A Database Publication

Computing with the AMSTRAD

No. 12
December 1985
£1

The independent magazine for Amstrad computer users

It's all over now, Baby Blue!

Word processing for all: we evaluate the PCW8256

Four light pens reviewed

A fast-moving Christmas game for you to key in

14 extra graphics commands to upgrade your CPC464

How to play clever tricks with your screen display

Christmas capers in a fast, festive frolic

Join the electronic mail revolution: exclusive offer for linking your Amstrad to the telephone

ESP

THE PEN THAT LIKES TO SAY YES

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FEATURES/ FUNCTIONS	ESP	dk'tronics	Any Other
SINGLE COMPLETE ON SCREEN MENU	YES	NO	
DRAG SCREEN OBJECTS	YES	NO	
FLIP SCREEN OBJECTS	YES	NO	
CURSOR REMOVAL	YES	NO	
ELASTIC BOXES	YES	YES	
ELASTIC LINE	YES	YES	
ELASTIC TRIANGLE	YES	NO	
ELASTIC ELLIPSE	YES	NO	
ELASTIC DIAMOND	YES	NO	
ELASTIC POLYGON	YES	NO	
ELASTIC HEXAGON	YES	NO	
ELASTIC OCTAGON	YES	NO	
ELASTIC CUBE	YES	NO	
ELASTIC PYRAMID	YES	NO	
CIRCLES	YES	YES	
SOLID CIRCLES	YES	NO	
SOLID BOXES	YES	NO	
SOLID ELLIPSES	YES	NO	
WEDGES	YES	NO	
BEZIER SIMULATIONS	YES	NO	
ZOOM EDIT	YES	YES	
REVERSE/MIRROR IMAGES	YES	NO	
REFERENCE BACKGROUND	YES	NO	
GRID BACKGROUND	YES	NO	
X,Y DISPLAY OPTION	YES	NO	
PAINT FILL	YES	YES	
COLOUR WASHING	YES	NO	
RESIDENT SCREEN DUMP	YES	NO	
3D EDGE PLOTTING	YES	NO	
TEXT	YES	YES	
9 BRUSH SIZES	YES	NO	
18 SPRAY NOZZLES	YES	NO	
4 BASIC TEXTURES	YES	NO	
TEXTURE VARIATION	YES	NO	
XOR TEXTURE SHADING	YES	NO	
RESIDENT SYMBOL/SHAPE FILE	YES	NO	
RESIDENT FLECK PRINT FILE	YES	NO	
26 PAPER COLOURS	YES	NO	
15 COLOUR/TONE PALETTE	YES	NO	
POINT SETTING	YES	YES	
FIXED POINT RAYS	YES	NO	
MIRROR DRAWING	YES	NO	
HOME FUNCTION	YES	NO	
KEY CONTROL NUDGE	YES	YES	
JOYSTICK NUDGE	YES	NO	
AVAILABLE FOR 464	YES	YES	
AVAILABLE FOR 664	YES	?	
MODE 1 & 2 AVAILABLE	YES	?	

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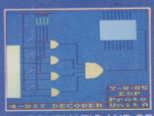

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Amend Account Details

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Essential Features of the System Include:

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CASHCALC

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SALES LEDGER

The programs are designed for use with or without VAT.
A printer is essential.

SALES LEDGER	SALES REPORTS
Invoices	Statements
Cash receipts	Ledger control account
Credit notes	Day book listing
Journals	Name and address file
Entry corrections	Aged debtor analysis
New customers	Customer credit limit file
	Customer details

PURCHASE LEDGER

The programs are designed for use with or without VAT.
A printer is essential.

PURCHASE LEDGER	PURCHASE REPORTS
Cash payments	Remittance advices
Invoices	Ledger control account
Credit notes	Day book listing
Journals	Name and address file
Entry corrections	Aged creditor analysis
New suppliers	Supplier credit limit file
	Supplier details

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SALES LEDGER

STOCK CONTROL

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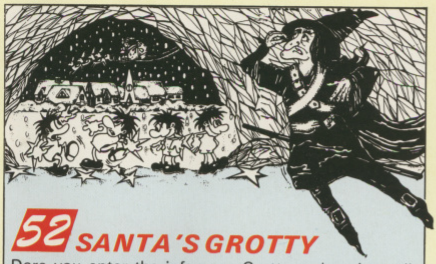

Now YOU can fly with the legendary Red Arrows – in the most challenging flight simulation ever!

It's the most exciting flight simulator ever written for a home computer – the product of many months of dedicated work by some of Britain's top programmers, enthusiastically aided by the talents of aircraft designers, engineers, mathematicians – and the Red Arrow pilots themselves.

Every ounce of power contained in the micro, and its enhanced sound and graphics capabilities, is used to give the utmost realism to re-creating the most spectacular aeronautical displays ever seen in the skies of Britain.

You start by practising take offs and landings. Then, once you have won your wings, you fly in formation as part of the Red Arrows team. There's no margin for error as you fly a mere six to 10 feet from each other – at speeds of between 300 and 350 miles an hour!

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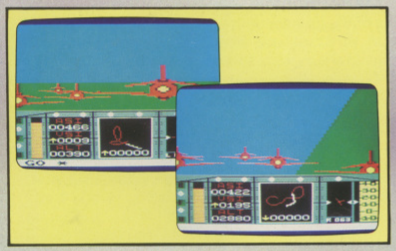
On the panel in front of you are all the instruments you need – plus a screen giving you an external view of the complete formation you are flying. Slip out of line for a second and the eagle-eyed Red Leader will be on the radio ordering you back into position.

The program comes with a detailed flight handbook that will soon give you the confidence to take YOUR place alongside the ace pilots of the Red Arrows, even if you've never flown before!



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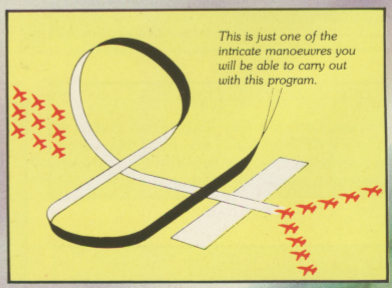

This is just one of the intricate manoeuvres you will be able to carry out with this program.

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– Amstrad User

Our first show was an outstanding success . . .

AMSTRAD COMPUTER SHOW

Organised by Database Publications

Champagne Suite, Novotel, Hammersmith, London W6
Saturday and Sunday, January 11 and 12

This time we've got many more surprises in store for you – and lots more room to wander around!

★ Amstrad goes striding into 1986 as the most innovative and profitable computer company in Britain. Come and see for yourself the ever-growing range of products that puts it head and shoulders above the rest.

★ So many people turned up for the first-ever Amstrad Show in October that entry had to be restricted and lengthy queues formed outside. Not this time! We've almost doubled the floor area – so you'll be able to move around with ease.

★ Every stand was taken at the October show, and many potential exhibitors had to be turned away. This time they've booked well in advance! Well over a hundred exhibitors will be there – with just about every piece of hardware and software that has yet been produced for the Amstrad range.

★ And that means lots more products – and lots more bargains! One of the features of the October show was the way exhibitors entered into the spirit of excitement that pervaded the show and slashed their prices. This time many thousand more visitors will be going home with some really worthwhile bargains!

★ One thing you'll get for nothing – and lots of it – is advice! Waiting to talk to you, and answer any problems you may have about Amstrad computing, are some of Britain's top Amstrad experts. They'll all be there!

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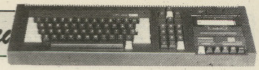


"Serious home computing and personal office use is here to stay" – Alan Sugar at an annual report press conference

Why Sugar succeeds as others fail

AMSTRAD'S continuing success story in the troubled UK micro marketplace is due to the company not pandering to "Boffins' ego trips", according to chairman Alan Sugar.

The chief executive insists in the company's annual report that this is the reason Amstrad has gone from strength to strength where other household names have failed.

"We produce what the mass market customer wants", he informed shareholders, hammering home the message that all the company's products reflect tried and tested technology.

"One of our talents is to engineer products with all the specifications and facilities the market demands and delete those that are only enjoyed by the minority".

Alan Sugar went on to pinpoint a number of other company strengths which is ensuring Amstrad remains ahead of the pack:

- The ability to identify market trends.
- A philosophy of outstripping the competition on price, specification and quality.
- An engineering team which can understand the commercial as well as the technical side of innovation.
- The ability to procure component parts, and being able to understand and read the semiconductor market.
- A degree of flexibility concerning where company products should be made.
- An understanding of the seasonal nature of the business.
- Having the right inventory at the right time.

Nor does the Amstrad chairman go along with the view that the micro market in the UK is in decline.

"I must firmly disagree with these reports", he says. "It is true that certain types of low cost computers have seen their peak, but serious home computing and personal office use is here to stay".

ON-LINE AMSTRAD DATABASE LAUNCHED

RIVAL news services on the Prestel national computer network, Micronet and Viewfax, have teamed up to launch an on-line database for Amstrad users – with a little help from *Computing with the Amstrad*.

Launched at the Amstrad Computer Show, it provides not only news but hints and tips, hardware and software reviews and a wide range of free and discounted telesoftware.

And the first two programs to be offered – Robot Ron and Missile Command – had originally been written for *Computing with the Amstrad* by A Team member Roland Waddilove.

It has been Amstrad's success in the micro marketplace which prompted the setting up of the new database.

Problems

"Despite the recent problems for companies such as Acorn and Sinclair, the new Amstrad micros are proving to be highly successful", said Lindsay Reid, managing director of Viewfax. "So there are now sufficient users to warrant the new database".

The new service is accessed from your Amstrad via the telephone. You also need a modem, RS423 interface, ROM expansion card and special ROM software.

A complete package containing all you need can now be obtained from *Computing with the Amstrad*. See Page 87.

The big attraction

WILDING, one of Britain's largest office equipment distributors and dealers, is selling the new PCW 8256 from Amstrad.

Terry Wilding, managing director of the fast-growing £20 million company says: "The PCW 8256 was given a sneak preview at our new branch in Baker Street, Central London shortly after its launch and we sold eight of them within four days.

"This illustrates the interest and likely demand for this incredibly cost-effective system".

MICROS BOOST PROFITS TO £20 MILLION

AMSTRAD has hit the jackpot in the micro marketplace with computer product sales boosting company profits to more than £20 million.

The group's latest annual report reveals that computers, peripherals and software now account for 67 per cent of the turnover of £136 million.

These figures show a dramatic increase over the previous 12 months, where they amounted to only four per cent on sales of £84 million.

The latest results to be made public were described as nothing short of sensational by one leading London stockbroker.

"You only have to compare them to what has been happening with Acorn, Sinclair and Commodore during the same period", he told *Computing with the Amstrad*.

Amstrad's success in the home market has been somewhat overshadowed by its worldwide breakthrough, with international sales amounting to £73 million.

Most of this came from computers and associated products, whereas the previous year's overseas sales of £13 million were almost exclusively non-micro.

According to chairman Alan Sugar: "We have now built up a world distribution of computer products and paved the way for a ready made market in this sector.

"This gives us a massive customer base and leaves us far less dependent on the UK market".

Amstrad is known to be pinning high hopes on sales of the new PCW8256 abroad. With this in mind the machine is now on sale in most important overseas markets and production has been ramped up to 40,000 a month.

"I am confident that this machine alone will have tremendous impact on profits in our new financial year", says Alan Sugar.

Amstrad leads in France

AMSTRAD is now number one in France. The company has just revealed that it recently became the micro market leader on the other side of the Channel.

Such has been its success there that it now employs 29 people engaged in sales, marketing and administration from new offices in Paris.

Under the leadership of Marion Vannier, the local chief executive for Amstrad, the company has built up a network of dealers across the country.

"This market is behind that of the UK and USA and is just starting its boom years", says Amstrad chairman Alan Sugar.

"Obviously armed with the experience of the UK and the history of the events in the US market, we are poised to read the market trends and react accordingly".

Other major Amstrad markets in Germany, Spain, Italy, Scandinavia and Australasia are all being serviced by Amstrad International (H.K.).

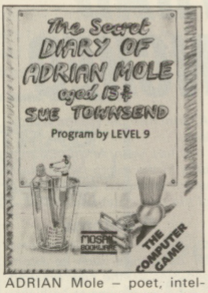
This organisation has recently set up a new factory in Hong Kong to produce peripheral items that complement computer products.

The first of these will be a new dot matrix printer.

Colour copier

A COLOUR printer screen copier for the Amstrad range has been released by Greysoft. Claimed to be the first program of its kind, it is designed for the Seikosha GP 700A colour printer.

The program costs £13.80 on cassette and £18.80 on disc.



ADRIAN Mole – poet, intellectual and secret diarist – has conquered a new creative medium by becoming the subject of a computer game for the CPC range from Level 9.

Based on Sue Townsend's books, "The Secret Diary of Adrian Mole Aged 13¾" and "The Growing Pains of Adrian Mole", the game enables players to become Adrian Mole and discover how they would cope with the problems that beset him over a year of his life.

It is available on cassette only, price £9.95.

More new products ready for launch

THE January Amstrad Computer Show has been selected by DK'Tronics as the launching pad for a range of expansion and upgrade peripherals for the 6128.

It will include 64k and 256k memory expansion upgrades, a 256k silicon disc and a high resolution ROM, light pen and enhanced software.

These follow on from the company's launch of a similar range for the 464 at October's show.

Neil Rawlinson, DK'Tronics marketing director, said the launches signalled a change of allegiance – the company having made its name producing peripherals and upgrades for the Spectrum and Commodore.

He outlined the reasons for the change. Amstrad was a more serious market proposition than Sinclair and Commodore – both essentially computer companies with corporate problems and aging products.

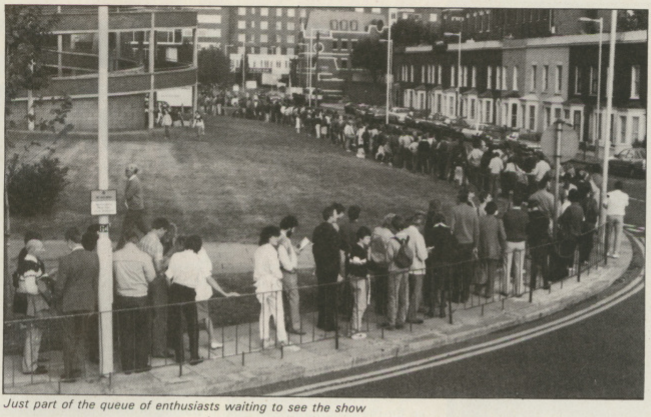
"In the 6128 Amstrad has the computer of the moment", he said.

Rawlinson also noted the absence of the usual hordes of teenagers at the Amstrad Computer Show in October.

He believes this reflects a continuing trend in the UK towards a more serious market.

