an EPROM socket which will take up to 16K of EPROM — 27128. The EPROM replaces the RAM between 8K and 16K on the memory map and permits the use of the slower 450ns EPROMs. The 16K of the 27128 is split into two 8K areas switched in and out by a switch inside the pack, which makes it a little awkward as it is under the cover and not removable when using the machine.

The Cramic is a bigger version of the Memic (16K) which resides in parallel with the 16K RAM on a ZX-81. It can be used to capture and retain any 16K program. Used in conjunction with a 16K RAM pack it allows you to restore a program in seconds. The Cramic is bank-switched by a software I/O output instruction to ports 16 to 31.

The control of switching and copying of memory to the Cramic is done by a small machine code program in a REM statement at the beginning of each program and must be typed-in or run in from TAPE before using the pack.

The Passport program allows you to use the Cramic as a second program, switching between that and the original. Spare memory in another location will be required to swap variables between programs. The Cramic is housed in an 8½in. x 1in. x 3in. black box which is attached to the ZX-81 by a flexible ribbon cable. An expansion connector is also provided at the back for the RAM pack.

The RAM consists of 6116-type memories backed-up by a lithium battery. The cover has two switches; SEL brings in the Cramic during a program and ON allows the Cramic to be put in parallel with the existing 16K RAM so that any program typed-in may be ‘captured’ by just deselecting the Cramic. Unfortunately that crashes the program in RAM but re-inserting the machine code will bring it back as good as new.

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Modem allows ZX-81s to speak to each other

MAPLINS has two kits of interest to the ZX-81 user and both can be used to provide an on-line 300-baud modem. The first, which is the modem, was issued as a kit in February, but until now the RS232 and the software was not available to use it.

The important thing about 300-baud working against Prestel is that it is used commercially to obtain information from databases for which you have to pay a fee and also you can communicate with other computer users who do not have ZX-81s. Free databases or bulletin boards are also available; a list of them can be obtained from the Association of Computer Clubs.

The modem is not the easiest of kits to build as it uses a five-band resistor colour code but if you follow the instructions to the letter the kit can be assembled without too much difficulty. The problem is in setting-up the modem and connecting it to a telephone line.

To set up the modem an oscilloscope is essential, except that it is difficult to set up accurately. Most of the controls can be set up using a sensitive voltmeter but to check the mark space ratio the modem is best looped back to itself and, using the RS232, sending Us until Us return on the screen.

Having set up the modem, a plug and socket must be ordered from British Telecom to connect it to the line. Once connected to the telephone line, you can telephone Maplins and order components, check your item is in stock and if you are using a credit card, pay for it.

The RS232 kit is much easier to build but you will require a mother board and at least 2K of RAM to run the terminal program — the program to talk to the modem. The software is stored on tape and conversion is made to ASCII characters by using an EPROM. The RS232 can also be used to run a printer or to talk to another computer which has an RS232.

The RS232 interface cannot produce negative voltages, so full implementation of the standard is not possible.

The modem costs £40.45, RS232 interface kit £25.45, motherboard £8.45, modem case £7.85. Maplins is at PO Box 3, Rayleigh, Essex SS6 8LR. Tel: 0702-552911.

Programming a joystick

ELECTROTECH has produced a large box containing a programmable joystick and three large push-buttons. In appearance it looks very similar to the large games machine controls. A printed circuit board which contains a 2K RAM plugs into the back of the Spectrum. It is used to store the information on what keys to operate when the joystick switches are operated.

There are eight positions on the joystick as the corners also operate both switches. Whether that will be useful or confusing will depend on the game. All the micro-switches are large professional types which should last a long time. That also explains the cost of the joystick, expensive at £43.70 for the standard model.

A tape which accompanies the joystick is a Basic program which allows you to program the joystick and SAVE the results on to tapes as a machine code file.

It allows you to re-load the key combinations for a game without the slow process of the Basic program.

The keyboard is not affected and can be used as well as the joystick for entering the score. Seven functions can be programmed — three switches and a four position joystick.

The cost might suit some shops which wear out joysticks very quickly but there seem to be cheaper alternatives for the average user.

Electrotech is at 2 Heath Close, Winston Hill, Luton, Beds. Tel: 0582-429809.

Controller

KEMPSTON Microelectronics has produced a conversion tape for six of the most popular games which allows you to convert the game for use with its joystick. It has also included a machine code version of COPY in the latest release of software for the printer interface, called by a USR command.
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Teaching aid is impressive

The number of educational programs for the 16K ZX-81 is growing but there is still room on the market for good-quality programs such as Spelling Bee.

When the program is run the ZX-81 displays a very detailed picture of a bush, a hive and a hyperactive bee which flies between them. The student is then asked to select the spelling.

The first level is the easiest. You are asked to name objects which appear on the screen. The computer starts with a bee and continues by displaying pigs, trees and even a gate.

The second level is slightly more difficult. The computer asks you to spell five-letter names. If you have most of them correct the computer displays a birthday cake with candles glowing on the top.

The difficulty level increases although the same pictures are shown but the computer highlights a part of the picture and asks you to name that part. It could be the arm of a chair or the wing of a bee.

Spelling Bee uses very impressive graphics and is ideal for a young child learning to spell. The package is produced by Image Software, 185 Elm Road, New Malden, Surrey KT3 3HX. It costs £5.

Good but may perhaps be late

It is unfortunate that Maze Guzzler and Super Breakout have been released so late, as they are both good games. Putting any traditional game on to the 1K ZX-81 is still an occupation pursued by some software houses but there are so many copies of Breakout and Pacman on the market already that software houses should concentrate on something more original.

Maze Guzzler is the Pacman game on this tape. It includes all the usual features of fairly intelligent ghosts, energy pills and on-screen scoring.

The maze is put up at the beginning of the game but you have to press the RUN key to start the ghosts and your guzzler moving around the maze. You have four chances at clearing the mazes of the life-giving dots. If you manage to stay in the game for long enough you will find that the action becomes faster. The ghosts seem to be dopey at times but they usually get the guzzler in the end. The game on the other side of the cassette is called Super Breakout. It consists of bouncing a ball against a brick wall and the bricks fall out as they are hit. If you miss the ball on its return you lose one of your four lives.

Maze Guzzler and Super Breakout will give hours of fun to people who have 1K ZX-81s. The cassette costs £3.50 from Select Software, 37 Councillor Lane, Cheadle, Cheshire.

Spaced-out collection

Alien Rain and Outraider are two games on one cassette for the 16K ZX-81. In Alien Rain you control a little man at the bottom of the screen. Home is at the left of the screen and the object of your quest lies at the right, in a cave.

The little man must run from the left to the right, rescue an alien and return home. Points are gained for the number of aliens rescued.

The only obstacles endangering the little man's mercy mission are thousands of evil invaders which rain from the heavens. If you are hit by one a life is deducted from the three lives allowed at the beginning of the game.

At first you are protected by three shields which the invaders destroy slowly. Those defences will give you time to rush backwards and forwards, rescuing as many aliens as possible.

The game runs at nine levels; the ninth is fairly slow but the first is very fast.

The graphics are impressive and even the title pages have been designed for the best effects.

The second game on the cassette is Outraider. It is your job to protect the grey area in the middle of the screen. To do so you are given a spaceship which can be rotated to face the assaults of enemy craft which are out to destroy the grey area.

When the main hull of the mothership has been penetrated and an enemy ship has sent a missile into the grey area the game is over.

The concept of Alien Rain is original and the game is fast. It is something which can be played again and again. Outraider is interesting as you need to use only one key control to play. The games have a quality about them which would attract even a Spectrum owner.

The cassette is available from Computer Rentals Ltd., 140 Whitechapel Road, London, E1. It costs £3.50.
Halls of Things could be a danger to health

HALLS OF THINGS for the 48K Spectrum is a game which could change the Spectrum games scene overnight.

The program is technically excellent and dangerously addictive, although you can forget about high scores until you become adept.

You play a little man who must rush up and down the stairs to different levels of a maze in which several magic rings can be found. The problem is that some little space invader-type creatures are out to get you with their fireballs and lightning. You can fight them with your fireballs, lightning and sword. You can also heal the wounds which have been inflicted on you by using magic, of which you have a limited amount.

The screen display makes it even more impressive. It looks as if the game is running on an Apple 2E or UK-101, both computers more expensive than the Spectrum. The game is bound to be a hit apart from one criticism. Halls of Things has no sound. The fights between Things and the hero could be made even more dramatic with the addition of lightning zaps or explosions.

Cosmic Guerrilla is an arcade game which is also produced by Crystal Computing for the Spectrum.

You have three spaceships to save and, depending on how far you proceed in the game, the aliens mutate from ordinary space invaders to cosmic pigs. The sound and graphics combine to make the game good fun and easy to play. Halls of Things costs £6.50 and Cosmic Guerrilla £5.95. Both cassettes can be obtained from Crystal Computing, 2 Ashton Way, East Herrington, Sunderland, SR3 3RX.

The world comes to visit

IF YOU HAVE a Spectrum and you want to know about far-off places you may never have to pick up a gazetteer because of a new database package called Countries of the World.

The program, for the 16K and 48K Spectrum, centres on an incredible high-resolution colour drawing of a world map. The countries can be listed and scrolled through backwards and forwards.

Each country has a code number and by referring to that number you can access its statistics, general information and a graphics representation of its position on the globe.

The detail in the program is very fine but some points made about countries are inaccurate. For instance, the program gives the capital of Andorra as Andorra-La-Viella, where it should be Andorra-La-Vella. Little mistakes like that spoil the program.

Another new release is Maze Chase. The program is in the Pac-man mould but is very addictive and difficult to play.

The manufacturer says the game has four mazes on the 16K version and 12 on the 48K. We have managed to get through only the first few mazes as the game is so difficult.

The player must eat the energy pills and lemons while staying away from the evil guardians. If a magic strawberry is eaten the guardians will lose their power and you can eat them.

Maze Chase and Countries of the World are available from Hewson Consultants, 7 Graham Close, Blewbury, Oxon. Maze Chase costs £4.95 and Countries of the World £5.95.
Cracking the EGG is no joke

WHEN YOU HEAR that the universe is being threatened by a giant Ectogenetic Galactic Gamete — EGG to all you intelligent people — you may decide to catch the next bus out of the Universe.

In Spawn of Evil, however, a new game for the 16K Spectrum, you decide to fight and promptly put your spaceship into attack mode. Your job is not only to destroy the EGG before it becomes indestructible but also to kill all the Pulsoids, Cycloid and Aliens which breed from it.

The software is in two parts and each part can be run independently.

Your spaceship glides through a 3D representation of outer space where waves of spawn dart across the screen. We found it extremely difficult to hit anything.

The controls of the spaceship can be changed to meet your requirements but the speed at which a change of direction is accomplished is so slow that we could not hold many pulsoids in our gun sites long enough to fire a laser blast.

Despite the difficulty of getting used to, Spawn of Evil is a well-presented and graphically-impressive package. It can be obtained for £4.95 from dK'Tronics, Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex CB1 3AQ.

Picking clubs at Troon

THERE ARE MANY games of golf on the market but none simulates the rolling greens and deep bunkers of Troon. The game is for the 48K Spectrum and provides a graphic representation of the 18-hole championship course.

You do not have to be an expert golfer to play it but making a shot requires slightly more golfing skill than just guessing the co-ordinates of the hole for which you are aiming.

The graphics in the game are cleverly-used and well-produced. When teeing-off the player will see an aerial view of the next hole, along with trees, lakes, green and rough. As the ball gets nearer the hole a close-up view of the hole, complete with flag, is shown.

The range of clubs you can use seems almost infinite and the game gives a list of those clubs on-screen to help you choose which you want to use.

You can let all your friends or family join the championship game to see who is the best player. The game is relatively user-friendly, so you do not have to have a set of golf clubs stored in the cupboard to be able to play it.

Troon is a very complex game and one of the only games of golf on the market which features club selection. It can be obtained from Hornby Software, 21 Pinfold Hill, Leeds LS15 0PW and costs £6.95.

Oil the wheels ensures success

IF YOU HATE J R Ewing and would like to take over his corporation you will like Dallas, a game for the 48K Spectrum from CCS Software.

You are in charge of a new oil company which must make $200 million in nett assets and $80 million to take-over Ewing Associates. There are three levels of difficulty but at each level you must buy a concession of land, put a moving rig on it, start drilling until you find oil, and then go into production.

To make the kind of money needed to take-over Ewing you will have to build production plants on at least three concessions to make sufficient profit. If you do not you could be bankrupt. As with any good simulation game there are hazards with which you must deal. Tornadoes may destroy your rig, drilling accidents may occur and the taxman may call for very large amounts of cash.

Dallas is an engrossing game and needs several hours’ play to complete successfully. It is a game which all the family will want to play as it is guaranteed to turn even the youngest youngster into a megalomaniac who needs a regular dose of power and money in the game.

Dallas can be obtained from CCS Software, 14 Langton Way, London SE3 7TL. It costs £6.
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The trophy will be awarded annually with a different theme each year. In 1983 the theme is adventure and strategy games. The judges will be looking for a number of factors when making their decision. They include:

- Instructions
- Program documentation
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As well as the first prize of £1,000, which can be won by programs for either the Spectrum or the ZX-81, there will be two second prizes of £250, one for the Spectrum and the other for the ZX-81. Similarly there will be two third prizes of £100. In addition there will be 10 runners-up prizes for each machine, consisting of five CCS programs and a free annual subscription to Sinclair User.

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- Entries must reach Sinclair User at 30-31 Islington Green, London N1 8Bj, by Tuesday, September 20.
- Results will be announced at the Christmas ZX-Microfair in December.
- The entrant assigns CCS the exclusive licence with the right to sublicense, to copy, modify, sell and publish the original or modified program in any form and CCS undertakes to pay a royalty fee of 20 percent of the nett invoice price on the sale of such program(s) and further will pay a fee of £10 in respect of each publication of the respective program listing. CCS assigns
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- The judges' decision is final.
- No correspondence can be entered into between entrants and the organisers.
- Employees of ECC Publications and CCS and their associated companies may not enter.

The award will be judged by three people well-known in the world of Sinclair computers—Mike Johnston, organiser of the highly-popular ZX Microfairs and consultant editor of Sinclair User; Trevor Toms, author of a number of books on the Spectrum and the ZX-81; and John Gilbert, Sinclair User software reviewer. The panel will be chaired by Nigel Clark, editor of Sinclair User, and Melvin Lloyd-Jones, a director of CCS.

**ENTRY FORM**

I agree to abide by the rules of the competition.

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Latest software...
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Introduction

One thing's certain about the Sinclair world - there's never a dull moment.
Every month sees new software and new hardware, produced by Sinclair enthusiasts, or produced by Sinclair itself.
The magazines do a fantastic job of keeping you up to date with the input of enthusiasts. We want to keep you in touch with Sinclair's own developments.
Every month, there'll be a Sinclair Special in this magazine.
Sometimes, inevitably, there won't be anything new to say - we want to break away from the breathless announcements of hardware and software you just can't buy.
But when something new is available, we want you to have accurate information - fast. You'll find it here.
This month, we're giving you the latest information on the recommended retail prices of Sinclair equipment. They're our prices, and you may well find things cheaper (or dearer) in the shops. If they're cheaper - terrific! Snap them up.
Note, however, that from us the ZX81 is down to £39.95.
We're also announcing six superb new Sinclair cassettes for the Spectrum, and three more which make full use of the ZX81. There's an order form at the back of this Special.
Next month ... but there, next month is another story! Watch (as they say) this space.

Nigel Searle. 
Managing Director, 
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Sinclair has been overtaken by other suppliers of upgrades. Stephen Adams reports.

Spectrum finds itself at full stretch

The SPECTRUM is in four basic forms. Model 1s which have two IC-type sockets into which a printed circuit board is plugged and model 2s which have all the RAM fitted on to the main printed circuit board. There are, of course, two types in each category, the 48K and the 16K.

The 48K cannot be expanded, as all the existing memory space is covered with either ROM or RAM — all 64K of it. The ROM can be switched out externally to add different ROMs using the ROMCS but the RAM cannot as there is no equivalent RAMCS.

Therefore all memory expansions can be done only to the 16K models. As the computer already contains 16K of RAM, the top 32K of memory area — 32K-64K — is the only space to put it. Most memory expansions fill that space with 32K worth of RAM chips but the East London Robotics 64K add-on — the SP80 — has two sets of 32K RAM which can be switched in and out under a program instruction or from the keyboard.

The kits consist of four memory-decoding chips, except model 1 versions where all the chips are soldered to a PCB, and eight 32K by one-bit chips. Those RAM chips are very sensitive to static electricity and warnings are included in all the instruction sheets. The way to handle them properly is not to remove them from their protective packaging until needed and to keep touching an earthed object such as a radiator or gas pipe occasionally to release the static charge. The static can be caused by nylon or wool in your clothing being rubbed.

Putting-in the chips can be a little difficult and it is recommended that you check that the pins are straight before you insert them. The Fox Electronics kit has the pins already straightened.

Also check that none of the pins is bent outside the socket or underneath the chip when you have finished.

The best technique to use is to put all the pins on one side into the socket and then to pull the pins on the other side over the holes in the other side of the socket. Once both sets of pins are resting in the socket holes you can push down gently on the chip to push it into its socket.

The instructions vary from a four-page, step-by-step meticulous description by Delta Research to one page just listing where the chips go by Fuller. Apart from the Fuller instructions all provided sufficient detail to allow you to know where each chip goes and what precautions to take.

As part of its instructions Fox Electronics also includes a sheet showing how to tune the colour on a Spectrum to give better results. It also shows you how to tell whether it is the Spectrum or the TV set causing a problem. Sheets normally cost £1 from Fountain Electronics but are free with its RAM kit, along with a small Basic program to demonstrate the usefulness of 48K.

The fitting of the Fox kit was the easiest but if you have problems you can send back the kit with the details of the Spectrum at any time in the following 12 months. East London Robotics will fit the chips at an extra cost of £7 by post or £3 by personal visit.

Delta sends a memory test tape which checks all the memory by using a machine code program going through at least all the manufacturer’s specifications. The tape can be used to keep an eye on suspect memory faults as it stops with an error which can then be sent back to Delta or Sinclair. The tape normally would cost £3.50 and is a really comprehensive test taking at least eight minutes.

East London Robotics and Delta were the only model 1 boards we could test and both could be fitted easily with less trouble than the model 2.

East London Robotics also does an SP80 kit which can provide 64K of memory in the same sockets as the SP48 (48K) fitted. That is achieved by having two separate banks of 32K, switched by an OUT instruction.

That is possible only because of the 64K RAM chips which are used instead of the 32K RAMs and a massive modification of the decoding chips which plug into the Spectrum. No soldering is required but some care needs to be taken inserting the chips, as three of them are wired together using twisted insulated wire.

A LED is also soldered on to one of the chips to indicate which bank is being used. The only problem is that you can see it only with the top off or looking through the edge-connector hole. The LED lights when it is in bank two and when the machine is turned on the light shows on bank one.

The only problem with the SP80 is that the stack and any program running in it must be in the 16K of memory provided by Sinclair. If it was allowed to go into the top 32K it would be switched-out on the first OUT instruction and the program would have nowhere to go.

Also the machine code stack for return addresses would have to be in the lower 16K area for the same reason. That leaves the user to develop a pro-
gram which will be able to use banks of memory without having the convenience of Sinclair Basic to cope with it.

Prices of the various kits are detailed, along with an indication of how good the instructions were, guarantee period and number of tests performed on memory after fitting.

It is also possible to add a RAM pack on the back of the Spectrum. A Spectrum-type 32K RAM pack has been produced by Cheetah Marketing Ltd. It fits very snugly on the back of the Spectrum and because it is outside the case it does not matter if it is model 1 or model 2.

It also has an extension piece on the back so that you can plug in Microdrives when they arrive. The RAM pack has no known wobble in use and can be fitted very easily by plugging it into the expansion port. It costs £39.95.

The alternative is to use a ZX-81 type RAM pack with an adapter to give you another 16K or 32K. To use it you will require an adapter.

EPROM Services and myself both make adaptors for the 16K RAM pack. Mine can also cope with a 64K RAM pack to give a full 32K by changing a soldered strap on the board or ordering a 64K version. I also produce an Adam II which lets you have a 16K RAM pack on the back of the Spectrum but which also allows devices which used to work in the popular 8K-16K region to work in the 56-64K region of the Spectrum. All the adaptors mentioned cost £9.

Of the RAM packs and kits reviewed, Fox Electronics for kits and Cheetah for RAM packs stand out as good value for money.

Fox Electronics, 141 Abbey Road, Basingstoke, Hampshire. Tel: 0256-20671

Cheetah Marketing, 359 The Strand, London WC2 OHS. Tel: 01-240-7939.