"You can already notice it – in changes in computer use away from the games and towards serious applications and the production of more profound software", he said. "The market is definitely becoming more professional.

"I cannot wait to see if this trend will continue and will be checking on its progress at the January Amstrad show.



Just part of the queue of enthusiasts waiting to see the show

Amstrad show was a winner

SO successful was the first ever Amstrad Computer Show, organised by *Computing with the Amstrad* publishers Database Publications, that arrangements for a follow-up exhibition in January had begun before the cheering died down.

The doors had to be closed several times to control the flow as more than 10,000 people poured into London's Novotel Exhibition Centre on October 5 and 6.

They packed the aisles around the stands occupied by 72 leading Amstrad hardware and software suppliers, many of whom were launching exciting new products.

"Packed!" was Micronet reporter David Janda's concise summation of the scene which confronted him on the morning of day one. "This reporter has never attended a show so crowded".

"A highly successful event... the show exceeded the wildest speculation, with a queue forming all the way down to the Hammersmith flyover", reported the Viewfax observer.

"Exhibitors we spoke to were clearly delighted with attendances", reported Janda.

"Lots of people were buying printers, interfaces, disc drives, ROM boards, RAM extensions, software, printer paper, light pens and all manner of other goodies", said Viewfax.

"As for the punters . . . well, all the folk we talked to displayed the frantic, glassy-eyed enthusiasm of true absorbtion – and this reporter felt it to be the best show he's ever attended", Janda enthused.

Previewed

The visitors' excitement was fuelled by the fact that more than 30 new products were launched or previewed at the show, including the £29.95 Prestel link modem from Cirkit, Viewfax's Amsnet database, the Picturesque machine code monitor and disassembler, Hi Soft's C Plus Plus, Pocket Wordstar from David Ruben, several printers and dozens of new utilities, business programs and games.

Now it's going to happen all over again. At the same place – the Novotel, Hammersmith – on Saturday and Sunday, January 11 and 12.

But this time there will be more elbow room – Database Publications has arranged with the Novotel to increase the amount of floor space by 50 per cent.

Said the head of Database Publications, Derek Meakin: "The outstanding success of this first-ever Amstrad show has proved without any doubt the pre-eminent role Amstrad now plays in the computer marketplace.

"The show has done much more than convince many thousands of users that Amstrad is here to stay – it has also won over many third-party suppliers who have been toying with the idea of moving into the Amstrad market.

"What they saw at the Novotel in October opened their eyes. One very positive – and immediate – result is that many new hardware and software products for the entire Amstrad range are now in production.

"A good proportion of them should be ready in time for the January show. It's going to be a very exciting occasion".

What the trade thought..

THE first Amstrad Computer Show won rave reviews from both the media and the general public alike.

But it was those people at the sharp end of the action – the exhibitors – who were loudest in their praise for the event.

Here is what a cross section told *Computing with the Amstrad:*

Paul Donnelly, The Amstrad Centre: *"It was one of the most exciting shows we've been to, and believe me we've been to them all. The organisation was superb".*

Ann Lovejoy, Bubble Bus Software: *"We were delighted with the show. It was so successful that we had people literally fighting over the joysticks on our games".*

Brian Simpson, GB Standard: *"Absolutely fantastic, an absolute success".*

Bryan McAlley, Amstradraw: *"Fantastic. The best computer show that we have ever exhibited at – and we've been to them all".*

Tom Maxfield, Sagesoft: *"We were overwhelmed by the response and caught, as they say with our pants down".*

Jon Day, Kuma Computers: *"We were really impressed with the show and will definitely go to the next one".*

Ian Park, Vulcan Electronics: *"It was very well organised and we look forward to going to the next show. We did very well".*

Eric Gaskell, E.G. Computer Graphics: *"It was packed out, the response was overwhelming. We had printed 600 leaflets and they had gone in two hours – we could have done with 3,000".*

David Link, Hisoft: *"Excellent. A wonderful show. It was well worth it and gave us a tremendous opportunity to demonstrate our products to an interested audience".*

Lindsay Reid, Viewfax: *"Excellent. It reminded us of the old days when micros first appeared on the scene. There was a lot of excitement".*

Activist UK boss Hugh Rees-Parnall (left) takes on Barry McGuigan

Sports stars jumping on bandwagon

BRITISH sports celebrities have been eagerly limbering up to jump aboard the fast moving Amstrad bandwagon.

Several big names have already signed contracts with leading software houses to endorse simulation products. And many more are queueing up for the opportunity.

"It's no wonder they are all eager to get in on the act", said one programmer. "After all, this is certainly one way to make big money without even breaking into a sweat".

First off the mark was the controversial Irish snooker player Hurricane Higgins. He proved to be right on cue with Hurricane Higgins World Snooker and Hurricane Higgins World Pool – both from Amsoft.

Hardly had Amstrad users managed to pot the black when along came Glen Hoddle Soccer, courtesy of the England and Spurs star – and, once again, Amsoft.

Now the news is out that waiting in his corner to deliver the knock out punch on the Amstrad games front is the new world featherweight boxing champion, Barry McGuigan.

Flushed with success after putting challenger Bernard Taylor in his place, McGuigan was quick to accept a somewhat easier purse from Activision.

Barry McGuigan World Championship Boxing is due to be released for the Amstrad any day now.

And for anyone who fancies his chances at fisticuffs, here is the opportunity to take a crack at the title without risking a bruise.

"The Activision computer game gives everyone the chance to fight me, but only after beating 19 other opponents", Barry told *Computing with the Amstrad*. "And they're no walkover. Believe me, I've tried them".

The Hurricane Higgins and Glen Hoddle games are available on disc or cassette at £12.95 and £9.95 respectively.

Barry McGuigan's game will be released on cassette only at £9.99.

Tottenham Hotspur star Glen Hoddle demonstrates soccer on the Amstrad

Leisure range

FIVE new leisure packages for the Amstrad CPC range have been released by Melbourne House.

Gyroscope, costing £8.95, requires the player to guide a spinning gyroscope over an undulating landscape.

Wham – The Jukebox, at £12.95, has two channel sound which allows the user to compose tunes. It includes six songs by pop stars Wham.

Mugsy's Revenge is a follow-up to the 1984 hit Mugsy and is strong on graphics and animated screens. Price: £8.95.

Lord of the Rings Part I is the sequel to The Hobbit and incorporates two cassettes, the paperback version of "The Fellowship of the Rings" and a 32 page instruction booklet. Price: £15.95.

Big Daddy's Rock 'n' Wrestle, price £9.95, is by the same team that devised The Way of the Exploding Fist.

Also getting in on the act . . . Hurricane Higgins

FRANKIE GETS CONVERTED

THE software package from Ocean featuring pop superstars Frankie Goes to Hollywood has been converted for the Amstrad and is launched on December 1.

The game, which has been topping the charts recently in its Spectrum and Commodore versions, is a one-of-a-kind program because it comes with a free audio cassette containing a previously un-released recording of the pop blockbuster "Relax".

It is a joint publishing venture of the band, their recording company, Island Records, creative producers ZTT and Ocean Software.

Ocean director David Ward told *Computing with the Amstrad:* "We call it Datatune and it is a totally new idea.

"Players load the game from the program cassette and then insert the audio cassette.

"A voice-over describes how to play the game on side one, and on the flip side players can hear some inspirational music in the form of the band's greatest hit recording".

Frankie Goes to Hollywood costs £9.95.

GAMES PACK

THE autumn/winter compilation pack Computerhits 10 has been released for the Amstrad by Beau-Jolly.

The package offers a variety of adventure and arcade games, sports simulation, strategy and arcade adventures and costs £9.95.

Spitfire 40

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SUPERCHARGE

SUPERPOWER SIDEWAYS ROM CARD (Ref B101)

This unit opens up a whole new field of personal computing, previously only available to owners of the BBC Micro and other top of the range computers.

The SUPERPOWER Sideways Rom Card has the following features:

- Matching case, with easily detachable cover.
- Fits snugly to rear of computer.
- Bus extension for fitting of Disk Interface etc.
- Houses up to 7 Roms. (Foreground, Background & Extension).
- Any mix of 8K or 16K Eproms.
- No additional power supply necessary.

SUPERPOWER ROM BASED SOFTWARE

CURRENTLY AVAILABLE:

Programmer's Toolbox; Disk User's Utilities; Mailing List & Club Membership; Assembler, Disassembler & Machine-code Monitor.

COMING SOON:

Word Processor; Database....SEPTEMBER
Spreadsheet; Graphics/Statistics... OCTOBER

Rom-based Software has the following important advantages:—

1. Written in machine-code, it is very fast in operation.
2. Programs are instantly available from the keyboard.
3. The program code does not use RAM, thus permitting much larger files to reside in memory, reducing the number of disk accesses and saving time when manipulating files.
4. The program itself cannot become corrupted.

SUPERPOWER DISK USER'S UTILITIES (Ref B103)

Program allows detailed inspection and modification of information held on disk and is of particular use for recovering data from corrupted disks. Individual sectors can be read from and written to. All data can be output to the screen and/or printer. Program also contains a number of functions of use to assembly language programmers.

TABULATE DIRECTORY: Displays directory and enters EDIT mode. READ DISK SECTOR: Read sector and enter EDIT mode. LOAD DISK FILE: Load first sector into buffer and remainder to memory for fast access. Enter EDIT mode. LOAD UPPER ROM: Catalogues resident roms, prompts for rom selection and enters EDIT mode. EDIT MEMORY: Displays current buffer. Data displayed is Buffer Address, Hex and ASCII. Comprehensive editing facilities. 'COPY' key gives Intelligent Data Copy. 'TAB' key gives printer output. WRITE: Write sector to disk. DISASSEMBLE: Disassembles code from specified address, giving address, object code, menmonics and ASCII. Screen and/or Printer output. SEARCH MEMORY: Search sector or a complete file for ASCII string or series of Hex codes. UTILITIES: Includes Format, Hex/Decimal conversions, jump calculations etc.

SCREEN UTILITIES: Select from four display modes; choose background and foreground colours.

SUPERPOWER SIDEWAYS ROM CARD (Ref B101)

SUPERPOWER MAILING LIST AND CLUB MEMBERSHIP PROGRAM (Ref B102)	£39.95	SUPERPOWER DISK USER'S UTILITIES ROM (Ref B103)	£39.95
SUPERPOWER PROGRAMMER'S TOOLBOX (Ref B104)	£39.95	SUPERPOWER ASSEMBLER, DISASSEMBLER & MACHINE CODE MONITOR (Ref B105)	£39.95
SUPERPOWER WORD PROCESSOR (Ref B106)	£39.95	SUPERPOWER DATABASE (Ref B107)	

SUPERPOWER MAILING LIST AND CLUB MEMBERSHIP PROGRAM (Ref B102)

Program handles thousands of name and address records (label and non-label fields). Twenty classification indicators make possible sophisticated selective examination, counting and printing of records. Alphabetical order is dealt with on data entry, allowing user to select 'key' word. Works with single and double disks as well as cassette.

Main Commands ... ENTER: Data entry(*) GET: Load new file. COUNT: Selective Count. FIND: Find 'Name' or any String(*). LIST: List current file on screen (*). PRINT: Print label data or whole records selectively. MERGE: Merge and Sort files. SAVE: Write a file to disk or cassette. RESET: Reset colours, label sizes, class definitions, string constants etc. (*Editing facilities available).

SUPERPOWER ASSEMBLER, DISASSEMBLER & MACHINE-CODE MONITOR (Ref B105)

This suite of routines represents the complete Development Package for the Amstrad Z80 programmer. The assembler has a sophisticated text editor, a comprehensive set of options, is very fast and incorporates special techniques enabling large source files to be handled in memory. The full-feature disassembler produces files which can be edited and then re-assembled. The Machine-code Monitor routines are extremely powerful, including the setting of conditional breakpoints (including loop counter option), single-step execution, alternative five column binary and mnemonic formats. Both sets of Z80 registers can be displayed. Other options include Intelligent Move, Modification of code to run at a new address and colour selection of border, paper and pen.

SUPERPOWER PROGRAMMER'S TOOLBOX for the CPC 464 (Ref B104)

ADDITIONAL BASIC

TURTLE: Logo-like turtle graphics. TUNE: Output music string. CIRCLE: Draw a circle. FILL: Fill an area surrounded by foreground colour. GRAPHICS PEN/GRAPHICS PAPER: Set graphics and background colours. COPYCHR: Read a screen charter. ECHO ON/ECHO OFF: Printer output on and off. PAGE ON/PAGEOFF: Paged screen output on and off. CLEAR INPUT:— clear input buffer. (+ extra graphics commands).

PROGRAMMER'S AIDS

EDITOR: Gives 2 additional windows for program editing. FIND (& REPLACE): Find a string and optionally replace. XREF: List references to particular line numbers (GOTO's, GOSUB's etc). COMPACT: Remove REM statements. FRAME: Synchronise screen update with frame fly-back. PRINTER: Epson-compatible or Amstrad printer for dump routines. FDUMP: Fast two-tone screen dump, with user-definition of 'pen' and 'paper'. CDUMP: Shaded screen dump depicting up to 9 colours. PLOAD: Load program saved under 'P' option. INFO: Give details on specified disk file. MEDIT: Comprehensive HEX and ASCII memory editor. LTRON (LTROFF): Send TRACE output to printer. HELP: List commands, functions and their parameters.

ROM-BASED SOFTWARE FULFILS THE PROM

YOUR AMSTRAD.

SUPERPOWER WORD PROCESSOR (Ref B106)

This program incorporates the most useful facilities offered by the best Word Processors currently available on the BBC Micro and other up-market Home Computers.

Text Entry/Editing. User choice of 40 or 80 column mode. Document formatting achieved through use of embedded commands. Text can be formatted and justified on screen, if required. Find <Replace>with 'wild-card' option. Word count, character count and page numbering reported.

Formatting. Multiple rulers are provided, allowing sophisticated layout of documents e.g. different combinations of TAB stops at different points in the text. All the normal controls are available e.g. page lengths & width, margins, indents, tab stops, justification, headers, footers etc., together with output of control characters to the printer.

Virtually UNLIMITED Document Length. The disk routines in the program handle multiple data files representing parts of a total document, with loading and saving carried out automatically.

Simple Calculator. A calculator window can be called to carry out simple arithmetic calculations. It is also possible to embed a calculation in the text, with the result being calculated and printed on output.

Data Exchange. As part of an integrated suite, the program will be able to handle ASCII files originating from the Spreadsheet, Database and Graphics/Statistics Packages.

Disk/External Commands. Direct Access available.

MANY MORE FEATURES. Ask your dealer for information.

SUPERPOWER DATABASE (Ref B107)

This menu-driven program has been designed to be the most comprehensive and flexible Database which can be achieved in 16K of machine code. Of special note are the PROCEDURES which have been implemented, enabling the more advanced user to write simple structured programs to manipulate the database information in order to meet his more specialized requirements. Databases need not be limited in size since the program contains routines for multiple file handling.