Delta Research — cheques to Servodata Ltd — 15 Church Street, Basingstoke, Hampshire. Tel: 0635-45373.

Fuller Micro Systems, 71 Dale Street, Liverpool 2.

<table>
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<th>Producer</th>
<th>RAM</th>
<th>Instructions</th>
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Making machine code easier to understand

The term disassembler has been used in many ways by professional producers of software to describe their products and some confusion has arisen as to what a disassembler should or should not do. The strict definition of a disassembler calls for a program which will translate the numeric values of machine code into the mnemonics of assembly language. There are other packages which do all kinds of things with machine code but do not fulfill that definition. The correct term for those packages is toolkit.

The mnemonics of assembly language look like shortened versions of Basic keywords. They are used to represent the machine code numbers which computers can understand but which human programmers still find difficult to cope with in great quantities. It is much easier to understand a mnemonic such as RET, which means Return to Basic, than its machine code counterpart, which in this case is 201.

Most disassembler packages include a monitor program which allows the user to change machine code stored in RAM which has been disassembled. The disassembler makes the editing process easier, as mistakes can be spotted quickly if the programmer has a disassembly and not just a list of numbers which have to be sorted.

When computers had just been invented there was little software and assemblers made things easier. You could enter code in mnemonic form using the assembler and check the code using the disassembler.

When microcomputers were invented the disassemblers used on the large mainframe computers had to be altered to work on the smaller systems, as many of the instructions which were used on mainframes could not be used on micros.

The first disassembler to appear commercially for the ZX-81 was ZXDB, from Bug-Byte. The company has built its reputation with that package along with its ZXAS assembler and the reason was because it was cheap and ran on an inexpensive computer.

The Bug-Byte disassembler was fairly standard in its performance. It allowed you to specify the address, or position in memory, at which you wanted the disassembly to start. The program would disassemble one line at a time and you had to press NEWLINE for the next instruction in memory to be disassembled.

The ZXDB for the ZX-81 used two fields, or areas, on the screen in which to display information. The first showed the address at which an instruction was located and the second showed the disassembly of the machine code instruction.

Other disassemblers, such as the Crystal Computing Monitor and Disassembler for the Spectrum, use three fields. The extra area on the screen is used to display the numeric machine code on which the disassembler is working. It is a good idea as you can check the mnemonics and machine code against each other to see if the disassembler is working correctly.

If a company produces both a disassembler and an assembler it usually makes both programs compatible. That means that both programs can be put into the computer to work together and dispenses with the need to load one program to enter code and then load the next to check that the code is correct.

Having both programs in RAM at the same time will make programming in machine code quicker and easier but the amount of memory left for machine code programs will be reduced drastically. The advantages outweigh the disadvantages, though, so it is a good idea to buy a disassembler which can be used together with an assembler.

Two problems occur when a disassembler starts to produce question marks because it has not been programmed to recognise a machine code instruction. One disassembler which does not follow the Z-80 instruction set is ZXDB from Bug-Byte. The program uses 8080 code instead of Z-80. Instructions which are common on the Z-80 are named differently on 8080. For instance, LD in Z-80 is called M in 8080 code. Those two names mean different things. The LD instruction means load a register with a value, whereas M means move.

Trying to use a disassembler which does not understand the full Z-80 instruction set is like trying to use BBC Basic on a Spectrum or ZX-81. As BBC Basic is not the same as Sinclair Basic, the machine would not recognise the extra commands of the other language. As a result, when buying a disassembler, make sure that the program understands the complete Z-80 instruction set and not just a subset.

Disassemblers can serve two purposes. They can be used to view code which you have stored in RAM or they could be used to look at the ROM of the machine.

With a good disassembler you could obtain a listing of the complete Sinclair ROM for either the ZX-81 or Spectrum. If you knew sufficient about machine code you might also be able to tell...
how the ROM works. To investigate the ROM, or go bug-hunting in it, you need the proper kind of disassembler. Picturesque produces a monitor and disassembler package which suits the purpose. The disassembler has to provide facilities for output to a printer, as the Basic interpreter and operating system within the ROM are very lengthy.

Picturesque produces a monitor and disassembler package which suits the purpose. The disassembler has to provide facilities for output to a printer, as the Basic interpreter and operating system within the ROM are very lengthy.

A true analysis would have you jumping to different parts of the ROM when JP, or Jump, instructions are indicated. Jump is similar to the Basic GOTO instruction but there are many options available with that command and the disassembler will help you to spot them.

Your disassembler should be capable of handling the RST instruction as it is used many times in the ROM. It means Restart and the instruction provides a quick entry point into the ROM for programmers using ROM routines in their machine code programs.

The RST 10 instruction, for instance, would send the computer control to the part of the ROM which deals with the printing process. The routine sets up the machine to display one character on the screen.

Most disassembler packages on the market for both Sinclair machines are being sold mainly as an afterthought to assembler packages. The disassembler has a very important role in computing and the second-class sticker with which it has been labelled is unfair.

A disassembler should be a necessity when you are writing machine code programs.

If you are to buy one, take as much time about choosing it as you would when buying an assembler. In many cases it will be the disassembler which will disappoint you with its performance and not the assembler.

For instance, the Bug-Byte ZXDB was a breakthrough when it was launched but with hindsight it is somewhat mediocre. The standard of the documentation with ZXDB was far from satisfactory; as a result, the program was difficult to use.

Disassemblers are becoming more complex all the time and there is not much which can be done to improve them. Many of the programs on the market, however, could be streamlined to fit into less RAM than is now the case.
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|-------------|--------|--------|
| Abdex | Consultants | Specwaders
| ++ Spookyman | ++ Star Trail |
| ++ Invasion | ++ (Man, Dock) |
| ++ Harrier | ++ Zoom |
| ++ Cosmos | ++ Ghost’s Revenge |
| ++ The Android Run | ++ 3D Tunnel |
| ++ High Noon | ++ 5.95 |
| ++ EX | ++ Knob in 3D |
| ++ Mazeman | ++ 5.95 |
| ++ The Wizards | ++ Time Bandits |
| ++ Warriors | ++ Spectral Maze |

Apocalypse

Software...Galactic Jailbreak
Axis Labyrinth
Blab Comp & Vid. Chopper Rescue
Pony Express
Gulpman
Gold Digger
Silversoft
Confusion
Software

Campbell

Systems LeafProw
C.Tech Specman
D.J. Software..Froggy
DK Tronics...3D Tank £4.95
Meteoroids

*State “AGF version”* ”PLUS 21 ZX81 Titles”

We are pleased to say that future software support commitment for the AGF Interface II has been safeguarded from many of the companies listed above.

For example, all new titles from Imagine, launching with Zoom, will be compatible and carry the compatibility logo, shown below, on their packaging. This new logo scheme will help you select software that is guaranteed compatible and is also being adopted by many of the supporting suppliers.

As the time of printing it is hoped that pending releases from Bug Byte will enjoy AGF compatibility.

AGF Hardware. 26 Voin Goff Place, Dorking, Surrey, West Sussex. PO22 9BY

SINCLAIR USER August 1983

55
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We need games for:
Spectrum
Dragon
Oric
BBC
Commodore
(VIC20 & 64)

PLEASE NOTE: OUR DECISION WILL BE FINAL — NO CORRESPONDENCE WILL BE ENTERED INTO. PLEASE ENSURE THAT YOUR NAME AND ADDRESS APPEAR ON THE TAPE TO ALLOW US TO CONTACT YOU SHOULD YOUR GAME BE CHOSEN.

RICHARD SHEPHERD SOFTWARE
FREEPOST, MAIDENHEAD, BERKS SL6 5BY.
Ken Rylett of Burnage, Manchester wrote Solitaire for the 16K Spectrum to allow people to play the traditional game. Move one spot over to the next to an empty space. The peg which has been jumped will then disappear. The aim is to finish with only one spot remaining. Moves should be entered as number, then letter.

Letters to be entered in graphics mode are underlined.

```
1010煲MUB 9000
1020 BORDER 5: PAPER 5: INK 0
1030 FOR n=1 TO 64
1040 LET P(n)=1
1050 PRINT BRIGHT 1: INK 2: AT V(n),H(n); "a"
1060 NEXT n
1070
1080 FOR n=20 TO 148 STEP 16
1090 PLOT n,20: DRAW 0,128
1100 NEXT n
1110
1120 FOR n=60 TO 188 STEP 16
1130 PLOT n,20: DRAW 0,128
1140 NEXT n
1150
1160 PRINT AT 2,8; "A B C D E F G"
1170
1180 PRINT AT 4,6; AT 6,6; 2; AT 8,6; 3; AT 10,6; 4; AT 12,6; 5; AT 14,6; 6; AT 16,6; 7; AT 18,6; 8
1190
1200 PRINT AT V(28),H(28); " "; AT V(29),H(29); " "; AT V(30),H(30); " "; AT V(31),H(31); " "
1210 LET P(28)=0; LET P(29)=0;
1220 LET moves=0; LET pegs=60
1230 PRINT PAPER 1; BRIGHT 1;
1240 PRINT PAPER 6; INK 0; BRIGHT T 1; AT 9,0; "ONLY "; AT 10,0; "bc de"; AT 11,0; "f9hi"
1250 INPUT PAPER 0; INK 7; BRIGHT T 1; "MOVE FROM ?"; LINE F$
1260 IF F$="99" THEN GO TO 3560
1270 IF F$<"1" OR F$<"8" OR F$<"A" OR F$<"H"
1280 THEN BEEP 1; PRINT PAPER 2; INK 7; BRIGHT 1; FLASH 1; AT 20,0; "ONLY NUMBER THEN LETTER e.g. 2A"; FOR n=1 TO 250; NEXT n; PRINT AT 20,0; " "; GO TO 2020
1290 " "; GO TO 2020
```