Field types — alphanumeric, integer, currency, floating point, logic, calculated and date.

MAIN FILE COMMANDS
— Create/Modify database structures, reports and procedures.
— Create ASCII file from a Database, enabling data to be passed to the Word Processor, Spreadsheet and Graphic/Statistics programs.
— Copy data to new Database.

RECORD EDITING
— Add, amend, delete, insert, view and duplicate.
— Search and Sort. Due to intelligent file structure and the indexing system adopted, both SEARCH and SORT are extremely fast.

REPORTS
Standard — selected fields may be output, together with totalling on those nominated. (Value fields only). Screen or printer output.

Labels — user-selected fields for printing. User-defined label size, number on sheet etc.

User-defined — user created report-format, combining entered text and designated fields. Editing and storing facilities.

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HOW TO ORDER

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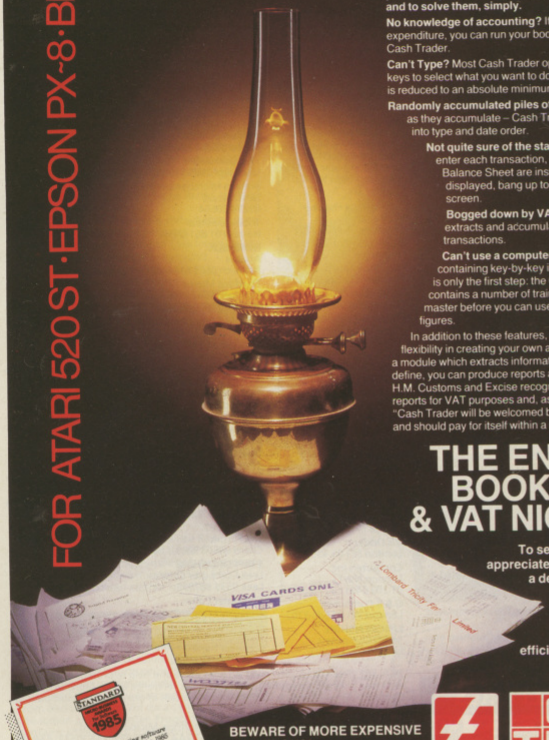

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All by yourself? Then play . . .

SOLITAIRE

BRIAN and MARTIN BOND present an off-the-peg micro version of this traditional game

SOLITAIRE is a computer version of the traditional board game. The object is to remove all the pegs but one from the board. To remove a peg you simply jump another peg over it into an empty space. The jump may be either vertical, horizontal or diagonal.

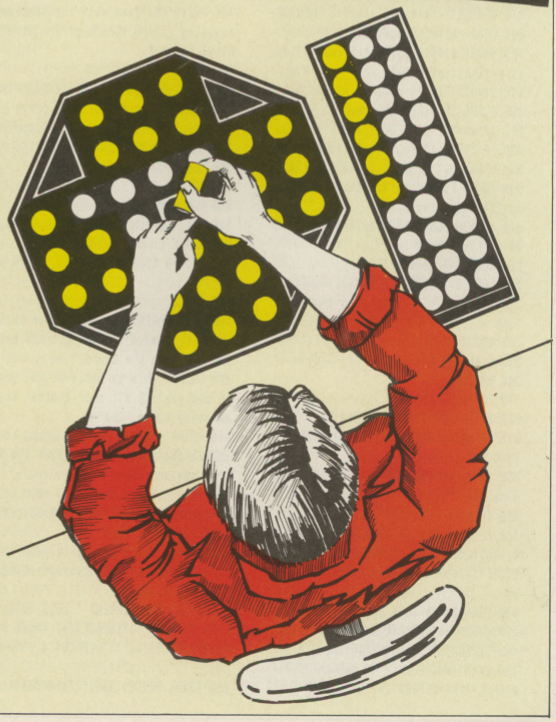
There are two game options. If you select option one the last peg must finish up in the centre hole – this can be rather tricky. The second, easier, option allows you to finish with the final peg in any of the nine centre holes.

To tell the micro the jump you want to take simply move the rectangular sight over the peg you want to move, press Space, then move the sight to the destination hole and press Space once more. You guide the sight using the Z and X keys for left and right, and the right square bracket and back slash keys for up and down.

If you find yourself snookered you can press Q to quit. Full instructions and prompts are given in the program, as well as error checking to eliminate cheating. Not of course that you would cheat. Amstrad owners are above that sort of thing, aren't they?

VARIABLES

k$	Current key pressed.
op%	Option.
vol%	Volume.
tim	Time delay.
col%	Colour.
hole$, peg$	Strings of user defined characters.
f%	True or false move.
peg%	Number of pegs left.
px%,py%	Peg x and y position.
px1%,py1%	Peg position on first Space Bar.
xx1%,yy1%	Cursor position on first Space Bar.
x2%,y2%	Cursor position on second Space Bar.
px2%,py2%	Peg position on second Space Bar.
p%	Peg home or not.
x1%,y1%	Cursor position.
ro%	Row coordinate for peg box.
co%	Column coordinate for peg box.



```
10 REM SOLITAIRE
20 REM BY B & M Bond
30 REM Converted by David Andrews
40 REM (c) Computing With The Amstrad
50 MODE 1
60 GOSUB 540:REM instructions
70 GOSUB 410:REM options
80 a$="Solitaire":x%=27:y%=23:GOSUB 7
00:REM double height
90 GOSUB 810:REM init
100 GOSUB 910:REM layout
110 IF op%=2 THEN GOSUB 1390:REM remo
ve
111 IF op%=1 THEN GOSUB 2330:REM peg
box
120 WHILE peg%<>1 AND k$<>"Q"
130 x1%=160:y1%=192:px%=11:py%=14
140 col%=2:GOSUB 1500:REM cursor
150 GOSUB 1570:REM get key
160 IF k$="Q" THEN GOTO 300
170 IF TEST(x1%+16,y1%-16)<>2 THEN GO
SUB 1980:col%=3:GOSUB 1500:GOTO 130
180 SOUND 1,40,2,vol%:xx1%=x1%:yy1%=y
1%:px1%=px%:py1%=py%
190 k$=""
200 GOSUB 1570:REM get key
210 IF k$="Q" THEN GOTO 300
220 IF TEST(x1%+16,y1%-16)<>0 THEN GO
SUB 1980:col%=3:GOSUB 1500:GOTO 130
230 SOUND 1,40,2,vol%:x2%=x1%:y2%=y1%
:px2%=px%:py2%=py%
240 tim=30:GOSUB 2020:col%=3:GOSUB 15
00
250 GOSUB 2060:REM check
260 LOCATE 1,1:PRINT CHR$(22)+CHR$(0)
270 IF f%=1 THEN f%=0:GOSUB 1980:GOTO
 130
280 GOSUB 2330:REM peg box
290 tim=30:GOSUB 2020
300 WEND
310 PEN 2
320 IF k$="Q" THEN GOTO 360
330 IF op%=1 THEN IF TEST(176,176)=2
THEN 370
340 IF op%=2 THEN GOSUB 2180:REM chec
k holes
350 IF p%=1 THEN 370
360 SOUND 1,800,30,vol%:SOUND 1,900,3
0,vol%:LOCATE 1,1:PRINT"Hard Luck!":L
OCATE 1,2:PRINT"Another (Y/N)":GOTO 3
80
370 FOR p%=140 TO 0 STEP -5:SOUND 1,p
%,2,vol%:NEXT:LOCATE 1,1:PRINT"Well D
one!":LOCATE 1,2:PRINT"Another (Y/N)"
380 k$="":WHILE k$<>"N" AND k$<>"Y":k
$=INKEY$:k$=UPPER$(k$):WEND
390 IF k$="Y" THEN RUN
400 CALL &BC02:MODE 2:PEN 1:END
410 REM **** Game Options ****
420 PEN 2
430 LOCATE 9,2:PRINT"G A M E  O P T I
 O N S"
440 PRINT:PRINT"OPTION (1)";:PEN 3:PR
INT"  The pegs are placed in all":PRI
NT"the holes on the playing area, wit
h the"
450 PRINT"exception of the central ho
le. To win,":PRINT"the last peg must
reside in this hole."
460 PRINT:PRINT:PEN 2:PRINT"OPTION (2
)";:PEN 3:PRINT"  An easier variation
 of the":PRINT"game, can be played by
 removing one of"
470 PRINT"the pegs, from any part of
the playing":PRINT"area. The object t
hen, being to finish"
480 PRINT"the game with the last peg
residing in":PRINT"one of the nine ce
ntral holes."
490 PEN 2
500 PRINT:PRINT:PRINT SPACE$(6)"Pleas
e Select Option Number"
510 op$="":WHILE op$<>"1" AND op$<>"2
":op$=INKEY$:WEND:op%=VAL(op$)
520 CLS
530 RETURN
540 REM **** instructions ****
550 INK 2,24:INK 0,0:INK 1,6:INK 3,20
560 PAPER 0:PEN 2:BORDER 0
570 LOCATE 11,2:PRINT"S O L I T A I R
 E"
580 PEN 3
590 PRINT:PRINT" The object of the ga
me is to reaove":PRINT" all the pegs
but one from the board."
600 PRINT" This is achieved, by jumpi
ng one peg":PRINT" over another into
an empty space. The"
610 PRINT" method used to jump, is to
 place the":PRINT" sight over the des
ired peg and press"
620 PRINT" Space Bar, then move to th
e position":PRINT" you wish to jump t
o, followed by the"
630 PRINT" Space Bar again. Horizonta
l, Vertical":PRINT" or Diagonal moves
 are all valid."
640 PRINT:PEN 1:PRINT " KEYS USED:-";
:PEN 2:PRINT" ]";SPACE$(4);"Move up":
PRINT SPACE$(13)"\";SPACE$(4);"Move d
own"
650 PRINT SPACE$(13);"Z";SPACE$(4);"M
ove Left";PRINT SPACE$(13);"X";SPACE$
(4);"Move Right"
660 PRINT SPACE$(13);"Q";SPACE$(4);"Q
uit Game";PRINT SPACE$(13);"V";SPACE$
(4);"Adjust volume"
670 PRINT SPACE$(9)"SPACE";SPACE$(4);
"Store Position":PRINT:PRINT:PEN 3:PR
INT SPACE$(7)"Press Space Bar To Cont
inue"
680 WHILE w$<>" ":w$=INKEY$:WEND:CLS
690 RETURN
700 REM **** double hieght ****
710 INK 1,0:INK 2,0:INK 3,24:INK 0,0
711 PEN 3
720 PAPER 0:CLS
730 BORDER 0
735 PEN 3:LOCATE 11,12:PRINT"Please W
ait A Moment":PEN 1
740 LOCATE 1,25:PRINT a$:y%=y%*16:x%=
x%*16:xx=LEN(a$)*16
750 FOR q%=0 TO 16 STEP 2
760 FOR w%=0 TO xx STEP 2
770 IF TEST(w%,q%)=1 THEN PLOT w%+x%,
y%+q%+2,2:PLOT w%+x%,y%+2+q%+2
780 NEXT:NEXT
790 LOCATE 1,25:PRINT SPACE$(LEN(a$))
:LOCATE 11,12:PRINT SPACE$(20)
800 INK 1,6:INK 3,2:INK 0,0:INK 2,24
810 REM **** initialise ****
820 vol%=7:peg%=33:co%=2:f%=0:a%=0:p%
=0:col%=2:px%=11:py%=14
830 SYMBOL AFTER 200
840 SYMBOL 200,0,3,15,31,63,63,127,12
7:SYMBOL 201,0,192,240,248,252,252,25
4,254
850 SYMBOL 202,127,127,63,63,31,15,3,
0:SYMBOL 203,254,254,252,252,248,240,
192,0
860 SYMBOL 205,0,0,3,15,31,31,63,63:S
YMBOL 206,0,0,192,240,248,248,252,252

870 SYMBOL 207,63,63,31,31,15,3,0,0:S
YMBOL 208,252,252,248,248,240,192,0,0
880 peg$=CHR$(208)+CHR$(201)+CHR$(10)
+CHR$(8)+CHR$(8)+CHR$(202)+CHR$(203)
890 hole$=CHR$(205)+CHR$(206)+CHR$(10
)+CHR$(8)+CHR$(8)+CHR$(207)+CHR$(208)
900 RETURN
910 REM **** layout ****
920 PEN 3
930 bg=4:s=0
940 FOR p=7 TO 1 STEP -1
950 bb$=STRING$(8+s,CHR$(143))
960 b$=CHR$(214)+bb$+CHR$(215)
970 LOCATE p,bg:PRINT b$
980 bg=bg+1:s=s+2
```

```
990 NEXT
1000 FOR p=11 TO 18
1010 LOCATE 1,p:PRINT STRING$(22,CHR$
(143)):NEXT
1020 bg=19:s=s-2
1030 FOR p=1 TO 7
1040 bb$=STRING$(8+s,CHR$(143))
1050 b$=CHR$(213)+bb$+CHR$(212)
1060 LOCATE p,bg:PRINT b$
1070 bg=bg+1:s=s-2
1080 NEXT:PEN 3
1090 r$=STRING$(6,CHR$(143))
1100 FOR c=4 TO 25:LOCATE 30,c:PRINT
r$:NEXT
1110 PEN 1
1120 MOVE 110,352:DRAW 238,352,1:DRAW
 350,240,1
1130 FOR r=1 TO 27:READ x%,y%
1140 IF x%=-1 THEN READ x%,y%:MOVE x%
,y% ELSE DRAW x%,y%
1150 NEXT
1160 p$="Peg  Box"
1170 PEN 1
1180 FOR p=11 TO 20
1190 LOCATE 28,p:PRINT MID$(p$,p-10,1
)
1200 NEXT
1210 PRINT CHR$(22)+CHR$(1)
1220 PEN 2
1230 FOR y%=11 TO 17 STEP 3
1240 FOR x%=2 TO 20 STEP 3
1250 LOCATE  x%,y%:PRINT peg$
1260 NEXT:NEXT
1270 FOR y=5 TO 23 STEP 3
1280 FOR x=8 TO 14 STEP 3
1290 LOCATE x,y:PRINT peg$
1300 NEXT:NEXT
1310 FOR y=4 TO 24 STEP 2
1320 FOR x=30 TO 34 STEP 2
1330 PEN 2:LOCATE x,y:PRINT peg$
1340 PEN 0:LOCATE x,y:PRINT hole$
1350 NEXT:NEXT
1360 IF op%=1 THEN PEN 0:LOCATE px%,p
y%:PRINT hole$
1370 PEN 2
1380 RETURN
1390 REM **** remove ****
1400 PEN 2:a%=1
1410 LOCATE 1,1:PEN 2:PRINT"Place Cur
sor"
1420 x1%=160:y1%=192:px%=11:py%=14:co
l%=2:GOSUB 1500:REM cursor
1430 WHILE k$()" ":GOSUB 1570:WEND:RE
M get key
1440 SOUND 1,12,2,vol%:col%=3:GOSUB 1
500:a%=0:REM cursor
1450 LOCATE 1,1:PRINT CHR$(22)+CHR$(1
)
1460 PEN 0:LOCATE px%,py%:PRINT hole$

1470 LOCATE 1,1:PRINT CHR$(22)+CHR$(0
)
1480 LOCATE 1,1:PEN 0:PRINT"Place Cur
sor"
1481 GOSUB 2330:REM peg box
1490 RETURN
1500 REM **** cursor ****
1510 PEN col%:MOVE x1%,y1%
1520 MOVE x1%,y1%-8:DRAW x1%,y1%,col%
:DRAW x1%+8,y1%,col%
1530 MOVE x1%+22,y1%:DRAW x1%+30,y1%,
col%:DRAW x1%+30,y1%-8
1540 MOVE x1%+30,y1%-26:DRAW x1%+30,y
1%-34:DRAW x1%+22,y1%-34
1550 MOVE x1%,y1%-26:DRAW x1%,y1%-34:
DRAW x1%+8,y1%-34
1560 RETURN
1570 REM **** get key ****
1580 k$=""
1590 WHILE k$()" " AND  k$()"Q"
1600 WHILE INKEY$()"":WEND
1610 k$="":WHILE k$="":k$=INKEY$:WEND
1620 k$=UPPER$(k$)
1630 col%=3:GOSUB 1500:REM cursor
1640 IF k$="]" AND TEST(x1%+16,y1%+26
)<>3 THEN y1%=y1%+48:py%=py%-3
1650 IF k$="\" AND TEST(x1%+16,y1%-60
)<>3 THEN y1%=y1%-48:py%=py%+3
1660 IF k$="I" AND TEST(x1%-30,y1%-16
)<>3 THEN x1%=x1%-48:px%=px%-3
1670 IF k$="X" AND TEST(x1%+60,y1%-16
)<>3 THEN x1%=x1%+48:px%=px%+3
1680 IF k$=" " THEN GOTO 1740
1690 IF k$="V" AND a%=0 THEN GOSUB 17
70:REM volume
1700 IF k$="Q" AND a%=0 THEN GOTO 175
0
1710 IF x1%<16 THEN x1%=16:px%=2  ELS
E IF x1%>304 THEN x1%=304:px%=20
1720 IF y1%<48 THEN y1%=48:py%=23 ELS
E IF y1%>336 THEN y1%=336:py%=5
1730 SOUND 1,12,2,vol%
1740 col%=2:GOSUB 1500:REM cursor
1750 WEND
1760 RETURN
1770 REM **** volume ***
1780 LOCATE 1,1:PRINT CHR$(22)+CHR$(0
)
1790 SOUND 1,12,2,vol%
1800 PEN 2
1810 LOCATE 1,1:PRINT"Volume :"
1820 LOCATE 13,1:PEN 2:PRINT CHR$(240
);"Up ";CHR$(241);"Down"
1830 LOCATE 1,2:PRINT"Press V to Resu
me Play"
1840 k$=""
1850 WHILE k$()"V"
1860 PEN 1:LOCATE 9,1:PRINT vol%;" "
1870 WHILE INKEY$()"":WEND
1880 k$="":WHILE k$="":k$=INKEY$:WEND
:k$=UPPER$(k$)
1890 IF ASC(k$)=240 THEN vol%=vol%+1
1900 IF ASC(k$)=241 THEN vol%=vol%-1
1910 IF k$="V" THEN 1950
1920 IF vol%<0 THEN vol%=0 ELSE IF vo
l%>7 THEN vol%=7
1930 LOCATE 9,1:PRINT vol%;" "
1940 SOUND 1,12,2,vol%
1950 WEND
1960 LOCATE 1,1:PRINT SPACE$(22):LOCA
TE 1,2:PRINT SPACE$(23)
1970 RETURN
1980 REM **** false ****
1990 PEN 2:SOUND 1,700,10,vol%:LOCATE
 1,1:PRINT"Not allowed":tim=450:GOSUB
 2020
2000 LOCATE 1,1:PEN 0:PRINT"Not allow
ed"
2010 RETURN
2020 REM **** delay ****
2030 t=TIME
2040 WHILE (TIME-t)<tim:WEND
2050 RETURN
2060 REM **** check ****
2070 IF x2%=xx1%+96 AND y2%=yy1% AND
TEST(xx1%+64,yy1%-16)=2 THEN GOSUB 22
40:LOCATE px%-3,py%:PRINT hole$:RETUR
N
2080 IF x2%=xx1%-96 AND y2%=yy1% AND
TEST(xx1%-32,yy1%-16)=2 THEN GOSUB 22
40:LOCATE px%+3,py%:PRINT hole$:RETUR
N
2090 IF x2%=xx1% AND y2%=yy1%+96 AND
TEST(xx1%+16,yy1%+32)=2 THEN GOSUB 22
40:LOCATE px%,py%+3:PRINT hole$:RETUR
N
2100 IF x2%=xx1% AND y2%=yy1%-96 AND
TEST(xx1%+16,yy1%-64)=2 THEN GOSUB 22
40:LOCATE px%,py%-3:PRINT hole$:RETUR
N
2110 IF x2%=xx1%+96 AND y2%=yy1%+96 A
ND TEST(xx1%+64,yy1%+32)=2 THEN GOSUB
 2240:LOCATE px%-3,py%+3:PRINT hole$:
RETURN
2120 IF x2%=xx1%-96 AND y2%=yy1%+96 A
ND TEST(xx1%-32,yy1%+32)=2 THEN GOSUB
 2240:LOCATE px%+3,py%+3:PRINT hole$:
RETURN
```

```
2130 IF x2%=xx1%+96 AND y2%=yy1%-96 A
ND TEST(xx1%+64,yy1%-64)=2 THEN GOSUB
 2240:LOCATE px%-3,py%-3:PRINT hole$:
RETURN
2140 IF x2%=xx1%-96 AND y2%=yy1%-96 A
ND TEST(xx1%-32,yy1%-64)=2 THEN GOSUB
 2240:LOCATE px%+3,py%-3:PRINT hole$:
RETURN
2150 f%=1
2160 LOCATE 1,1:PRINT CHR$(22);CHR$(0
);
2170 RETURN
2180 REM **** Check Holes ****
2185 p%=0
2190 FOR x%=8+16 TO 14+16 STEP 3+16
2200 FOR y%=8+16 TO 14+16 STEP 3+16
2210 IF TEST(x%,y%)=2 THEN p%=1
2220 NEXT:NEXT
2230 RETURN
2240 REM **** jump ****
2250 LOCATE 1,1:PRINT CHR$(22)+CHR$(1
)
2260 tim=60:GOSUB 2020:SOUND 1,80,2,v
ol%
2270 PEN 0:LOCATE px1%,py1%:PRINT hol
e$
2280 tim=60:GOSUB 2020:SOUND 1,80,2,v
ol%
2290 PEN 2:LOCATE px2%,py2%:PRINT peg
$
2300 tim=60:GOSUB 2020:SOUND 1,80,2,v
ol%
2310 PEN 0
2320 RETURN
2330 REM **** Peg Box ****
2340 peg%=peg%-1
2350 IF peg%<33 AND peg%>21 THEN ro%=
30
2360 IF peg%<22 AND peg%>10 THEN ro%=
32
2370 IF peg%<11 AND peg%>0 THEN ro%=3
4
2380 co%=co%+2:IF co%>25 THEN co%=4
2390 PEN 2:LOCATE 1,1:PRINT CHR$(22)+
CHR$(1)
2400 LOCATE ro%,co%:PRINT peg$
2410 LOCATE 1,1:PRINT CHR$(22)+CHR$(0
)
2420 RETURN
2430 DATA 350,110,240,0,106,0,0,106,0
,244,108,352,-1,-1,460,352,560,352,56
0,0,460,0,460,352
2440 DATA -1,-1,96,320,32,256,96,256,
96,320,-1,-1,96,96,32,96,96,32,96,96,
-1,-1,256,32,256,96,320,96,256,32,-1,
-1,256,320,256,256,320,256,256,320
```