Letters to be entered in graphics mode are underlined.
2040 INPUT PAPER 0; INK 7; BRIGH
T 1,"MOVE TO?"; LINE T$
2045 IF T$="99" THEN GO TO 3560
2050 IF T$="1" OR T$="6" OR T$="2" THEN
2060 PRINT PAPER 2; INK 7; BRIGH
T 1:""; GO TO 3560
3220 "NEXT NUMBER THEN LETTER
T# 2150 "IN": FOR n=1 TO 250: NEXT
3230 PRINT AT 20.0."; "GO TO 2040
3240 PRINT PAPER 1; BRIGHT 1;
INK 7; FLASH 1:AT 12.25.;" TO 
3250 T$ 2110 LET f=(CODE F(1)-49)*8)<(CODE 
3260 F(2)-64) 2020 LET t=(CODE T(1)-49)*8)<(CODE
3270 T(2)-64)
3280 IF PCF=0 OR PCF=1 THEN
3290 BEEP 1:1 PRINT PAPER 2; INK 7;
3300 BRIGHT 1:FLASH 1:AT 20.6;" 
3310 INVALID MOVE: FOR n=1 TO 250
3320 NEXT n PRINT AT 20.6;" 
3330 "AT 10.25;"; "GO TO 2020
3340 2100 2110 LET dffv=(V(n)-V(n+4))
3350 LET dfft=H(n+4)-H(n+1)
3360 THEN GO TO 3100
3370 2130 IF dffv=4 AND dfft=0
3380 THEN GO TO 3290
3390 2140 IF dffv=4 AND dfft=0
3400 THEN GO TO 3290
3410 2150 IF dffv=-4 AND dfft=0
3420 THEN GO TO 3460
3430 2160 BEEP 1:1 PRINT PAPER 2;
3440 INK 7; BRIGHT 1; FLASH 1:AT 20.6;
3450 INVALID MOVE: FOR n=1 TO 250
3460 NEXT n PRINT AT 20.6;" 
3470 "AT 10.25;"; "GO TO 2020
3480 3100 3120 BEEP 1:1
3490 3120 IF P(t+1)=0 THEN GO TO 4000
3500 3130 PRINT INK 2:AT V(t);H(t):"a 
3510 \"AT V(t);H(t):" a 3140 LET P(t)=1 LET P(t+1)=0
3520 LET P(t)=0
3530 GO TO 3500
3540 3220 BEEP 1:1
3550 3220 IF P(t+1)=0 THEN GO TO 4000
3560 3230 PRINT INK 2:AT V(t);H(t):"a 
3570 \"AT V(t);H(t):" a 3240 LET P(t)=1 LET P(t+1)=0
3580 LET P(t)=0
3590 GO TO 3500
3600 3320 BEEP 1:1
3610 3320 IF P(t+1)=0 THEN GO TO 4000
3620 3330 PRINT INK 2:AT V(t);H(t):"a 
3630 \"AT V(t);H(t):" a 3340 LET P(t)=1 LET P(t+1)=0
3640 LET P(t)=0
3650 GO TO 3500
3660 3420 BEEP 1:1
3670 3420 IF P(t+1)=0 THEN GO TO 4000
3680 3430 PRINT INK 2:AT V(t);H(t):"a 
3690 \"AT V(t);H(t):" a 3440 LET P(t)=1 LET P(t+1)=0
3700 LET P(t)=0
3710 3520 LET moves=moves+1
3720 3550 LET P(t)=P(t)+1
3730 3540 PRINT PAPER 1; INK 7; BRIGH
ENTHUSIASTIC Sinclair programmers are all familiar with the experience of being chased round the screen by more or less intelligent ghosts.

David Gibbs of Sutton Coldfield, West Midlands has provided an opportunity for 1K ZX-81 owners to reverse their roles and chase the ghost round the screen.

The ghost has an advantage, in that it can walk off one side of the screen and re-appear on the other. Move using the usual cursor keys.

```
10 LET Z=10
15 LET T=0
20 LET B=0
40 LET B=B+(INKEY$="8")-(INKEY$="9")
45 LET Z=Z+(INKEY$="6")-(INKEY$="7")
46 LET T=T+1
50 CLS
60 IF Z=A AND B=C THEN GOTO 20
80 PRINT AT A,C;"(i)"
90 LET M=INT(RND*3)
100 LET A=A+(M+3)-(M+2)
110 IF M=3 THEN LET A=A+1
120 PRINT AT Z,B;"(i-)"
130 IF C=32 THEN LET C=1
140 IF C=0 THEN LET C=31
145 IF C=32 THEN LET C=1
150 IF A=21 THEN LET A=1
160 IF A=0 THEN LET A=20
165 GOTO 30
200 PRINT AT 0,0;"YOU TOOK ";T;
"MOVES TO CATCH HIM"
210 LET D=10
220 FOR C=1 TO D
230 PRINT AT Z,B;"(i<)"
240 NEXT C
250 LET D=D-1
260 FOR C=1 TO D
270 PRINT AT Z,B;"(i-)"
280 NEXT C
290 IF D>0 THEN GOTO 220
300 PRINT AT Z,B+1;"BURP"
```
A simple mathematics test program for children with some very professional graphics. Cedric is a clown who likes to help children with their arithmetic.

He will ask simple sums involving addition and subtraction and will give the correct answer if the incorrect one is input.

(16K ZX-81)
PHILIP MEADE of Chippenham, Wiltshire wrote this short and simple Telephone routine to simulate a telephone ringing on the Spectrum. The sound could be inserted in a game or used, as it was here, to infuriate others in the office.

```
10 LET a=10: LET b=0.015
20 FOR c=0 TO 10: BEEP b,a: NEXT c
30 PAUSE 10
40 FOR c=0 TO 10: BEEP b,a: NEXT c
50 PAUSE 60
60 GO TO 10
```
MATCH THE FIGURE on the left with that on the right. Advance the figure on the left by pressing "1" and press "0" when the figures are identical. Clear a sheet of 16 figures for an increase in speed and a bonus. Clear eight sheets for another bonus and a slightly more difficult game.

The sooner you match your numbers, the higher your score. Match a space invader to gain an extra 300 points. The game ends when three lives are lost or more than 30 shots are fired in one sheet.

Peter Bernstein of Northwood, Middlesex, who wrote the game for the 16K Spectrum, says his highest score is 25,400.
GO
250 LET SH=SH+1: IF SH=30 THEN
GO TO 430

360 FOR A=1 TO LEN AS: IF AS(A)="a" AND N=10:
THEN GO TO 290
270 NEXT A
280 BEEP .05, -10: GO TO 360
290 LET SC=SC+6-LEN AS+A-F)*10:
[F+1]: IF NK>10 THEN LET I=I+N:
GO TO 310
300 LET SC=SC+200
310 LET HT=HT+1
320 LET AS=A$ (TO A-1)+AS(A+1 TO 0)
330 IF NK>10 THEN BEEP .03, 20:
GO TO 350
340 FOR W=45 TO 20 STEP -3: BEEP .01, W:
NEXT W
350 PRINT AT 10,14; " ST "
10.20-LEN AS-F; AS AT 16,17; FLAS
H 1: SC
360 IF AS="" "( TO LEN AS)
AND G=16 THEN GO TO 520
370 NEXT B
380 LET B$=STR$ (INT (RND*10)): IF I/10=INT (I/10) AND I>0 THEN
N LET B$="a", LET I=0
390 IF G=16 THEN LET G=15: LET
B$=" "
400 LET AS=A$+B$
410 IF LEN AS>7-F THEN NEXT G
420 IF L<3 THEN PRINT AT 10,11:
FLASH 1; BRIGHT 1; "(9*96)"; BEEP .05, 20:
430 PRINT AT 10,11; BRIGHT 1; F
440 FOR A=0 TO -40 STEP -1: BEE
STORM

1 REM (MACHINE CODE-188 CH
6 PRINT "WHEN THE LAST PAIR HAS BEEN ENTERED ENTER (S)"
10 LET A$=""
20 LET X=16520
30 IF A$="" THEN INPUT A$
40 IF A$="S" THEN STOP
50 SCROLL
60 PRINT A$( TO 2); X:
70 POKE X,16*CODE A$+CODE A$( 2 >476
80 LET A$=A$(3 TO )
90 LET X=X+1
100 GOTO 30
110 PRINT AT 0,0;"00000000 VVV
storm"
20 POKE 16418,0
30 FOR N=1 TO 23
40 PRINT " 
50 NEXT N
60 POKE 16418,2
70 PRINT AT 10,3;"ENTER LEVEL OF DIFFICULTY"
80 INPUT A
90 IF A>255 THEN GOTO 80
100 POKE 16654,A
105 PRINT AT 10,3;" ENTER SPEED"
110 INPUT A
120 IF A>255 THEN GOTO 110
130 POKE 16690,A
135 PRINT AT 10,3;"
136 FOR N=1 TO 50
137 IF INKEY$<>"" THEN GOTO 140
138 NEXT N
140 RAND USR 16520
150 PRINT AT 10,10;"GAME OVER";
155 PRINT AT 10,9;"PRESS A KEY"
160 IF INKEY$<>"" THEN GOTO 160
170 IF INKEY$="" THEN GOTO 170
180 RUN
190 SAVE "STORM"
200 RUN

YOU ARE situated at the top of the screen. Avoid the storm of black squares rushing at you by moving left and right with keys “1” and “0”. At the start of the game you are asked to enter your speed and difficulty level. Entering “5” for both produces a reasonably fast game.

CHornby of Hassocks, Sussex speeded the game by writing part of it in machine code. Enter the short initial program. RUN it, then enter the series of numbers two at a time, working from left to right, entering “S” to end the series. RUN the program again, delete all lines except line one, and then enter the main program. (16K ZX-81).
YOU PLAY the part of cheerful Pete who, to bring some happiness into the lives of his fellow party-goers, is bouncing balloons on his tennis racquet. The others at the party have threatened that if Pete fails and misses his balloons they will eat him. Prolong Pete's life by moving him left and right with keys "1" and "0".