Give your fingers a rest . . .

All the listings from this month's issue are available on cassette.

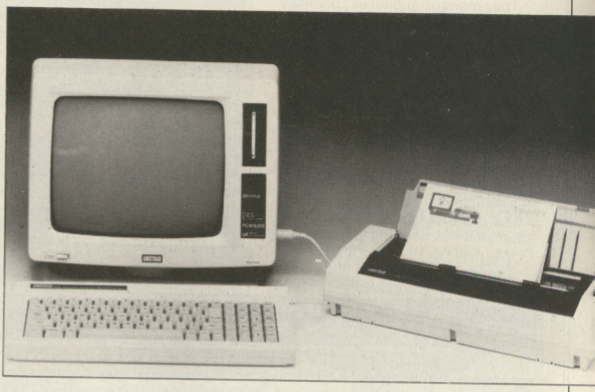
See our special offer on Page 93.

THERE has long been a demand for a really inexpensive plug-in-and-go word processor doubling as a personal computer, for business, office and serious home use. And Amstrad have come up with the goods in spectacular fashion.

At £459 the PCW8256 represents unparalleled value for money. Though it has its faults, about which I don't intend to pull any punches, its appearance at this price is likely to have far-reaching effects on manufacturers of upper bracket machines who may complacently have thought they had the "adult" market to themselves.

The PCW is built to run a powerful but readily usable piece of software called Locoscript, which accesses the hardware directly in the manner of a dedicated word processor. But the machine also comes with CP/M Plus, a wide range of utilities, Basic and Logo.

Most of the applications programs, languages and utilities available on other Amstrad computers are upwardly compatible with the PCW, and software houses are already configuring those that are not.



For the money there's just no competition...

GABRIEL JACOBS puts Amstrad's latest offering through a rigorous evaluation

THE entry-level package consists of the computer itself with 256k of RAM, of which 116k is configured as a RAM disc, one 3in 178k disc drive, a green screen monitor, keyboard and NLQ printer.

The computer, disc drive and monitor are housed in one unit which sits on what looks like a tilt-and-swivel base, though it neither tilts nor swivels. The disc drive is mounted vertically next to the monitor, with a blank below it for a second 720k drive for about £160, including fitting on location by a qualified engineer.

At the front of the unit are an on/off button and a brightness control wheel. At the back there is an edge connector ready to take an RS232/Centronics card (about £60), and a vertical hold knob.

The printer is attached to the unit via a DC power line and a ribbon cable. Unfortunately these are too short to position it comfortably next to the keyboard, if that is the way you would like it set up, to allow, for example, enough room at the back of a normal-sized desk for a pile of fanfold paper.

But the overall footprint of the PCW is if anything smaller than most business machines plus printers. The keyboard cable, spring-coiled in the centre, plugs into the side of the unit and a single mains plug neatly services all the hardware.

Inside the unit is a 14in CRT and associated wiring, but surprisingly little digital circuitry. Clearly everything possible has been done to cut component costs.

The main printed circuit board consists basically of just a Z80 processor, printer and disc controller chips and eight RAM chips handled by bank switching. There is no fan, so in contrast to many other office computers, it is absolutely silent in operation – and damaging cigarette

and pipe smoke can't be sucked into the disc drive either.

The monitor produces perfectly readable text at normal viewing distance, though the lack of an anti-glare filter can be a nuisance if you work by a window in daylight.

The unique feature of the monitor, however, is that it displays 90 columns by 32 lines, which allows far more text to be seen on screen than with standard word processors, and far more cells with spreadsheets. For applications which require the usual 80 × 25 display there is an appropriate screen driver among the CP/M utilities.

The keyboard looks pretty, but in fact is a little too cramped at the right-hand side, and has a cheap feel to it, producing a tinny echo unless you have the lightest of touches.

There are 82 keys, including separate £ and # signs, EXTRA and ALT keys for control sequences and for the full range of European characters, a shift lock with an LED which, unusually, disengages when you press either of the Shift keys (as on a typewriter), and a bank of function and dedicated word processing keys, part of which doubles as a numeric keypad.

The dot matrix printer can handle both single sheet and continuous tractor-fed stationery, with settings for different thicknesses of paper. It is bi-directional and logic seeking, but is relatively slow, even in draft mode. However it does produce very nice NLQ typescript of which no business need ever be ashamed, and in a range of popular typestyles from tiny half height characters (subscript and superscript) to double width 10-pitch with, of course, bold, underline and double-strike. The proportional-space setting produces particularly attractive results. Figure I summarises the printer's capabilities.

In some ways the printer is quite different from all others. There are no buttons or switches on it at all, since its operation is entirely under the control of the main unit, all functions being handled at the keyboard. Yet it also has a unique extra hardware feature – a single sheet alignment mechanism, of the kind found on high quality electric typewriters, which pulls through a sheet of paper from the paper tray and automatically sets it to top of form. This is not as good as having a sheet feeder, but it does speed up paper changes when printing a multi-page document on plain paper.

LOCOScript is very powerful, and consequently not all that easy for a first-time user and efforts have clearly been made to make its operation as simple as possible.

There are pull-down menus (Figure II), sub-menus which can be by-passed by the expert user (Figure III), and sensible default settings. But many useful features lurk at the lowest menu levels, and it takes experienced guesswork or long searches through the manual to reach some of them.

The package has all the usual modern word processing functions – various direct cursor addressing modes, search and replace, block operations in RAM and on disc, cut and paste, a phrase glossary and so on.

Page breaks and underlining are shown on screen, as well as right justification if in 10-pitch or 12-pitch style, but not enhancements such as Bold, Italic, superscript or subscript.

Re-formatting of paragraphs after editing is automatic once the cursor has moved beyond the carriage return, but it can also be done at any time with a single keystroke.