Pete the Party-goer was written for the 16K Spectrum by J Smith of Coulsdon, Surrey.

```
1 REM xxxxxxxxxxxxxxxxx
2 CLS : LET n$="Spectrum"
3 LET hi=0
4 GO SUB 1000
5 LET sc=0
6 LET c=1 : LET li=3
7 PRINT AT 11,0:"Instructions
(y/n)"
8 PAUSE 0
10 IF INKEY$="y" THEN GO SUB 2020
11 DEF FN k(j)=2*(SGN(PEEK(j
+2345))-(PEEK(j+8976))))
20 PRINT AT 21,0:"level 1-3?"
PAUSE 0: LET l$=INKEY$:
21 IF l$="3" OR l$="1" THEN BE
EP .5,-40: GO TO 20
23 CLS
24 PRINT TAB 6;"SCORE: ";sc:TAB
16."HIGH:";hi:TAB 25;"LIVES:";li
i
25 LET l=VAL l$
40 LET i=1
50 DIM a(1+1,2)
60 FOR n=1 TO 1+1
70 LET a(n,1)=INT(RND*5)+6
80 LET a(n,2)=1
85 IF RND>.6 THEN LET a(n,2)=a
(n,2)*2
90 PRINT AT a(n,1),n*2; INK n;
"0"
100 NEXT n
105 PLOT 0,23: DRAW 131,0: GO S
UB 3020
110 LET x=18
115 LET y=8
120 FOR n=1 TO 1+1
121 BEEP .0001,60
130 PRINT AT a(n,1),n*2;
" 
140 LET a(n,1)=a(n,1)+a(n,2)
150 IF a(n,1)>6+(INT(RND*4)) T
HEN LET a(n,2)=a(n,2)
160 IF a(n,1)>19+a(n,2) THEN L
ET li=li-1: BEEP .1,-30: LET a(n
,1)=6: GO SUB 3000: PRINT AT 0.3
1+li: IF li=0 THEN GO TO 250
170 PRINT AT a(n,1),n*2; INK n;
"0"
180 NEXT n
190 IF c=1 THEN IF sc=16 THEN G
O SUB 2000
200 PRINT AT x-2,y+1; ";AT x-1
,y+1; ";AT x,y;" '
210 LET y=y+(INKEY$="0" AND y<1
5)+(INKEY$="1" AND y>0)
220 PRINT AT x-2,y+1: INK 2;"d"
;INK 0:AT x-1,y+1;"b";AT x,y;"c
a."
225 IF INKEY$="h" THEN PAUSE 30
```
PETE THE PARTY GUY

**FOR q=1 TO l+1: LET a(q,2)=
1*SGN a(q,2): BEEP .1,@*2: NEXT q**
AVOID the missiles flying towards you by using cursor keys "5" and "8". Each time you avoid a batch you descend another level and the game becomes more difficult.

Adam Dangoor of Richmond, Surrey wrote **Dodger** for the 16K Spectrum.

![ASIN:0273937358]
1999 FOR I=10 TO 40: BEEP .01, I: NEXT I: BORDER 2: PRINT AT 6.5: INVERSE 1: "YOU HAVE BEEN DESTROYED": PRINT AT 10.6:"RATING:" : R$: PAUSE 300: PRINT AT 16.3:"PRESS ANY KEY TO CONTINUE": PAUSE 0: CLS : BORDER 5: GO TO 4

2000 PRINT INK 1;" D O
D G E R ": PRINT ": 0 19
83 A.D." : PRINT : PRINT " The idea of the game is to avoid being hit by the alien missiles using the '5' and '8' keys. After every few waves of missiles that you dodge your spaceship will descend one character square until you reach the alien bases. You must keep away from the stars at the edge of the screen as they are mines. When you have finished a game you will get a rating." : PRINT : PRINT TAB 6: INVERSE 1: "PRESS ANY KEY TO BEGIN": PAUSE 0: RETURN

EAD A: POKE USR "B"+Z,A: NEXT Z:
DATA 240,252,254,204,252,24,8,2
8
20 RESTORE 20: FOR Z=0 TO 7: R
EAD A: POKE USR "C"+Z,A: NEXT Z:
DATA 16,16,56,56,124,124,124,25
4
30 FOR m=1 TO 29 STEP 2
40 PRINT INK 0:AT 21,m:"F"
50 NEXT m
60 LET X=3
70 LET H=0
80 LET Y=5
90 LET V=2
00 LET W=INT ((RND*29)+1)
100 LET V=V-1
110 IF V=0 THEN LET X=X+1: LET
120 IF X<10 THEN LET V=1
130 LET M=INT ((RND*29)+1)
140 LET N=INT ((RND*29)+1)
150 LET Q=INT ((RND*29)+1)
160 LET D=INT ((RND*29)+1)
170 LET F=INT ((RND*29)+1)
180 IF x>20 THEN GO TO 1990
190 LET Z=20
200 PRINT INK 1;AT X,Y;"AB"
210 PRINT AT 0,8,X
220 PRINT AT 0,8,X
230 IF Y<1 OR Y>29 THEN GO TO 1
240 999 INK 0
250 1000 PRINT AT Z,Q;"C":AT Z,W;"C"
260 1001 PRINT AT Z,M;"C":AT Z,N;"C"
270 1002 PRINT AT Z,D;"C":AT Z,F;"C"
280 1020 PRINT AT Z,Q;":":AT Z,W;"":
290 1023 PRINT AT Z,M;":":AT Z,N;"":
300 1024 PRINT AT Z,D;":":AT Z,F;"":
310 1025 PRINT AT X,Y;":":
320 1027 IF Z=X THEN IF W=Y OR M=Y OR
330 N=Y OR Q=Y OR D=Y OR F=Y OR W=
340 Y+1 OR M=Y+1 OR N=Y+1 OR Q=Y+1 OR D=Y+1 OR F=Y+1 THEN GO TO 1990
350 1028 IF INKEY$="8" THEN LET Y=Y+1
360 1029 IF INKEY$="5" THEN LET Y=Y-1
370 1030 LET Z=Z-1: IF Z<X THEN GO T
380 0 800
390 1040 GO TO 850
400 1992 IF X>Y THEN LET U=X
410 1994 IF X<16 THEN LET R$="SPACE
420 1995 CADET"
430 1995 IF X=15 OR X=14 THEN LET R$=
440 "SOLDIER"
450 1996 IF X=17 OR X=16 THEN LET R$=
460 "LIEUTENANT"
470 1997 IF X=19 OR X=18 THEN LET R$=
480 "COMMANDER"
490 1998 IF X=20 OR X=21 THEN LET R$=
500 "SPACE ADMIRAL"
You start with $200 in the bank and your aim is to make as much profit as possible from your mine. It costs you $4 to dig out one metre of the mine and each time you return to the surface your funds are altered to take account of your profit and expenditure. You may find coal (coal) or gold (gold), or you may be unlucky and be involved in an explosion, which will cost you $200. Key 6 moves you down the mine and Key 7 returns you to the surface.

You may find coal (coal) or gold (gold), or you may be unlucky and be involved in an explosion, which will cost you $200. Key 6 moves you down the mine and Key 7 returns you to the surface.

Mark Evans at Welling, Kent wrote Miner for the ZX81.

SNCLAIR USER August 1983
**Grid Race**

Try to trap the computer-controlled "V" which is moving down from the top of the screen. Move your "X" using the usual cursor keys. Avoid crashing into the walls or into the trails left by the "V" and the "X".

*Grid Race* was written for the 16K ZX-81 by Tim Betts of Duxford, Cambridgeshire.

1 REM "GRID RACE"
10 PRINT "<32*isP>"
20 FOR A=1 TO 20
30 PRINT "(isP:30*i:isP)"
40 NEXT A
50 PRINT "(32*1sP)"
60 LET X=19
65 LET DIR=3
70 LET Y=15
80 LET A=2
90 LET B=INT (<RND*20)+5)
91 LET C=A
92 LET D=E1
93 LET YD=1
100 PRINT AT X,Y;"X"
101 LET A=C
102 LET B=D
110 PRINT AT A,B;"Y"
118 PRINT AT A,B;"";
119 PRINT AT A,Y;"";
120 IF INKEY$="7" THEN LET YD=1
121 IF INKEY$="8" THEN LET YD=2
130 IF INKEY$="6" THEN LET YD=3
131 IF YD=1 THEN LET X=X-1
132 IF YD=3 THEN LET X=X+1
133 IF YD=4 THEN LET Y=Y+1
134 IF YD=2 THEN LET Y=Y-1
150 IF INKEY$="5" THEN LET YD=4
151 IF YD=1 THEN LET X=X-1
152 IF YD=3 THEN LET X=X+1
153 IF YD=4 THEN LET Y=Y+1
154 IF YD=2 THEN LET Y=Y+1
159 PRINT AT X,Y;
160 LET Z=PEEK (PEEK 16398+256*PEEK 16399)
170 IF Z=128 OR Z=0 THEN GOTO 9000
180 GOTO 2990
190 GOTO 100
2000 LET DIR=INT (<RND*4)+1)
2001 LET C=A
2002 LET D=B
2010 GOTO 3000
2990 LET L=0
3000 IF DIR=1 THEN LET C=C-1
3010 IF DIR=2 THEN LET D=D+1
3020 IF DIR=3 THEN LET C=C+1
3030 IF DIR=4 THEN LET D=D-1
3035 PRINT AT C,D;
3040 LET Z=PEEK (PEEK 16398+256*PEEK 16399)
3050 IF Z=0 OR Z=120 THEN GOTO 3
3055 PRINT AT C,D;
3060 GOTO 190
3070 LET L=L+1
3075 IF L=5 THEN GOTO 3090
3080 GOTO 2000
3090 PRINT AT 1,1;"YOU WIN"
3100 STOP
3000 PRINT AT 1,1;"YOU LOOSE"

---

1 REM "GRID RACE"
10 PRINT "<32*isP>"
20 FOR A=1 TO 20
30 PRINT "(isP:30*i:isP)"
40 NEXT A
50 PRINT "(32*1sP)"
60 LET X=19
65 LET DIR=3
70 LET Y=15
80 LET A=2
90 LET B=INT (<RND*20)+5)
91 LET C=A
92 LET D=E1
93 LET YD=1
100 PRINT AT X,Y;"X"
101 LET A=C
102 LET B=D
110 PRINT AT A,B;"Y"
118 PRINT AT A,B;"";
119 PRINT AT A,Y;"";
120 IF INKEY$="7" THEN LET YD=1
121 IF INKEY$="8" THEN LET YD=2
130 IF INKEY$="6" THEN LET YD=3
131 IF YD=1 THEN LET X=X-1
132 IF YD=3 THEN LET X=X+1
133 IF YD=4 THEN LET Y=Y+1
134 IF YD=2 THEN LET Y=Y-1
150 IF INKEY$="5" THEN LET YD=4
151 IF YD=1 THEN LET X=X-1
152 IF YD=3 THEN LET X=X+1
153 IF YD=4 THEN LET Y=Y+1
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3090 PRINT AT 1,1;"YOU WIN"
3100 STOP
3000 PRINT AT 1,1;"YOU LOOSE"
If you want Arcade quality control for your Sinclair ZX Spectrum, you’ll find the Protek combination hard to beat. The Interface is compatible with some of the best Arcade games from top software publishers including:

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Taking the strain out of calculating the wages

Starting with the ZX-80 Ronald Sims has always found serious uses for his machines. Claudia Cooke talks to him about how they help.

No-one was more pleased than Vera Sims when her husband Ronald invested in his first computer, a ZX-80. For the first time in almost 20 years, her workload was reduced from a day-and-a-half each week to only four hours. Mrs Sims has the job of calculating and paying the weekly wages for the 35 employees of the family automation business.

"I used to do it all in my head, with the help of a ready reckoner and it took me a day and a half. Now my husband has written a program which does it all for me and it takes a few hours. It has been marvellous".

Her husband has since changed to a ZX-81 with a 64K Memopack and the program covers job costing for up to 10 jobs, tax deductions, a variety of individual allowances and more than 30 subtotals and totals.

Mrs Sims, 69, says: "It was a bit strange at first because I didn't know the first thing about computers but I soon got the hang of it and now I'm really pretty quick".

"I was 70, interrupts to reveal that the early days were not that simple. "She just wouldn't believe it at first. When the computer produced the figures she used to take them down quickly and work it out herself to make sure. I must say her calculations were as quick as those of the computer."

"Now she realises that the computer just cannot make the kind of human errors which every person is bound to make at some time or another".

Although the Sinclair is his first computer, Sims is no newcomer to the processes of logic involved. He had worked in the radio industry since 1929 and had become fascinated by 'wirelesses' even before he left school at the age of 17.

"At school we had a physics master who was very keen on the wireless, as it was known in those days. I was charged with his enthusiasm and by the time I left I was one of few people who knew how they worked."

His first job was with a firm selling do-it-yourself wireless kits. People would buy the kits on Friday, he says, and return on Monday to find what they were doing wrong. His job was to advise customers exactly how to assemble them.

"In the early 1930s I realised my technical education was not keeping pace with the changes so I got a job with Siemens in telephone exchange development work. The logic then was the same as the logic of computers today and I was given a good training."

When the second world war broke
out, the company had just begun work on the development of radar and Sims became chief of test gear.

"There was such urgency because of the war that we had to start manufacturing in quantity products which had not been made previously. Being responsible for testing, it was the first time I really became interested in automation and automatic testing."

After the war, Sims left to join Michael Sobell, first as technical assistant to the buyer and then as chief buyer. He stayed with the company for 12 years and says that without Sobell’s commercial guidance he could never have started his own business.

Start it he did, 25 years ago, when he detected a gap in the industry for automation. Today his company, Lectromeec Controls, is still flourishing in south London, run by his three grown-up sons and his ZX-81.

He is working on a cashflow program for the firm, although he is doubtful whether his Memopack can cope with a sufficient number of invoices.

His wages program took many months to compile but the result has been worthwhile. Not only does it do the job much faster, it rules out the necessity for Mrs Sims to have her cash sheets checked by someone else before handing-out the pay.

"If you make a mistake you just look at the picture and know if it’s right or wrong", says Mrs Sims. "The only thing is that you lose your brain, because you just look at the picture and copy it all down. I used to have to make so many calculations in my head but now I almost think you could become brainless within a few years."

Sims has one criticism of Sinclair, levelled at the printer. "I think it was very ambitious to produce this printer but I think it leaves a lot to be desired. It prints so badly, I think it’s the thermal paper. If you leave it switched on Christmas, we couldn’t drag them away from the set. We all enjoyed it!"

The eldest grandson, aged 12, has already had the ZX-80 bequeathed to him, together with the 16K memory.

He is at least as enthusiastic as his grandfather.

Now Sims is working on a conversation program to use with his grandsons at this year’s Christmas gathering. It is a marvellous program so far, tailored individually to each of the four boys so that if one gives the computer his name, it is liable to answer back with the name of his brother.

A selection of 10 answers to each response from the boys appears at random, resulting in some highly-enterprising non sequiturs, as well as some startlingly accurate replies.

When asked how I was feeling by the computer, I replied “very hot”, only to be told rather cheekily: "You look all right to me". When I agreed with the computer’s suggestion, “I hear they call you Podge”, it replied curtly, "Stop mucking me about".

Sims hopes to develop the program to around 10 or 15 minutes by Christmas and is gaining evident enjoyment from the work involved.

Aside from the computer, he and his wife are kept busy at their home in Ewell, Surrey. Mrs Sims is a regular bowls player, although sadly out of action during my visit due to a back injury. Her husband likes nothing better than to sit down for an hour or so and play the organ. He is from a musical family and as a child learned to play a variety of instruments, including the piano, violin, flute and piccolo, but his favourite remains the organ. “I particularly love playing classical music. I have always found it relaxing. To return home and get lost in the music for a time is a wonderful way of recovering from work.”

The Sims also have a narrow boat, moored on the Thames, to which they retreat whenever possible during the summer months to enjoy the sun and the fresh air.

“Mostly we take it on the Thames these days, rather than the canals, but it is a wonderful way of relaxing. You don’t have to arrange it all in advance; you just decide to go and that’s it. It’s a kind of freedom which is very valuable in business because, contrary to popular opinion, you cannot just take-off on holiday overseas whenever it suits you. You never know what will happen until the last moment.”

Both are now semi-retired and the father figure wisely attempts to keep his nose out of the family business to a great extent, leaving his sons to run it the way they wish to do.

“I never pushed them into it, or expected too much of them. They all worked for other firms for a few years before joining me but I must admit it is pleasant that they all wanted to join. Now one is the managing director, one is sales director and the third is really installation manager.”

One of his sons has also become a highly-proficient organist, playing in a dance band. His father pours generous praise on his talent.

Married for 43 years, the Sims are a contented couple, although not content to sit back and do nothing. Theirs is an active life, made more so by the advent in their home of the computer.

They certainly defy any theory that computers are for the young. It was Mrs Sims who, having read Sinclair User, became the first person to nominate someone for the title of User of the Month — her husband.

She nominated him not only for his wages program but also for the fact that he derives so much enjoyment and relaxation from compiling the programs. His enjoyment of making the programs, she says, is almost greater than his enjoyment of operating them in his computer and although she steers clear of programming, she has learned a new skill at an age when few women expect to do so.
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Trade enquiries welcome excellent terms available A NEW DIMENSION IN SPECTRUM SOFTWARE
Nick Goldman and Jerry Seabridge show how to merge programs without much difficulty

Two into one will now go on the ZX-81

One problem until now with the ZX-81 has been that when a program is loaded from tape any previous program in the computer is NEWed and lost. That means that two programs, each saved separately on tape, could not be merged into one program. That would clearly be useful for, say, writing subroutines which could be written and tested separately and then merged with a main program on a different tape. The merge feature has been included on the Spectrum and the routine we developed means that now two programs can quickly be combined into one, with few restrictions on the programs so merged, on the ZX-81.

The procedure used is outlined and explanations of the important steps are given. The basic theory is to reserve space in the 16K memory by putting RAMTOP, the address of the first byte, above the Basic system area, to a value below the normal 16K value of 32768, and then transferring the first program, byte by byte, into the reserved space.

The second program is then entered, along with a routine which will retrieve the first program, add it to the second program, and correct the values of the length — the third and fourth bytes in each program line, see page 171 of the ZX-81 manual — and so on, so that the program will not crash or behave abnormally. Here is the procedure:

First, the user's first program is entered from cassette tape. Restrictions on the program are that the line numbers must all be lower than 9899 but greater than the greatest line number of the user's second program, yet to be loaded. That is so that when the two programs are merged eventually, the line numbers will be in the correct order and the computer will not crash. To this program must then be added the final line:

```plaintext
XXXX REM END
```

where XXXX is the line number, which must be big enough to make it the last line of the first program but must still be less than 99. When the program is entered, the following direct commands must be entered, in the correct order:

```plaintext
LET X = PEEK 16396 + 256*PEEK 16397 — 1
LET Y = 49230 — X
PRINT Y
```

and the value of Y should be written or remembered. Then:

```plaintext
POKE 16388, Y — 256*INT(Y/256)
POKE 16389, INT(Y/256).
```

X, the value of D FILE — see chapter 27 of the ZX-81 manual — minus one, is the last byte of the program and is thus the last byte which must be transferred. Y is the location where the first byte of the program will be stored — 49230 was chosen as it leaves a little spare room before the end of the computer's 16K; and RAMTOP is poked to that value — the two POKE commands — so that when NEW is executed the transferred bytes will not be erased. That can be verified by typing:

```plaintext
PRINT PEEK 16388 + 256*PEEK
```
16389 which should give the value of Y which was written.

Next the routine given in listing one, lines 9900 to 9920, is added to the first program. Then type:

GOTO 9900 followed by:

NEW as soon as the computer has finished the loop starting in line 9900.

That routine copies the bytes of the first program into the memory, starting at the location given by the variable Y. NEW is executed to clear everything except those stored bytes. To verify that the first program is still stored above RAMTOP, type:

PRINT PEEK (your value of Y)*256 + PEEK (your value of Y + 1).

That should return with the first line correct number of REM statements can be produced quickly.

As soon as the REM lines have been typed-in, the command GOTO 1 should be entered. The routine — lines 1 to 13 — will then transfer the first program back from above RAMTOP back to the main program, and when the report code 9/13 — STOP executed in line 13 — is seen, the final. The merged program can be tidied by deleting lines 1 to 13 and any left-over REM lines after line 9900 may also be removed.

This is how the final 13-line routine works:

The first two lines POKE RAMTOP to its usual (16K) value of 32768. That is so that as the routine progresses, the space where the first lines were stored can be over-written once those lines have been re-transferred, and that enables longer programs to be merged.

Lines 3 to 4 check for the location of the REM command in the line:

XXXX REM END

at the end of the first program, that being the marker used to indicate the end of the first program, and the loop passes to line 5 with the variable F being the location of this REM command.

The variable K which was defined previously by direct command is the location of the first byte in the first REM line — line 9900 — and is the location in which the first byte of the first program is POKEd. The REM statements are used to reserve space below the Display File — we spent some time trying to POKE the system variable DFILE but with no success — and the first program is simply POKE into the locations occupied by the REM lines. Thus lines 5 to 8 POKE the first program into the space reserved by the REM lines, except for the CHR$ 118 which indicates the last character in the line:

XXXX REM END

Lines 7 and 9 are to clear the space which was occupied by the first program.

Finally, lines 10 and 11 count the extra Xs left over from the last REM line POKEd into and line 12 POKEs the new length of the last line into the appropriate location. That means that the line

XXXX REM END

will finally become:

XXXX REM END (+ left-over Xs from the REM line)

and the appearance of this is an indication that the merging is successful. Of course, if the final REM line had exactly the correct number of Xs, the line will remain

XXXX REM END

Using this routine we believe that any two Basic programs can be merged into one. Of course, that does not extend the limit of 16K imposed by having only a 16K RAM pack and it should be noted that any variables stored will be lost as the procedure is followed.