Full advantage has been taken of the fact that the machine has a dedicated printer. Typestyles can be

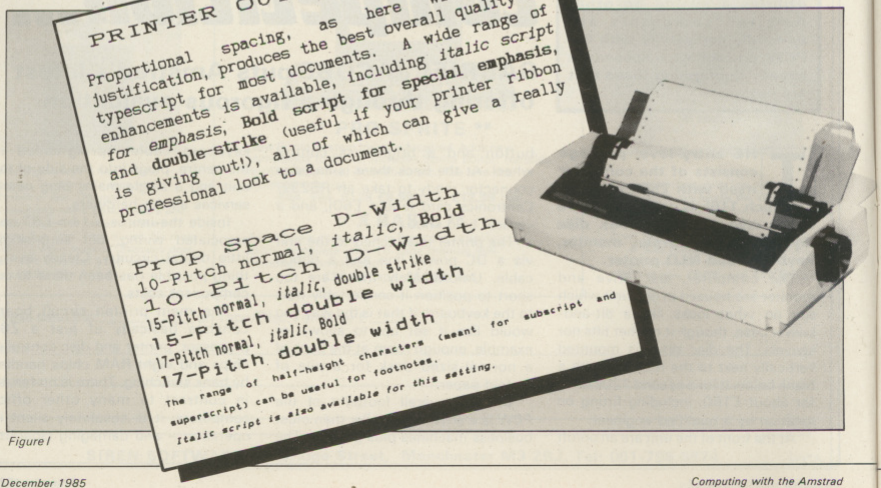


Figure I

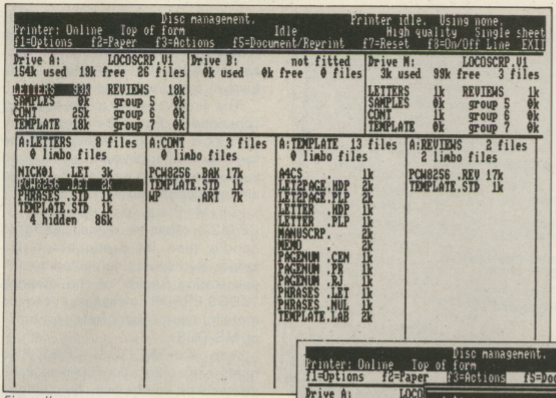


Figure II

Many useful features lurk at the lowest menu levels – but it may take guesswork to reach some of them

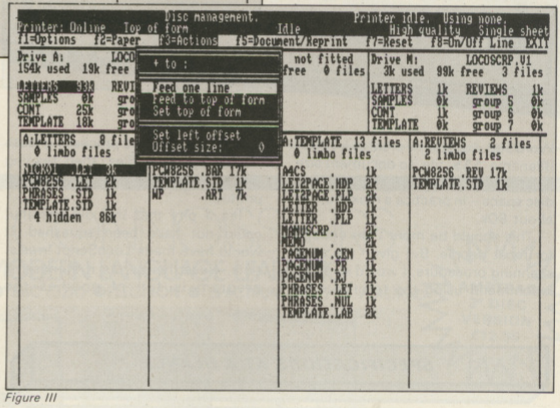


Figure III

freely mixed, with line-length being automatically adjusted.

Ruler lines and other printer layout instructions can be inserted anywhere in a document, and either shown on screen or hidden. A direct printing mode turns the PCW into a typewriter which stores text until Return dumps it to the printer – a very handy way of addressing a one-off envelope, for example.

Disc management is exceptionally good, and can be carried out both at the opening menu and while editing. LocoScript divides its disc files into up to eight user-defined groups. Each group has its own template which contains information concerning pitch, line spacing (in increments of ½ line), page layout, headers, footers, justification and so on.

The template is loaded into the RAM disc at boot-up, and thereafter into every newly created file in its group. So, for example, the group LETTERS could contain a standard letter template with your own address, together with a footer to print "Continued ..." if the letter exceeds one page, and fields for the date and name and address of the recipient.

Also associated with each file is an identity tag, which can be filled in by the user and rapidly inspected at any time, even at the opening menu, to see at a glance what the file contains.

This could be a real boon for those, like me, whose filenames become meaningless after a few weeks.

The major drawback of LocoScript is that it constantly formats a file for the printer while it is being edited – a painfully slow procedure, at least for those who are used to word processors which allow you to jump rapidly around a long document.

With LocoScript the text below the cursor position is continuously scanned and re-formatted on screen as the cursor passes over it. This happens whether you move by line, paragraph, page, in a search procedure, or – most frustrating of all – by default to the end of the file when a Save command is issued.

The process takes on average about a minute for each 10k of data, so saving a long file if the cursor is at the top calls for some patience.

Once formatted, the file is sent to disc as a print output, which has the advantage of allowing background printing – printing directly from the disc while another file is being edited – with hardly any drop in response time. But scanning could at least have been speeded up by not echoing the refreshed text to screen when saving, and by making more intelligent use of the RAM disc.

In operation LocoScript, like

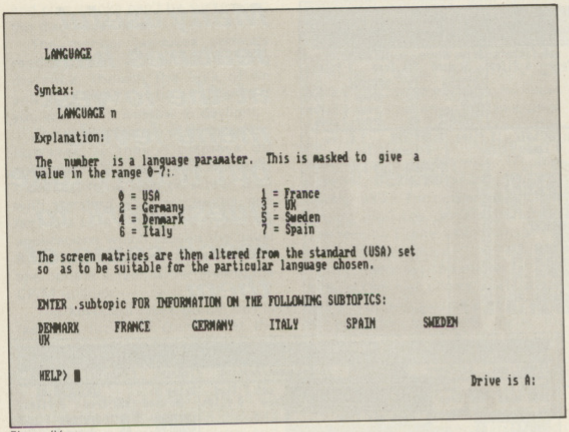


Figure IV

WordStar, constantly creates a TEMP (filename .$$$) file, so document size is limited to about half the available disc space – in practice a maximum of about 80k.

This should be more than enough for most people. But given the slow scanning procedure, I would strongly recommend using the technique on which I cut my word processing teeth – creating short files, then reading them into a global file for the final printout.

It's a pity that this old chestnut could not have been squashed. It would have made LocoScript irresistible. Nevertheless, as it stands the program is full of goodies too numerous to mention here, and in many ways rivals some word processing packages costing almost as much as the complete PCW hardware and software combined.

The first versions to be released contained a few little bugs which have now been eliminated. Amstrad say they will happily send a debugged version to those who buy, or have already bought, an early one.

CP/M Plus, an upgrade of CP/M2.2, offers more and is easier to handle than its predecessor. No longer is the user subjected to the devastating finality of the dreaded "BDOS ERROR" message, but to the more humane "Abort, Retry, Ignore?" of MS-DOS.

And like MS-DOS, CP/M Plus reads a file allocation table at each disc access, so discs can be changed without issuing a Ctrl+C, though LocoScript – which by-passes the CP/M environment – requires it.

In addition to all the usual I/O, copying, formatting and batch execution utilities, there are new extended directory commands, date and time stamping of files, password protection, a key re-definition program (which unfortunately will not work for LocoScript), printer set-up routines, an advanced programming toolkit, and a graphics system extension.

An on-line Help tree-structure (directly copied, for those who may know it, from DEC-s VAX/VMS Help Utility) is clear, thorough and extremely useful. Figure IV gives two examples of its capability.

Mallard Basic and Dr Logo come bundled with the PCW. Alternative Basics, Pascal (including Turbo), Cobol, Fortran, Lisp, Prolog and C are available from independent suppliers, as well as a vast range of applications software, from dBase II to WordStar (if LocoScript isn't enough for you). Happily, most of these are at prices which have been set in sensible proportion to that of the machine.

By the time the RAM disc, screen RAM, BIOS and BDOS have been deducted from the available 256k of RAM, the PCW is left with 61k of transient program area, more than adequate for most CP/M applications.

Any program, including the CP/M utilities, can be transferred from a physical disc to the RAM disc, which loses its contents when the machine

SPECIFICATIONS AT A GLANCE

Equipment	*Computer, monitor, keyboard, printer, manuals.*
Disc storage	*Single 3in 178k drive. Optional second 720k drive.*
Monitor	*Monochrome, 90 × 32 display, max. 720 × 256 pixels.*
Keyboard	*82 keys, masked numeric pad, four dual function keys.*
Printer	*Dot matrix NLQ 80+ columns. Tractor and friction feed.*
Processor	*Z80 running at 4MHz.*
RAM	*256k, including 116k RAM disc.*
Operating System	*CP/M Plus (CP/M Version 3).*
Input/Output	*Dedicated printer port. Optional RS232/Centronics card.*
Character set	*Full European.*
Bundled software	*LocoScript, Basic, Logo, CP/M utilities.*

is switched off, but gives faster access than even a hard disc could offer. This will prove particularly useful with spelling checkers, databases and so on, which make frequent disc passes.

The PCW is supplied with two thick ring-bound manuals – one for LocoScript, CP/M Plus and Logo, the other for Basic. Both are comprehensive and written in clear English.

In fact the section on CP/M is the best explanation of this operating system I have seen.

The structure of the LocoScript documentation, however, is rather higgledy-piggledy.

It takes a while before you become familiar enough with it to find what you want without a bit of a sturggle.

The PCW has a year's guarantee, but Amstrad are promising an impressive maintenance service at a comparatively low price once the guarantee has expired.

VERDICT: **When the Sinclair QL was first announced, at roughly the same price as the PCW – though incidentally without even a monitor and proper disc drive, let alone a printer – it was immediately hailed as an aptly named Quantum Leap in computing, with so-called 32 bit architecture suddenly brought within everyone's reach.**

Yet who notices the benefits of advanced architecture when actually using the QL?

The PCW, with its well-tried 8 bit CP/M system, may not be at the cutting edge of technology, but it is far more likely to succeed where the QL has failed.

It provides precisely what many institutions, businesses and individuals require – a complete system for word processing which can also access a large software base.

My criticisms of the PCW have therefore to be set against its genuine usefulness, its many qualities and, most of all, its astonishing price tag.

For the money, it simply has no competition.

SOFTWARE FOR THE AMSTRAD

ULTRABASE

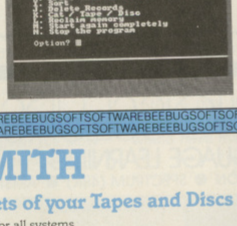
General Purpose Database

Ultrabase is a general purpose file management package allowing large amounts of information to be stored and processed. It is extremely powerful yet flexible & easy to use.

Once set up, the information may be retrieved, sorted on any field, displayed, updated, printed etc as required.

It is ideal for use in the home, school or office and is supplied with a comprehensive manual.

- Menu driven & easy to use
- Up to 15 fields per record
- Up to 25 characters per field
- Any number of files may be created
- Each file may typically hold up to 400 records (based on a 5 field record)
- More than 25K of memory for data storage
- Special label printing facility.



TAPE
£14.95 INC. VAT

DISC
£17.95 INC. VAT

REMBRANDT

Icon Driven Drawing Package

Rembrandt is an exciting new 16 colour painting and design package. It allows you to create amazing screens on the Amstrad computer using some very advanced features.

All options are selected from an on-screen icon menu and are extremely easy to use. This must be the ultimate drawing package for the Amstrad.

- Icon controlled
- Draw in any screen mode in any colour
- Circles, squares, rectangles, polygons etc
- Preview before fixing to screen
- Very fast fill & stipple fill
- Load/save screens to tape/disc
- Text anywhere
- Special magnify facility
- Cut and paste
- Scroll screen up, down or sideways
- Keyboard or joystick controlled
- Printer dumps for DMP-1 and Epson compatibles

TAPE
£13.95 INC. VAT

DISC
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LOCKSMITH

Unlock the secrets of your Tapes and Discs

Just the one program for all systems

Locksmith will make back-up copies of your favourite programs on disc or tape. It is ideal for tape users who are upgrading to a disc system and want to transfer their programs onto disc. It will give you full information about what is happening and help you to understand about protection and disc/tape headers etc.

TAPE to TAPE Handles large Basic programs, headerless files and different loading speeds

TAPE to DISC Transfer whole tape or selected files

DISC to DISC Backup of whole disc or selected files. Change program name option

DISC to TAPE Whole disc or individual files

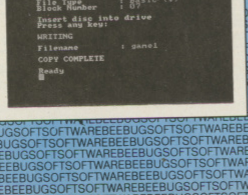
LOAD PROTECTED BASIC PROGRAMS

ASCII TRANSFER

READ TAPE/DISC HEADERS Displays Block no, Start address, File type, Length, End address etc

RELOCATOR

ON-SCREEN HELP



TAPE
£13.95 INC. VAT

DISC
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ROM
£29.95 INC. VAT

DISC DEMON

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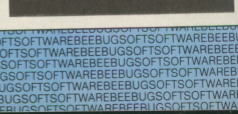

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HOW BASIC WORKS

Part II

By JOHN HUGHES

IN the first part of this series we saw how the lines of Basic that you input at the keyboard of your Amstrad are stored in RAM, beginning at location 368, and we saw that the Basic keywords are represented by one or two-byte codes called "tokens".

As you type in your program, these keywords are recognised by the Amstrad, and are automatically converted into tokenised form.

Numbers, too, are converted into different forms when they are input as part of a Basic program.

The way in which this is done varies, depending on whether the numbers are integers or real.

To keep things simple, we shall be looking mainly at integers. Even so, you should pick up enough ideas to give you an insight into the general operating procedures of the machine, and to help you write more economical programs.

Start off as you did before, by resetting your computer (Ctrl+Shift+Esc) and going into Mode 2. Then enter the following one-line program exactly as it is here, including the spaces round the = :

```
10 j% = 15
```

but don't run it at this stage. Then type in the following in direct mode:

```
FOR J=368 TO 381:PRINT PEEK(J);:NEXT
```

The computer will respond by showing the sequence of numbers shown in Figure I.

Some of this should be immediately familiar from last month's article.

You probably recognise the first two bytes as giving the length of the representation of the program line, and the second two as containing the line number. You can also see the usual zero serving as the end-of-line marker.

The two bytes before that, containing 25 15, represent the number 15 in the rather obtuse way in which the Amstrad represents integers in assignment statements.

Briefly, numbers from 0-9 inclusive are stored in one byte – our byte 379 – with 14 added to their value. Numbers from 10 to 255 are stored in two bytes, with the first containing 25 as here, and the second the number. And numbers over 255 are stored in three bytes, with the first byte containing 26.

Don't worry if you don't understand any of that – just be grateful that the designers arranged it that way, because in a typical assignment statement it saves one or two bytes of memory.

But the most curious feature of the line – and, as you will see, there are several other strange things about it – is that your *j%* is represented by two bytes in separate places. The first of these is byte 372, which contains 2, and which shows that the statement concerns an integer.

If you want a bit of fun, POKE the number 3 into that location and LIST the program again, and you will find that it now reads:

```
10 j$ = 15
```

because 3 is the code for a string.

The second part of the *j%* is in byte 375, containing 234. If you look up Ascii code 234 in the User Instructions, you will find that it stands for the "male" symbol, or the astronomical symbol for the planet Mars. But here it represents your j – Ascii code 106 – but with 128 added to it.

The Amstrad marks the last letter of a variable name by adding 128 to it, and as our name was only one

Byte numbers:													
368	369	370	371	372	373	374	375	376	377	378	379	380	381
14	0	10	0	2	0	0	234	32	239	32	25	15	0
line length		line number		%			J +128				number		EOL

Figure I: 10 j% = 15

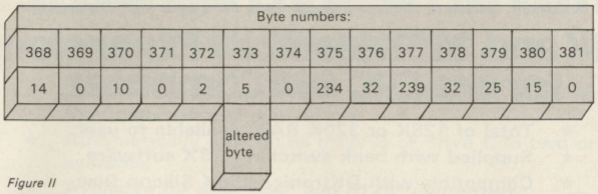

Figure II

character long, it was duly given the treatment.

If you have poked a 3 into byte 372, first set it back to its original condition by poking in a 2. Then, without clearing the screen, RUN the program and enter the same direct mode line as before to display the memory – and lo and behold, you will find that it has changed. It should now read as in Figure II.

That is, byte 373 now contains 5 instead of 0. In other words, the actual representation of the Basic line in memory has been altered during the running of the program, although if you list the line you will see that nothing has apparently changed.

To understand why this should be, remember that the RAM has to hold both your program and a certain amount of working space. When your program is run, a number of locations in memory are allocated to hold the value of each variable.

To see this in more detail, modify the memory display command to read:

```
FOR J=368 TO 389:PRINT PEEK(J);:NEXT
```

and the following will appear on the screen:

```
14 0 10 0 2 5 0 234 32 239 32 25
15 0 0 0 0 0 202 1 15 0
```

Concentrating on the last eight bytes, shown in detail in Figure III, you will see that bytes 388 and 389 contain the number 15 – this time in the more usual lo byte/hi byte format – and 386 contains 202. The 1 in byte 387 is the token for a colon separating statements in the same program line, and is used here as a separator.

202 represents the Ascii code for capital J (74) plus the inevitable 128 to show that it is the last letter of a variable name.

At which point you may well ask why on earth the variable which we represented earlier by the letter j suddenly shows up as the capital J.

The answer seems to be that since the Amstrad makes no distinction between upper and lower case variable names, and treats j and J as exactly equivalent, then capitals are as good as anything else.

And if you think that not making the distinction is a bit of a disadvantage on the Amstrad, then you haven't spent fruitless hours debugging a program on the good old BBC Micro which treats them differently . . .

You have probably worked out by now that the 5 which mysteriously appeared in byte 373 represents how far the variable under consideration is offset from the end of the program.

The end of the program is at byte 380 and there are five zeros before the beginning of the workspace which stores the name of the variable and whatever value it may take on as the program runs.

Another way of getting at the same information is to enter the instruction:

```
PRINT@j%
```

which asks for information about where the variable *j%* is stored. If the variable is recognised (in other words if it has been given a value and the computer has not since been reset), the answer will be the number of the first byte in which the value of the variable is stored – in our case 388 – try it and see!

It follows from this that there are some rather simple ways in which you can cut down on the workspace requirements of your programs.

First, unnecessarily inventing new variable names rapidly swallows up storage space, as each name is stored twice – once in the program line and once in the workspace.

Secondly, keeping variable names short is doubly efficient, as it saves room in both program and workspace. Of course, both of these tips conflict with the equally good advice to make your programs readable and easy to debug – the choice is yours!

Finally, what happens when you type NEW? In some computers, getting your program back is tolerably straightforward, as it is not actually erased from memory – and the BBC Micro has the command OLD to restore the program without any fuss.

The Amstrad doesn't do this – once you have scratched your program from RAM, then unless you have previously saved it, it's gone for good.

If you try that now, and then re-enter the direct mode line to check up on it, you'll see what I mean.

What's that? Not gone completely – there's a little of it still there? I'm afraid not. What you are seeing is the representation in memory of the direct mode Basic command which you've just entered . . .

Well, that concludes this look at the way Basic works. I hope it encourages you to explore further. And if you do find anything while you're PEEKing about, why not write in and let us know?

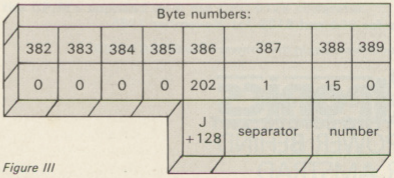

Figure III

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The 64K memory will give you the same amount and configuration of RAM as the CPC 6128, the 256K gives an extra 192K on top of this! The expansion will allow the use of CP/M+ (R) as supplied with the CPC 6128 with its massive 61K TPA opening up an even larger software base for Amstrad users.

The RAM can be accessed by means of bank switching using a single I/O port. Memory is actually switched in and out of the 64K Z80 address space in 16K sub-blocks (as are the ROMs). The port determines which particular combination of the original four 16K sub-blocks and any new sub-blocks from the expansion RAM will occupy the 64K address space at any time. The I/O port can be used from both BASIC and machine code. To use the additional 64K/256K, the expansion is supplied with bank switching software (although it can be switched without this software). The program adds some extra BASIC commands which make it possible to use the second 64K (or 3rd, 4th and 5th in the case of the 256K expansion) for storage for screens, windows, graphics and BASIC arrays. This ability means that you can write much larger BASIC programs, as most of the memory on the unexpanded CPC 464 is normally used for arrays, variables and graphics.

The additional BASIC commands are:

!BANK,n	Map a bank of 16K directly into memory space.
!SWAP	Alternate between the low and high screens.
!LOW	Change to the low screen.
!HIGH	Change to the high screen. (Default screen).
!SAVES,n	Store a screen to 16K bank.
!LOADS,n	Retrieve a screen from a 16K bank.
!SAVEW,w,n	Store a window's contents into expansion RAM.
!LOADW,w,n	Load a window with data from expansion RAM.
!SAVED,n,s,1	Transfer original RAM to expansion RAM.
!LOADDn,s,1	Load original RAM from expansion RAM.
!PEEK,n,s,v	Read the value of a byte in expansion RAM.
!POKE,n,s,v	Change a byte in the expansion RAM.

These commands make such features as pull down menus, full screen animation, and large spread-sheet type programs or Data-Bases very easily programmed from BASIC as never before possible on the unexpanded CPC 464.

NOTE: The contents of the expansion RAM are retained if the computer is reset. The consequence of this is that if the RAM is used for machine code, the contents will remain even if the computer crashes!

Available for 664 and 6128 1st November 1985.

*Except for differences in the firmware and BASIC ROMS.

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The 256K silicon disc is designed to be used with at least one normal disc drive attached. Data can be transferred onto the silicon disc from a normal disc. Application programs can then work on the data at vastly increased speed, especially on systems with only one normal drive. Software is contained in an expansion ROM.

There are two environments in which to use the silicon disc: (1) From BASIC under AMSDOS, and (2) Within CP/M. Both are detailed below:–

(1) From BASIC:

When the silicon disc is activated it will find out if there is a B drive or not. Using this information, the silicon disc is implemented as drive B or C. If there are two normal drives then an extra external command 'IC' is added. The silicon disc can then be accessed by logging on the drive using IB or IC. Alternatively specifying the drive letter in a file name will have the same effect. The silicon disc will react as would normal AMSTRAD disc drives.

At the start of a session using the computer the data can be transferred to the silicon drive using the external command :DISCLOAD. When the data is updated it can be stored on a disc using :DISCSAVE.

Even when the computer is reset (except by switching off) the contents of the silicon disc are kept. This means that it is possible to use CP/M and BASIC programs on the same data files without having to continually change disc.

(2) From CP/M 2.2.

The utility :SETDISC will write a COM file on a copy of your CP/M system disc. This program when called from CP/M will implement an additional drive, either B or C depending on whether there is a second normal drive connected. Using the SETUP.COM program you can get this program to run whenever you boot up into CP/M.

Once the drive is implemented, CP/M will treat it like the normal drives. Data can be transferred onto the silicon disc and vice versa using PIP utility.

The silicon disc is especially useful for single drive CP/M systems as the disc containing the programme is often nearly full and needs to stay in the drive. The silicon disc offers a cheap second drive for serious business applications.

NOTE: The silicon disc will also be available for the CP/M+ supplied with the CPC 6128 computer.

* 664 and 6128 versions available 1st November 1985.

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The pitfalls that can make DATA a bit dodgy

PETE BIBBY digs deeper into DATA and READ in Part Eleven of his series for programming beginners

LAST month we dealt with the Basic statements READ and DATA. We saw how we could use READ to put values into a variable, these values being held in lines beginning with DATA.

Each time a READ command was issued by a program the Amstrad took a value from the list of constants in the data line and stored this number in the variable following that READ.

We saw that READ was similar to INPUT except that instead of looking to the keyboard for a value, the micro looks to a value held in the program itself.

One major point to grasp is the way that a READ takes information from the list of numbers following a DATA: It does it sequentially.

The first time a READ is obeyed the initial number after the first DATA is taken. The next time a value is required it is taken from the second number following the DATA.

Each time a value is taken from the data list the Amstrad makes a note of where it is up to and sets what is known as a data pointer. This ensures that the next time a READ is issued the Amstrad looks at the next unREAD item in the data list.

If all that sounds a bit formal, don't worry too much. It's easier to use in practice than it is to read about. If you have any doubts at all have a quick look at last month's programs and you'll soon have a good working knowledge of READ and DATA.

While you're doing that you may notice that last month's Program VII, this month's Program I, is rather different. Have a look at it.

The general structure is familiar, it's just the usual FOR . . . NEXT loop READing values from a couple of lines of DATA. As the loop progresses running totals of the values are kept.

```
10 REM Program I
20 REM Formerly Program VII
30 sumone=0:sumtwo=0
40 FOR loop=1 TO 5
50 READ first,second
60 sumone=sumone+first
70 sumtwo=sumtwo+second
80 NEXT loop
90 PRINT sumone,sumtwo
100 DATA 1,2,3,4,5
110 DATA 6,7,8,9,10
```

Program I

What is unusual is that there are two numeric variables after the READ of line 50 – *first* and *second*.

How does this work? Does the first variable *first* take all its values from the first data line, line 100? And does *second* read its values from line 110?

The answer is no. That would be a bit too complicated. What happens is that when a READ is followed by two or more variables the data pointer keeps on moving down the data list one item at a time.

The first variable takes the value of the first item in the list, the second variable the next and so on. If you think about it, this is much the more sensible method.

Let's see how it works in the case of Program I.

Line 50, tucked away inside a FOR . . . NEXT loop that cycles five times, is the one we want to understand. Here a READ is followed by the two variables *first* and *second*.

The first time round the loop, when the READ command is obeyed, the Amstrad has to put a value in *first*. It looks at the first item in the first line beginning with DATA and takes that value. In this case it takes the value 1.

It doesn't stop there, though. There is another variable, *second*, following the READ and this needs a value as well, so it looks to the next free item in the data list – pointed to by the aptly-named data pointer – and takes that value.

So the first time round the loop *first* has the value 1 and *second* the value 2. Lines 60 and 70 just keep the running totals of the numbers stored in *first* and *second* as the loop progresses.

The second time round the loop line 50 again has to look to the data list for a value for *first*. This time the data pointer has reached 3, so *first* takes the value 3.

Then *second* is used to store 4, the next value along. As you can see, the two variables take it in turn to get values from the data list. Add a line like:

```
55 PRINT first,second
```

if you're still in any doubt.

While you've got Program I in your micro, let's just take another look at two common errors that occur when using READ and DATA. Try changing line 110 to:

```
110 DATA 67,8,9,10
```

and see what happens. Unless your micro is very different from mine you'll get a:

```
DATA exhausted in 50
```

message for your pains. What has happened is that by having 67 in line 110 instead of the previous 6 and 7 separated by a comma, we have reduced the number of data items in the list.

Before we had 10, now we have nine. The trouble is that as the loop cycles five times, each time taking two items from the list, the program needs 10 items in the data list.

What happens is that it runs out of data and tells you so. Notice, how-

ever, that the message refers to the READ line and not the line where the error actually occurred.

Next, try changing line 100 to:

```
110 DATA 6,7,8,9,1,0
```

which could happen if a lazy typist got the line wrong. Now there are 11 items in the list, not 10. Can you remember from last time what will happen when you run the program? Try it and see.

Even though you get the "wrong" answer, there's no error message. The Amstrad just takes the first 10 items. It doesn't know that the 1 and 0 at the end should have been 10. The moral is, be careful typing in data lists.

So far, all the items in data lists have been numbers which, unsurprisingly, we've read into numeric variables. We can, however, use READ and DATA to read in strings, as Program II shows.

Here the FOR . . . NEXT loop cycles four times, each time READing in an

```
10 REM Program II
20 FOR family=1 TO 4
30 READ name$
40 PRINT name$
50 NEXT family
60 DATA Peter, Eileen, Bodger, Spot
```

Program II

item from the data list of line 60. These strings are stored in the string variable *name$* in just the same way as we've seen with numbers.

Try changing the program to read in your own string input and you'll see that reading strings and numeric values from data lists are similar operations. Even the errors that you can make are similar.

Try changing the data list to:

```
60 DATA Eileen, Bodger, Spot
```

and:

```
60 DATA Peter,Eileen,Bodger,Sp,ot
```

and you'll see what I mean.

Notice that line 60 consists of a list of strings which are assigned to the string variable *name$*. Normally when we assign a string of letters to a variable we enclose them in inverted commas to tell the Amstrad that it is a string and not a variable name.

However, when we're reading from a data list, we needn't use the inverted commas, as the micro can tell from the variable name *name$* that we want a string variable. So, while we can have a line like:

```
60 DATA "Peter","Eileen",
"Bodger","Spot"
```

it's not usually necessary. There is, however, one time when it is necessary. Can you think of it? We'll come across it later.

There are a couple of more points to be taken into consideration when reading in strings. The first is that you have to read a string value into a string variable. Try changing line 30 to:

```
30 READ name
```

and you get the message:

```
Syntax error in 60
```

This is because you've tried to store a string in a numeric variable. Notice that the error message points to the data list and not to line 30 where the mistake actually happened.

From this you can see that the following is good advice: When you come across an error message pointing to either a READ or a DATA line you should check all the program's READs and DATAs carefully, no matter where the error message points.

Before we finally leave Program II, try changing line 60 to:

```
60 DATA 1,2,3,4
```

and run the program. As you see, it works perfectly. This is because the numbers in the data list are stored as string variables in *name$*.

However they are strings, not numerics. You can't do sums with them as you'll see if you now add:

```
35 name$=name$+1
```

and try to run the program.

You get a:

```
Type mismatch in 35
```

message because you've tried to add a numeric, 1, to a string, *name$*.

This may seem a bit pedantic in the case of Program II, after all it's so simple no one could mistake a string for a number, and vice versa.

However, when you learn that data lists can contain both strings and numbers you'll see how easily the above mismatch problems can arise. Program III shows what I mean.

Here line 30 is reading values into two variables, the string variable *name$* and the numeric *age*. So as the loop cycles the program will look to the data line and expect a string,

```
10 REM Program III
20 FOR family=1 TO 4
30 READ name$,age
40 PRINT name$,age
50 NEXT family
60 DATA Peter,34,Eileen,21
70 DATA Bodger,3,Spot,2
```

Program III

then a number, a string, then a number and so on.