A large number of direct commands have been used where they could have been included in the two routines we have given — listing one and two — since if the procedure is to be worthwhile it should be as short as possible.

For long programs it is obviously superior to run the two routines in FAST mode but that is not very informative if for any reason the computer should crash. Therefore until you are confident that you have the procedure correct, we suggest that you take the extra time to run the routines in SLOW mode and keep an eye on the computer, even if that takes a long time.

Listing 1.

9900 FOR F=16509 TO X 9910 POKE Y-16509+F,PEEK F 9920 NEXT F

Listing 2.

1 POKE 16388,0
2 POKE 16389,128
3 FOR F=Y TO 9999
4 IF PEEK F+51 THEN NEXT F
5 IF PEEK F+52 THEN NEXT F
6 POKE G+K-Y,PEEK G
7 POKE G,0
8 NEXT G
9 POKE G,0
10 FOR G=F+K-Y TO 9999
11 IF PEEK G+118 THEN NEXT G
13 STOP
9900 REM X X X X X X X X X X X
XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXX
9901 REM (100 Xs)
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**SINCLAIR USER August 1983**
Poor presentation handicaps teaching aids

John Gilbert reviews the latest releases.

The educational sector of the book market is expanding but the standard is not becoming noticeably higher. Although the psychology of teaching by computer seems to be developing in the proper direction, the standard of presentation in many cases is not good enough. The explanation is that the books on the market are either too difficult or too easy for the beginner to understand.

The Spectrum Starter Packs, numbers one and two, are for the 48K Spectrum. They suffer from being too easy for the age range at which they seem to have been aimed. The packs do not take into account that most children looking at them are growing up in an age of electronics. They do no more than illustrate points in the Spectrum manual and show how the various commands work on the computer.

Both starter packs contain program cassettes which explain how the computer works and provide examples of the Spectrum Basic commands. Most of the information on the cassettes is dealt with in the books accompanying the packs, so the inclusion of such cassettes is superfluous.

The books could be used in primary schools, although they would be of more value as a talking-point for teachers than an aid which is given to children who are then left to learn programming virtually on their own.

The intentions behind the starter packs seem good but a little more work could have gone into them to improve the presentation. Spectrum Starter Packs, one and two, cost £9.95.

Books on so-called good programming techniques are now forming an important sector of the market. Although most authors fail to inform their readers that there is no best way of programming, the standard of the books is good.

Databases for Fun and Profit, by Nigel Freestone, is one of the good programming books. The author aims to give the reader an understanding of data structures which are used in programming. The book is not machine-specific and should be easily understood by most owners of the ZX-81 and Spectrum.

It starts by introducing the binary and hexadecimal number systems which are associated with computers, particularly with storage and machine code. It then explains how arrays can be used to create a variety of data structures, such as lists, trees and stacks.

When those structures have been explained the author shows how they are used in several types of programs. He shows what is needed to write diary and bank account programs and name and address systems. He also shows how to incorporate arithmetical formulae, such as income tax calculations, into a program to provide some way of processing the data once it is entered.

Databases for Fun and Profit contains much valuable information for anyone wanting to put Sinclair machines to good use. It is published by Granada Publishing and costs £5.95.

Turning from software to hardware we move to hardware with Simple Interfacing Projects, by Owen Bishop, also published by Granada.

Like the book on databases it is not machine-specific and that makes it different from all the rest. The projects include a real-time clock, a music generator and a ROM board. There are 12 projects which can be built and they are laid out in an easy-to-understand manner. A brief explanation is given of the project and how it works, then the construction details are discussed. As a result the book would be of interest to anyone who has a computer and a basic grounding in electronics. Some experience of programming would also be useful but not essential. Simple Interfacing Projects costs £6.95.

Another book which will be of interest to ZX-81 owners is The Ins and Outs of the Timex TS-1000 and ZX-81, by Don Thomasson. The book looks as if it was written for a readership in the States but it has some relevance in Britain. It explains the hardware of the ZX-81 and includes a complete circuit diagram of the machine.

The author explains how the CPU chip works and gives a detailed account of the pins which feed it with input and output data. A practical knowledge of electronics is necessary for you to follow the discussions in the book and a knowledge of machine code would also be helpful. It is published by Melbourne House and costs £5.95.

A new work from Interface is The Turing Criterion — Machine Intelligence
It describes its workings in detail and does not indulge in technical jargon.

or student of computers, writes Stephen Adams.

It provides an insight into how the computer works and then describes the Spectrum in detail, including complete circuit diagrams of everything, except the ULA.

The user has to be satisfied with a pin-by-pin description of that device. The author describes its workings in simple detail and does not indulge in technical jargon. The circuit principles are explained but not component by component, except where the author is sure of his ground, i.e., the power supply, CPU and RAM chips.

The video section is a little misleading as it refers to B-Y as BLUE-YELLOW, where in real life the Y stands for luminance — the whiteness of the picture. It gives the adjustments necessary to deal with some problems associated with the video.

One-third of the book is circuit diagrams and descriptions of circuits the user can add to the back of the Spectrum. The author seems a little nervous about suggesting that the user make improvements inside the Spectrum. A port made from a PIO, add-on joysticks, plus an exterior keyboard are also described. One suggestion for model one users only is to allow for 127 extra ports by improving on the decoding for the I/O map.

The differences between the models one and two are pointed-out frequently, with photographs to show the components on the circuit board. A "dead cockroach" IC and the transistor across the model two Z-80A CPU are described, along with why they were necessary.
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GLOSSARY

Basic — Beginners’ All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultraviolet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.

Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time’s obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 102
Starting from Scratch

continued from page 101

able to type-in other people’s programs, such as those in Sinclair User and Sinclair Programs, without too much difficulty.

It is that important when using the ZX-81 that it is not installed. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not for everyone’s liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in Sinclair User and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type \"LOAD 13\" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

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SINCLAIR USER August 1983
VALHALLA is an animated graphics adventure whose undisguised intention is to steal the title of "best micro adventure game bar none" from THE HOBBIT.

The 48K program uses a new operating system MOVISOFT and boasts a number of HOBBIT-like features. There are 20 significant characters, each with their own aims and objectives.

You are a minor God set the task of recovering Odin's Golden Helmet. To complete this you will also have to master three lesser tasks, one of which is to rescue IDUN, a maiden responsible for the Golden Apples which keep the Gods youthful.

The games' designer, LEGEND, claims that the program involves a sophisticated degree of interaction. For example, should an enemy overhear you telling a friend some important information, he will try to ruin your plans.

LEGEND stresses that the personality of each of the characters is genuinely independent "as opposed to pseudo independent behaviour like Thorin sitting down and singing about gold or Gandalf walking off with your door for no reason".

The moving graphics are reportedly of cartoon quality, with both background and foreground movement illustrating the events of the plot.

Pretty impressive claims. HOBBIT fans will no doubt feel both intrigued and sceptical...

Watch this space.

...Graham Taylor, Software Editor, POPULAR COMPUTING WEEKLY - 26th MAY '83

UK Release August 15th.
What is the difference between a bit and a byte?

Andrew Hewson considers the basics of machine code

HAVING RECEIVED a number of letters asking about the fundamental ideas of machine code programming, I have devoted most of the column to the topic. John Stevens of Hammersmith, London writes:

I am trying to learn how to write machine code programs but I am finding it difficult to understand the meaning of some of the words which are used. Can you explain as fully as possible what is the difference between a bit and a byte, and between a register and a variable?

A bit is the fundamental building block of computer memory and can exist in only one of two states. The two states can be thought of as representing ON or OFF; TRUE or FALSE; YES or NO; UP or DOWN; MALE or FEMALE or any other pair of logically opposite conditions. The mechanism by which a computer memory works is not really important to us but in the Sinclair computers the state of a bit is memorised by setting a microscopic solid state switch either ON or OFF as appropriate.

The usual notation is to think of one state as the ZERO state and the other as the ONE state. A bit is considered to be set when it is in the state representing ONE and to be re-set otherwise. That notation allows us to speak of a given pattern of bits in terms of its binary equivalent and by converting the binary number to a decimal, each bit pattern can be given an exceptional positive integer decimal number.

For example, consider eight bits of which the right-most four are set and the left-most four are re-set as illustrated in table one. The binary pattern of the eight bits can be converted to a decimal if it is remembered that, in a binary number, the right-most column is the units column; the next column to the left is the twos column; the next to the left again is the fours column and so on, doubling at each move to the left. The decimal equivalent of 00000111 is therefore:

\[ 0 \times 128 + 0 \times 64 + 0 \times 32 + 0 \times 16 + 1 \times 8 + 1 \times 4 + 1 \times 2 + 1 \times 1 = 15 \]

Obviously it is inconvenient to refer to bits as the right-most or the third from the right and so the convention is adopted of numbering the bits from the right, starting at zero as shown in table one. When that convention is used the number of each bit is also the power to which 2 must be raised to give the value of the column. That is:

2 \text{ bit number} = \text{column value}

Bit 3, for example, is in the eights column because \(2^3 = 8\).

I chose to consider a group of eight bits together because the Z-80A microprocessor at the heart of the Sinclair computers is designed to operate on eight bits at a time. The term operates covers all the types of tasks which the Z-80A can perform directly such as addition, subtraction, rotation, logical AND, or the like. Thus although a bit is the fundamental unit of computer memory, bits are usually manipulated together in groups of eight, so a group of eight bits is called a byte — pronounced bite.

There are 256 ways of arranging the contents of a group of eight bits. The first is \(00000000\), the second is \(00000001\), the third is \(00000010\). Thus each of the bytes in RAM can be used to hold a single positive whole number lying between 0 and 255 inclusive by setting or re-setting the eight bits in the byte according to the binary equivalent of the number.

The Z-80A does not alter the contents of memory directly when it is executing a program; rather it copies the contents of a location in memory into one of several special locations in the microprocessor called a register and then operates on the contents of the register. The Z-80A is a powerful microprocessor because it has many registers and so it can hold several numbers at once, thereby reducing the need to make time-consuming transfers between the processor and memory.

Most of the registers have one or more special features. The most important one is the ‘a’ register or accumulator, so-called because the results of most

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Table 1. Three ways of representing a group of eight bits of which the left-most are reset and the right-most are set. The bit number is shown on the bottom line.