The data lines have to be constructed so that this is what actually happens. If items are out of order in either the read line or the data list, havoc occurs. Try changing line 30 to:

```
30 READ age,name$
```

and you'll see the point. Notice that the error message points to the data list and not to where the error occurred.

It's not just the read line where you can get you variable types in a twist. Put back the original line 30 and type in:

```
60 DATA 34,Peter,21,Eileen
```

Now when you run the program you'll get the message:

```
Syntax error in 60
```

Be grateful – at least this one's pointing to the right place!

Try your own variants on Program III, mixing up string and numeric variables in the data lists. You'll soon get the hang of them.

Remember not to put too much trust in the error messages. Just because they say that there's a mistake in line 60 doesn't necessarily mean that line 60 is where you made your mistake.

And talking of mistakes, have a look at Program IV, which is trying to

```
10 REM Program IV
20 FOR boast=1 TO 3
30 READ rubbish$
40 PRINT rubbish$;
50 NEXT boast
60 DATA I,am,wonderful
```

Program IV

use a data list to print the modest message!

```
I am wonderful
```

It's a nice program that you should have no problems understanding. The loop cycles three times, each time reading a string from the data list into *rubbish$*. It then prints out that string and the loop goes round and gets another.

It does, however, have one fault besides the inaccurate message. The strings are all jammed together to produce the message:

```
Iamwonderful
```

It would be nice to have some spaces there. Can we do it by putting spaces in front of the strings in the data list? Try it and see. You'll find that altering line 60 to:

```
60 DATA I, am, wonderful
```

still results in

```
Iamwonderful
```

This is because the Amstrad ignores the leading spaces.

What we have to do is to turn to the inverted commas we came across earlier. By using these around the strings we can get our spaces to be accepted. So line 60 becomes something like:

```
60 DATA I," am"," wonderful"
```

Now, suppose I'm flushed with success at getting my spaces into the message and want to repeat it five times. Could I put the whole thing in a FOR . . . NEXT loop that cycles five times and so get the required number of messages? Program V attempts this, but doesn't get too far.

All you get when you run the program is one:

```
I am wonderful
```

and a:

```
DATA exhausted in 40
```

What's happened is that the program has run out of data items in the list. The first time round the outer loop there's no problem. The inner loop cycles three times, reading in values for *rubbish$* and printing them. Hence the first message.

```
10 REM Program V
20 FOR repeat=1 TO 5
30 FOR boast=1 TO 3
40 READ rubbish$
50 PRINT rubbish$;
60 NEXT boast
70 PRINT
80 NEXT repeat
90 DATA I," am"," wonderful
```

Program V

Now the program sets off around the outer loop for the second time. It gets to the inner loop, which cycles three times for every cycle of the outer loop, and line 40 attempts to READ *rubbish$*. And this is where the program grinds to a halt.

What has happened is that it has run out of data items. The first three READs have taken what is in the list and moved the pointer along each time. Now it's pointing to nothing. There are only three strings in the list and you've had them. There are no more left for the program to read.

Of course what you want the micro to do is to go back to the beginning of the list again. The trouble is that you haven't told it that that's what you want.

What you have to do is to use a RESTORE command. This sets the data pointer back to the beginning of the data list. In other words, the READ commands starts taking items from the front of the list again.

In the case of Program V the line needed is:

```
65 RESTORE
```

which has the program producing the required five messages. Every time the inner loop finishes its three cycles the RESTORE sets the data pointer back to the first item in the data list, I.

Now when the inner loop starts again it has the necessary data for the second message. When that loop finishes, the RESTORE restores the data list and the program carries on.

RESTORE doesn't have to be used by itself. It can be followed by a line number specifying which data line the data pointer is to go to. So in this case we could have had a line such as:

```
65 RESTORE 90
```

which sets the data pointer to the first item after the DATA of line 90. However, as there's only one data line in the program it's a bit pointless. Program VI shows a more practical use of a line number with RESTORE.

While it's hardly a wonderful maths test, the program does show how RESTORE can be used to choose between two different data lists. Line 100 ensures that if the user has made a mistake, the next set of questions are the easier set. It does this by using the RESTORE 130 to get the data pointer to select the easier numbers.

On the other hand, if the answers to the easy questions are correct, the RESTORE 140 of line 110 has the Amstrad READing from the harder set of numbers.

```
10 REM Program VI
20 WHILE eternity=0
30 easier=0
40 FOR loop=1 TO 3
50 READ number
60 PRINT "What is ";number;" times ";
number;
70 INPUT answer
80 IF answer<>number*number THEN PRIN
T "WRONG!": easier=-1
90 NEXT loop
100 IF easier=-1 THEN RESTORE 130
110 IF easier=0 THEN RESTORE 140
120 WEND
130 DATA 2,3,4
140 DATA 6,7,8
```

Program VI

Can you alter the program so that there are three or even more alternatives? I leave that up to you.

And that's where we come to an end for this month. We've seen how READ and DATA can be used to read in both string and numeric variables from data lists. We've also come across some of the pitfalls that await the unwary.

Finally we explored RESTORE and saw how it could be used with line numbers to select different data lists.

After all that I leave you with Program VII.

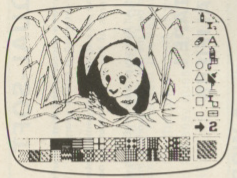
What's happening here? The FOR . . . NEXT loops and the READ and DATA are fairly familiar, but what's that DIM?

The answer comes next month when we'll be dealing with arrays.

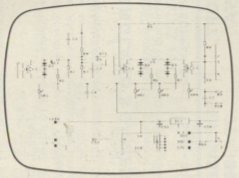
```
10 REM Program VII
20 DIM number(5)
30 FOR loop=1 TO 5
40 READ number(loop)
50 NEXT loop
60 FOR loop=1 TO 5
70 PRINT number(loop)
80 NEXT loop
90 DATA 100,200,300,400,500
```

Program VII

HIGH-RES GRAPHICS AT LOW-RES PRICE

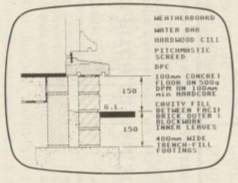


FREE-HAND DRAWING ICON SOFTWARE



ELECTRONIC CIRCUIT DESIGN WITH CIRKWIK

USING GRAFPAD FOR TRACING



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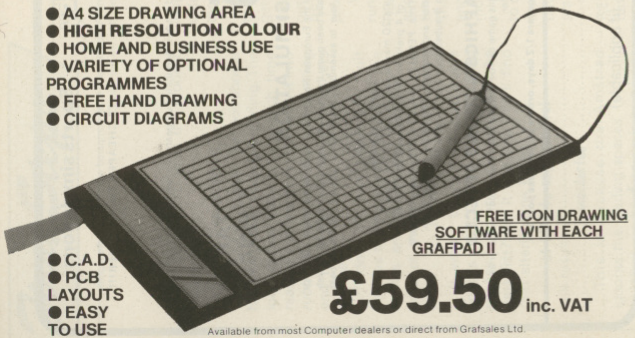

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CWA-1

Draughts can put the wind up you

UNTIL a few weeks ago my view on draughts was that it was a game played by people who, as yet, couldn't play chess.

With the arrival, however, of **Draughts,** by CP Software, my whole outlook on the game has changed.

It seemed impossible that a game as apparently as simple as this could be as subtle or as complex as I have found it.

When the game is loaded you are given the options – Play or Help.

Help will list all the instructions and rules of the game, and gives a few hints on playing.

If you decide to play, you are presented with a range of skill levels – from the beginners' level, with an almost instantaneous response, to the grandmaster level with a response time of approximately 300 seconds.

When the game is in progress, the instructions can be accessed and the colours of the board and pieces changed, allowing vile-looking combinations.

One feature, helpful for beginners and usually present in this type of program, is a hint option to suggest a move to the player. Sadly, however, this facility is missing from this version.

The board is laid out in a similar way to street maps, with the rows numbered from 1 to 8 and the columns lettered from A to G.

For example, A1 is the bottom left square.

You move your pieces by entering the square of the piece to be moved followed by the square to be moved to.

This program can play a very good game of draughts.

I found that on the lower two levels I could beat the computer fairly often.

However, on the higher levels, the board was turned into a bloodbath with my pieces being swept away.

Overall the game is quite good. However, at the price of over £8 I might at least have expected a hint feature. I needed it . . . **Sean Murphy**

Heading into danger

FANTASTIC Voyage, by John Edmonds, Amsoft, loosely follows the storyline of the recently televised film, using the human body as the setting.

The difficulty has been correctly fixed to allow fair progress round the body, without revealing too easily the locations of eight parts of a "submarine" that you must assemble in the brain to escape.

You are cast as a miniaturised diver, and failure to complete the mission means you won't get back to full size in time for tea.

I managed to discover only four of the parts, and dragging them up to the head without mishap proved to be quite tricky.

The screens of the various body-parts and connecting passages are interesting, including novel and neatly-designed problems.

Obstacles include a variety of flaps and valves, growths, viruses, hostile body-surfaces, and some uninvited lodgers in the intestines.

Much of the opposition may be cleared away using a standard-issue laser, while captured white cells released at the appropriate moment mercilessly destroy the more-obstinate foe.

Other crises, such as infections, are indicated on a diagram – useful even if you do know your hepartic portal vein from your superior vena cava.

Yes, this program is educational, too, helping biology students to learn the names and locations of body parts, even if some of the interconnections have been exaggerated to provide a playable game.

The nicely-detailed graphics are often amusing, while the monochrome sprites

→

An epic worthy of the word

ADVENTURES are often described as epic, but **Ring of Darkness** from Wintersoft is the first graphics adventure that I would consider warrants the appellation.

Object of your quest is to find Shedir, the Ring of Darkness, and as you begin the screen gives a two-dimensional map of your locale, showing trees, mountains, hazards and towns.

Movement is by cursor keys, and each move represents a day's travel.

At frequent intervals you find yourself attacked by bandits and monsters, usually with fatal results.

To survive long enough to find the ring you will have to get money to buy weapons and food.

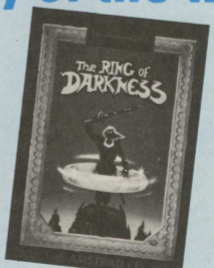
Most of the things you need can be bought in towns, and the picture changes whenever you visit one.

Each town seems to have its own king, who you will find is perfectly willing to allow you to undertake tasks for him and will charge you for the privilege.

You will also find various dungeons and towers to explore, all with their own monsters.

When you enter them you get a labyrinthine view of your surroundings. I suggest you make a map or you'll soon get lost.

Aside from the use of the cursor keys, you can enter simple commands such as



TRANSACT, UNLOCK, EXIT, OPEN.

Commands are also available for giving your status, inventory and for using any weapon or spell, though these have to be "readied" first, and quite often I found myself unable to fight because I had forgotten to do this.

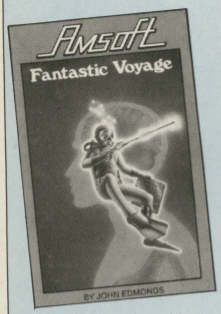
Wintersoft claims there are about 10,000 "movement days" in the map of the game, which works out at over 27 playing years.

Since it follows the pattern of the swords and sorcery type of adventure, experience counts for a great deal, and unfortunately has to be earned the hard way.

After weeks of exploration I doubt if I have experienced even half of its potential.

It's an absolutely superb game of phenomenal proportions that is likely to be of especial interest to lovers of D&D. Highly recommended.

Gandalf



flicker just a little, without annoying.

The real challenge depends on sprite animation, and much attention has been given to all movements, especially the swimming and drifting actions.

The program sports the usual features of a polished product – good instructions, user-definable keys/joystick/ pause options, scores, and music – well, Dr Kildare, at any rate.

The sound during play is adequate and will entertain according to taste.

Philosophers should ponder why the diver is building a submarine when successfully swimming about without one, and why he becomes invisible when out of energy, yet can still move. Will tea be worth escaping for anyway?

Others will be content to play this novel game carefully in the quest for the final screens. **Phil Murfitt**

Superb snooker simulation

ALEX Higgins, World Snooker, from Gem Software, is the best adaptation of the popular game I have seen yet.

Just looking at the title screen is enough to show the attention to detail that has been paid. It depicts a superb portrait of Alex Higgins and the likeness is uncanny.

Once the program is loaded you choose either a 6, 10 or 15-ball game with an option to practise. Gem has cleverly catered for users with monochrome displays by providing a numbered ball option.

Having positioned the cue ball, you use the arrow keys to move a round cursor in order to provide you with a sight-line for your shot.

At this point you input the force of the shot. This is indicated by a white line at the top of the screen which can be varied in length according to the strength of shot required.

Once this is set you can put left or right-hand side spin and/or top or bottom spin on the ball, giving you total

control over its final resting-place.

Or at least that's what's supposed to happen in theory. Inevitably, just like in the real game, ball-control only comes with plenty of practice.

Once you succeed in potting a red ball you choose a colour by moving the cursor

Quick peeks

Budget: *Designed to assist you to manage your day-to-day personal accounts. The two options, Accounts and Budget, can be used together or separately to input transactions or plan a monthly budget.* (No Man's Land)

★ ★ ★

CPGraph: *A colour graphics package which allows you to visualise any data in the form of vertical or horizontal bar charts, curves or pie charts. Can be used in conjunction with Budget or on its own.* (No Man's Land)

★ ★ ★

File Manager: *This program allows storage of up to 200 records which can contain up to 20 fields. The package contains search facilities on single or multiple criteria, and alphabetical and numerical sorting.* (No Man's Land)

★ ★ ★

3D Stunt Rider: *With throttle and directional control you can test your ability to to clear an increasing number of double-deck buses on a stunt motor cycle. Having done so you must then land on the distant ramp, retaining control.* (DJL)

★ ★ ★

Alien: *An adventure/strategy game based on the well known film in which you must search your ship, the Nostromo, to find and destroy the alien. A three window screen display provides you with a map of the ship, and command and report monitors.* (Argus Press)

★ ★ ★

3D Voice Chess: *This 3D chess package also has software generated voice prompts. Supports seven levels of play, side changing, change position, set up game and problem options, and move recommendation when asked.* (Deep Thought)

★ ★ ★

Android Two: *Can you stop the advance of the Millitoids, survive the maze of death and overcome the dangers encountered in the flatlands? You must achieve this and return to the capsule before the departure deadline avoiding lethal Hoverdroids, Bouncers and landmines.* (Vortex)

★ ★ ★

The French Mistress: *Designed as a learning aid for beginners, O level and CSE students, this educational package contains a control program and a comprehensive series of lessons and tests in vocabulary and grammar. Individual lessons can be loaded and used in a variety of ways and there is also a facility to create and edit your own word files.* (Kosmos)

Cubic's Curse: *Computer version of the famous Hungarian cube puzzle based on a 5×5×5 model. Your task is to determine the moves that restore the cube to its original state. The program operates using its own command language to control the manipulation of the cube.* (Tony Forbes)

★ ★ ★

Dragons: *Ladders and levels game in which you control a man attempting to collect jewels. You must also destroy five different varieties of small dragon by pushing newly-laid dragon's eggs on top of them. You can climb creepers and jump from cloud to cloud in your attempt to clear the screen.* (O. Goodman)

★ ★ ★

Rock Raid: *Pilot your ship through rock-infested space in an attempt to annihilate all debris and alien craft that could destroy you on contact. Controls allow you to rotate, thrust and fire in your attempt to survive unscathed.* (Kuma)

★ ★ ★

Kwikfile: *Low-cost database for small business or club secretaries. With options to search, sort and print in various user-defined formats, the program also contains a facility to view one record card while displaying up to 15 others in abbreviated form.* (A.L. Beech Agencies)

over to the ball of your choice. You then carry on and play the shot using the options identical to those for playing the red.