10 FOR I = 23286 TO 23325
20 INPUT ZS
30 IF ZS = "W" THEN STOP
40 PRINT ZS
50 LET Z(1) = CHR$(CODE Z(1) - 7 * (CODE Z(1) \mod 57))
60 LET Z(2) = CHR$(CODE Z(2) - 7 * (CODE Z(2) \mod 57))
70 POKE L(16 * CODE Z(1) + CODE Z(2) - 816)
80 NEXT I

Table 3. A Spectrum program to load 30 two-character hexadecimal codes into the printer buffer.
arithmetic or logical instructions are accumulated in the 'a' register. Some instructions use a second register as a second source of data together with the 'a' register. For example the instruction:

```
add a,b
```

means add the contents of the 'a' register to the contents of the 'b' register and leave the result in 'a'.

Thus a register is a dedicated location in the microprocessor which has specific attributes and functions. A variable is a location or group of locations in RAM which are used by a particular program. If the program is written in Basic or another high-level language, the variable is given a name and all references to the variable are made using the name.

The next question, from Alan Birmingham of London, follows from the previous one. He asks:

**What do the following programs do—an assembler, a disassembler, an interpreter, a compiler?**

A machine code routine consists of a sequence of instructions which the Z-80A understands directly with no need for prior interpretation. The simpler instructions are held in one byte of memory but the more complicated instructions can occupy as many as four bytes.

Generally, the instructions are executed in the order in which they are encountered, although there are exceptions. The Z-80A keeps a note of where the next instruction is to come by means of a special register pair called the program counter. Thus if the location pointed to by the program counter contains the number 128 in decimal — 80 in hexadecimal — the Z-80A will add the contents of the 'a' register to the contents of the 'b' register and leave the result in the accumulator, because 128 is the decimal machine code instruction for

```
add a,b
```

The decimal or hexadecimal codes for all the 600 or so instructions in the Z-80A instruction set are difficult to remember and so for that and other reasons machine code programs are almost always written using an assembler program. An assembler converts instructions like add a,b to the correct code. It also allows the programmer to name variables, add comments and give labels to various points in the program and to call subroutines using the labels. A good assembler will have other facilities as well, all aimed at making the programmer's job as straightforward as possible.

A disassembler performs the opposite function to an assembler; it converts a sequence of numbers into a sequence of mnemonics which are easier to understand than the original code. A list of the more important mnemonics is given in the Sinclair manuals in Appendix A. A disassembler is of use when analysing code written by somebody else to discover how it works.

The output from an assembler is a program which the microprocessor can understand directly because it consists of machine code instructions. In contrast, a program written using an interpreter, such as Sinclair Basic, is held in RAM in more or less the form in which it was entered by the programmer. Interpreters are high-level languages which bear little or no relationship to the instruction set of the processor on which they are run. Every time the program is executed, however, each line must be analysed by the processor before the required action can be taken. The principal disadvantage of the system is that the programs can be slow to execute, because the processor spends most of its time determining what each program line means.

A compiler circumvents the problem by analysing each program line once only and then storing a sequence of machine code instructions which are equivalent to the original program. Thus the speed of a machine code program is obtained without losing the convenience of a high-level language. The machine code produced by a compiler can be somewhat tortuous and inflexible and so when efficiency is essential an assembler is used instead.

Robert King of London asks: **I have a program which works well on my friend's Spectrum but always crashes on mine. I suspect a fault in the RAM. Have you a program which checks each RAM location in turn?**

Checking RAM involves setting every bit of every byte, checking that it remains set, and then re-setting every bit and checking that it then remains reset. Setting every bit in a byte is equivalent to POKEing 255 into that byte. Similarly, re-setting every bit is equivalent to POKEing-in 0.

Obviously it is not possible to POKE numbers into every memory location while the machine is running, because the computer will crash, but a partial check can be made by testing every location in the space area of memory.

The program in table two runs such a check. It can be loaded using an assembler or using the simple hexadecimal loader listed in table three. The program checks every location up to the bottom of the stack and returns the address at which it stops — about 32575 in the 16K machines and 65343 in the 48K machine when they are working correctly.

Finally, I must apologise for an error in the Kaleidoscope program which appeared in the June issue. Line 100 should read:

```
100 POKE S+32+31*1+32*J,K
```

My thanks to all those who pointed out the error.

---

### Table 2. A Spectrum machine code program to test each memory location between the beginning of the spare space—marked by the STKEND system variable—and the bottom of the stack.

<table>
<thead>
<tr>
<th>Hex code</th>
<th>Assembler code</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A 65 5C</td>
<td>LD H.L, (23553)</td>
<td>Set HL to address of spare space</td>
</tr>
<tr>
<td>44</td>
<td>LD B,H</td>
<td>Copy HL to BC</td>
</tr>
<tr>
<td>4D</td>
<td>LD C,L</td>
<td>Set A to O</td>
</tr>
<tr>
<td>3E 00</td>
<td>LD A,O</td>
<td>Copy A to memory</td>
</tr>
<tr>
<td>71</td>
<td>LD (H.L), A</td>
<td>Copy memory back to A</td>
</tr>
<tr>
<td>7E</td>
<td>LD A, (HL)</td>
<td>Compare result</td>
</tr>
<tr>
<td>FE 00</td>
<td>CP 0</td>
<td>Return if error</td>
</tr>
<tr>
<td>CO</td>
<td>RET NZ</td>
<td>Set A to 255</td>
</tr>
<tr>
<td>3E FF</td>
<td>LD A, 255</td>
<td>Copy A to memory</td>
</tr>
<tr>
<td>71</td>
<td>LD (H.L), A</td>
<td>Copy memory back to A</td>
</tr>
<tr>
<td>7E</td>
<td>LD A, (HL)</td>
<td>Compare result</td>
</tr>
<tr>
<td>FE FF</td>
<td>CP 255</td>
<td>Return if error</td>
</tr>
<tr>
<td>CO</td>
<td>RET NZ</td>
<td>Clear carry flag</td>
</tr>
<tr>
<td>A7</td>
<td>AND A</td>
<td>Increment HL</td>
</tr>
<tr>
<td>23</td>
<td>INC HL</td>
<td>Subtract stack pointer from HL</td>
</tr>
<tr>
<td>ED 72</td>
<td>SBC H.L, SP</td>
<td>Return if finished</td>
</tr>
<tr>
<td>C8</td>
<td>RET Z</td>
<td>Clear carry flag</td>
</tr>
<tr>
<td>A7</td>
<td>AND A</td>
<td>Add stack pointer to HL</td>
</tr>
<tr>
<td>ED 7A</td>
<td>ADC H.L, SP</td>
<td>Increment BC</td>
</tr>
<tr>
<td>C5</td>
<td>INC BC</td>
<td>Repeat for next memory location</td>
</tr>
<tr>
<td>18 67</td>
<td>JR - 25</td>
<td></td>
</tr>
</tbody>
</table>
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Following his last article about The Hobbit, Quentin Heath has received many pleas for help. He makes his last visit to Middle Earth.

**Goblins' Dungeon has claimed its last victim**

The Hobbit has proved to be one of the most popular adventure games for the 48K Spectrum. It has been elevated to cult status by many readers of Mind Games who continually find themselves stuck in the Goblins' Dungeon or facing the Dragon without an arrow.

This month I am closing the file on The Hobbit by revealing some hints and tips which have never been published. I warn you to read on only if you want to know the secrets of Hobbit.

The questions in my postbag centre mainly on the Goblins' Dungeon. We have reproduced part of a map prepared by a reader to show the structure of the dungeon to give you the answer to the problem, to which many readers have written to contribute their ideas.

The way out of the dungeon is simple. Ask Thorin to open the window. Then ask him to pick you up and carry you through the window. You will then find yourself in one of the many corridors of the Goblins' domain.

---

**THE GOBLINS LAIR**

---

continued on page 110
Some people have not tried to cross the river and doubled back to the forest gate. There is a boat hidden on the other side of the river and all you have to do is to throw the rope across, pull the boat through the water and climb into it.

You will then find yourself on the east bank and about to face those deadly spiders looking for a quick snack.

When you arrive at the first spiders' web you must break it with your hand. If you try to pierce it with your sword you will find yourself in trouble. Once you have broken the web you will be in the domain of the spiders. You can go east or north from there but if you want to survive you should take the latter option. If you go east you will finish in the deep bog.

The Elven King's Cellar is also a cause of difficulties. Some people find it difficult to get into the barrels to float in the river beneath the trap-door. It is best to have the ring in this situation. Wear it when the butler enters and eventually he will empty one of the barrels and leave off the lid. Get into the barrel and wait for the butler to push it into the river. You are then on your way to Lake Town and a battle with the dragon, Smaug.

The scoring system in the game seems to be erratic and many people who have finished the adventure have complained that they have not scored 100 percent. That is not a fault of the program. Readers who have not scored 100 percent have not been to all the places and done all the things they should have done.

I would like to hear from anyone who has managed to score 100 percent as I am still trying to reach that magic number. I would, however, like to stress that I cannot deal personally with more letters on The Hobbit. I have given you sufficient information to get out of most difficulties.

Next month I shall deal with two graphics adventures. The first is a new game called Halls of Things and the other is Black Crystal, brought to you by popular demand. If you have any hints or problems with Black Crystal I would like to hear from you.

The map of The Hobbit was supplied by Stephen Hawkes whose 80 percent is one of the highest recorded.

---

*If you have any views on mind games or if you have hints and tips on adventure, computer-modulated games or chess, please write to me: Quintin Heath, Mind Games, 30 Sinclair User, ECG Publications, 30-31 Islington Green, London N1 8BY.*
To get to Elven King's hall take off ring

To the waterfall (Wood elf)

The running river

The empty place

The side door

Smooth, straight passage

The lonely mountain

The tower halls (Dragon and treasure)

Tell bard to shoot dragon

The dragon's desolation

Running river

Lake Town (Bard takes bow and arrow)

Long lake

Dale Valley

The front gate

Ravenhill

Foot down forest river in barrel

Foot down forest river

Down

Down

Up

Up

Enter for 

Elven King's hall (Bath)

The top to

The trap door

N.

The waterfall (Wood elf)

The running river

A dark dungeon

The lonely mountain

The running river

The front gate

Dale Valley

The dragon's desolation

Running river

Lake Town (Bard takes bow and arrow)

Long lake

Tell bard to go to dragon, then follow him

To get to Elven King's hall take off ring

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