If you change your mind about any of the options in the process of preparing any shot, you can abort the process. This has the effect of returning you to the start of your shot.

Two scores are displayed on a simulated scoreboard at the top of the screen and its appearance compares very favourably with the real thing.

Should you be fortunate enough to have the Amstrad SSA1 speech synthesiser fitted, you can enjoy the added attraction of speech during your game.

Regrettably I was not in a position to put this option through its paces.

This game is an absolute must for all snooker fanatics as it gives a very realistic simulation of the game, even down to the way the balls rebound.

The graphics are, however, predictable – what else can you do with a snooker table and 22 coloured balls?

And without the speech synthesiser, apart from the expected click of the balls, there is little or no sound.

But who wants noise anyway when you are playing snooker?

David Andrews

Level 9 keeps up its high standard

IN **Emerald Isle,** one of the latest graphics adventures from Level 9, you play a pilot who is forced to bail out over an island in the Bermuda Triangle.

You recognise the island as being Emerald Isle, which legend says can only be left by the ruler of the island. So you must discover how to become that ruler so that you can leave.

You begin your quest dangling from a parachute in the upper branches of a tree. This could be your undoing if you are not careful but you soon find yourself in a maze of branches high in a forest.

The setting sun leads you to a city in the trees. An initial examination will reveal, or should I say cover, the means of getting past the palace guard.

A quick search of the palace will reward you, providing you went back up in the forest.

Nearly everything you have now will be used shortly, but don't bother with the beautiful room until you are ready to leave the island. The butler will continue to sneer until you reach that point.

If you are anything like me, your first descent from the palace yard will have you scurrying back up to find a

lamp. You haven't read the instructions properly either!

You return and soon see the light, though not the lamp. As with BR, there are several ways to travel.

A nice day at the seaside can ensue so stick around here for a bit. A police station doubles as a lost property office, but you'll have to go boating first.

This can present a bit of a problem but then where do the natives get their boats from? Obviously, you need an implement and if you have stuck to your guns and boldy threaded where no adventurer has gone before you should find the right stream.

Careful searching should provide you with the tools of the trade and a few other things as well.

You are now through the first stage of the game and on your own.

This game is a departure from the normal Level 9 adventure. The price is right. Level 9 says that since it is intended to be easier than their other adventures it is only fair it should be cheaper.

I not only couldn't agree more, I hope other software houses will follow suit.

The game is easier, noticeably so, yet it is still as big and as atmospheric as any of their other offerings.

Another difference is the "DARK PLACES".

Usually moving in the dark is definitely not recommended. Here you *have* to travel in the dark.

That awful gothic text has disappeared and the new character font is a lot easier to read.

Of course you can opt for just text or pictures and text using the WORDS and PICTURES commands respectively. The pictures are very good and quickly drawn. The save game facility is excellent.

While Level 9 has indeed made the game easier nothing is stinted in any other area.

I applaud the price reduction and, more importantly, the motive behind it. I have, yet again, to congratulate Level 9 for producing another masterpiece.

They are the producers of the finest adventures available and Emerald Isle is a worthy addition to their range. Highly recommended.

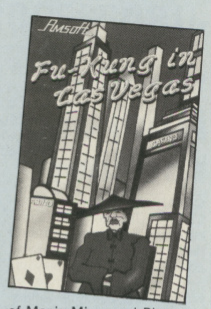
Gandalf

Planning on the platform

AFTER playing **Fu Kung in Las Vegas,** by Romik, I am left with the feeling of having seen something like this before.

Fu Kung is an oriental US Marshal who has been given the apparently impossible job of showing that every game in Las Vegas is fair.

The method that he uses is well known to all the veterans



of Manic Miner and Blagger.

He must negotiate all the obstacles in the room, collect four playing cards and then move into the next room by walking through the exit, indicated by a way-out sign.

The obstacles consist of stalagmites and stalactites, conveyor belts, force fields, mobile guards, killer sparks, collapsing floors and crushers.

To pass through each room safely, you must do a bit of careful planning, for brute force has little chance of success.

Movement is the usual up-down, left-right and jump. The keys are well positioned and there is a joystick option.

There are two levels of difficulty. In the hard level some objects which were harmless are now deadly.

The game has one odd feature – Fu Kung is apparently immortal. He can be killed and a moment later will reappear at the start of the present screen.

This is quite normal. However the oddity is that there is no limit to the number of times that he can be resurrected. This means that a game will last until it is abandoned by pressing Enter.

The graphics are clear if not terribly spectacular. The sound could have been used better as, apart from when Fu Kung is walking or jumping, the machine is silent.

My feelings about the game are that it is competent, but unexciting. However, those who enjoy the platform scenario should enjoy the challenge of Fu Kung's mission.

Sean Murphy

Working wonders from our spelling

COMPUTER Scrabble, by Leisure Genius, is a computerised version, cassette or disc, of the well-known game, coping with up to four players.

If you're quite fresh out of humans, the computer offers up to three opponents, with four selectable skill levels. I played a few "me against Fred Amstrad".

I did pretty well too, until I allowed Fred to increase his skill level to 2. In revenge I let some human scrabble fanatics loose upon him.

Once you've named the players and selected the skill level of any computer players, there are various options available such as green/colour and sound on/off.

You can choose to see the computer "think" on his turn – this can be fun – or whether you want to see the racks.

Not seeing means a lot of bottom shifting in front of the computer and a discovery by one evil-minded player that he could make all the others pass and get two turns if he was quick.

My gang decided that all racks on view was safer and didn't spoil the enjoyment.

The Scrabble board takes up most of the display, but all player names and current scores are permanently shown.

A numerical menu offers to hint a word if you're stuck, juggle the letters in your rack, display information on the distribution and values of tiles or squares and to change tiles, pass a turn or let you quit.

The playing vocabulary is approximately 11,000 words, "carefully selected" from Chambers 20th Century Dictionary, and the computer will challenge if your word is not among them.

However if you insist he meekly accepts, so if he's winning and the last tiles in your rack are XYZKH, the temptation is irresistible.

The white-on-orange menu is hard to read, even on a monitor. And the computer challenged "fuse", but later used "fuze".

Are we using an English or American database, I ask myself?

These small niggles apart, my gang gave the thumbs up and one, who's mouth was immediately washed out with soap, said he preferred playing on computer.

Scrabble does wonders for spelling and word recognition, parents please note. And there are no little tiles to lose.

Definitely one for Aunt Clara to buy for little Johnny. If she doesn't, you'd better get it for yourself, John.

Dorene Cox

Mr Men can help

THE four educational programs in **First Steps with the Mr Men,** by Mirrorsoft, are designed to help children from 4 to 8 years of age to develop essential pre-reading skills.

Each is accompanied by a short story which should be read when the children play the games for the first time.

In the first program Mr Greedy must be guided towards his ice cream through a series of five graded mazes, each one slightly more demanding than the last.

The five small pictures of Mr Clever which are provided to stick on to the cursor and Copy keys make it easier for children to explore ideas of direction with the minimum of adult assistance.

In the second program the player has to help Mr Silly to try on a series of coloured hats which are arranged on shelves.

This program helps children to practise left to right scanning while at the same time developing colour and shape matching skills.

Although all four programs do benefit from colour, this one is impossible to play without it, so owners of the green monitor would be well advised to get hold of a TV modulator before buying this package.

Mr Forgetful's wardrobe game is a memory test based on Pelmanism, where the player must help Mr Forgetful to open the doors of several wardrobes in which are hidden pairs of objects such as socks, shoes and mittens.

The final program is a variant of the wardrobe game where the hidden objects are letters instead of shapes.

This is an excellent package, making good use of graphics and sound. It's guaranteed to capture the imagination of any child.

Steve Lucas

Reviewed so far

Adventure Quest	Level 9
Alex Higgins, World Snooker	GEM
Americaf Football	APS
Amstradraw	B.S. McAlley
Android One	Vortex
Arnold goes to somewhere else	Nemesis
Artist & Sprite Designer	C.R.L.
Artwork	Kuma
Astro Attack	Amsoft
Amstrad Tutorial	Amsoft
Atomsmasher	Romik
Beach Head	U.S. Gold
Blagger	Alligata
Brawn Free	Nemesis
Bridge Player	C.P.
Centre Court	Epicsoft
Chopper Squad	Interceptor
Code Machine	Picturesque
Colossal Adventure	Level 9
Computer Scrabble	Leisure Genius
Confuzion	Incentive
Country Cottages	Sterling
Crystal Theft	Wiccasoft
Cubit	Mr Micro
Deep Thought Chess	C.P.
Defend or Die	Alligata
Detective	Argus Press
DFM Database+Labels	Dialog
Digger Barnes	Cable
Dragon's Gold	Romik
Draughts	C.P.
Draughtsman	Computer Graphics
Dungeon Adventure	Level 9
Emerald Isle	Level 9
Er*bert	Microbyte
Fantastic Voyage	Amsoft
Fighter Pilot	Digital Integration
First Steps with the Mr Men	Microsoft
Flexi-friend	Camel
Flight Path 737	Anirog
Flight Simulation	Myrrdin
Font 464	Hisoft
Football Manager	Addictive
Frank N. Stein	P.S.S.
Fruit Machine	Amsoft
Fruity Frank	Kuma
Forest at World's End	Interceptor
Fu Kung in Las Vegas	Romik
Galaxia	Kuma
Gate Crasher	Exopal
Gems of Stradus	Kuma
Ghouls	Micro Power
Handicap Golf	CRL
Happy Letters	B.E.S.
Hard Hat Mack	Ariolasoft
Harrier Attack	Durrell
Here and There with the Mr Men	Mirrorsoft
Happy Writing	B.E.S.
Holdfast	Kuma
Home Accounts Manager	Dialog
Home Budget	Kuma
House that Jack Built	Knightsoft
Hunchback	Ocean
Hunter Killer	Protek
Invostat	Dialog
Jammin	Taskset
Jet Boot Jack	English
Jet Set Willy	Software Projects
Key Factor	Amsoft
Killer Gorrila/Gauntlet	Micro Power
Lords of Time	Level 9
Manic Miner	Software Projects
Map Rally	B.E.S.
Masterfile	Campbell
Message from Andromeda	Interceptor
Millionaire	Incentive
Money Manager	Connect Systems
Mountain Palace Adventure	Duckworth
Mr Freeze	Firebird
Mr Wong's Loopy Laundry	Artic Computing
Music Composer	Kuma
Mutant Monty	Artic Computing
Mystery of the Java Star	Shards
Number Painter	ASK
Osprey	B.E.S.
Pinball Wizard	C.P.
Project Planner	Amsoft
Psychedelia	Llamasoft
Punchy	Mr Micro
Pyjamarama	Microgen
Return to Eden	Level 9
Ring of Darkness	Wintersoft
Roland in Space	GEM
Roland in the Caves	Amsoft
Roland Goes Square Bashing	Durell
Rollaball	Timeslip
Royal Quest	Timeslip
Screen Designer	DJL
Sir Lancelot	Melbourne House
Smuggler's Cove	Camel
Snooker	CDS
Snooker	Gem
Snowball	Level 9
Software Star	Addictive
Sorcery	Virgin
Splat	Incentive
Star Avenger	Kuma
Star Watcher	Amsoft
Stockmarket	Argos Press
Strip Poker	Knightsoft
Superchess	C.P.
Survivor	Anirog
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The Moors Challenge	Timeslip
The Prize	Arcade
The Wild Bunch	Firebird
Timebomb	Black Knight
Timeman One	B.E.S.
Timeman Two	B.E.S.
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PROTEXT FEATURE SUMMARY

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Inserting and deleting – Insert/overwrite mode, insert character or line, delete character forwards or backwards, delete word.
FIND and REPLACE – Wildcards, all or part of text, case specific, whole word or part of word, find control codes.
Block commands – Move/copy/delete/save/print/format.
Markers – 2 block markers and 10 place markers may be set anywhere.
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Ruler lines – Unlimited number of ruler lines to define margins and tabs.
Print options – Headers/footers, page numbers, variable line spacing, variable page length and margin sizes, conditional page throws, odd and even page features, continuous or single sheets, multiple copies.
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Help features – Optional on screen command summaries.
Built in character sets – Danish/French/German/Italian/Spanish/Swedish.
Other features – Non break space, display tabs, returns and hard spaces, soft hyphens, word count, case conversion, copy ruler. 40 page easy to read manual with full index and glossary of terms.

BENCHTESTS

A standard file of 775 words (4,785 characters) was used to carry out the following benchtests (all timings are in seconds):

	PROTEXT	TASWORD/AMSWORD
1 LOAD text file	4.7	10.2
2 SAVE text file	4.9	18.9
3 Re-FORMAT paragraph (85 words)	0.4	15.3
4 Re-FORMAT entire text	2.5	Not Possible
5 Move directly to start of text	under 0.1	2.2
6 Move directly to end of text	0.2	2.2
7 REPLACE 'the' with 'THE' (45 occurances)	1.7	34.1
8 SCAN entire text	2.2	7.2
9 MERGE file to centre of text	4.0	Not Possible
10 MERGE file to end of text	3.8	12.4
11 MOVE 85-word paragraph	under 0.1	6.8
12 PROGRAM LOAD TIME DISC ROM	12.9 Instant	14.6 Not Available

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Getting the arcade act together...

ROLAND WADDILOVE rounds off his machine code graphics series with a balloon game that demonstrates how the routines click together

OVER the past few months we've looked at the techniques we need to produce a machine code game. We've examined the screen memory map, looked at reading the keyboard and seen how to handle collision detection.

To see how it all fits together and round off the series, I've written the bare bones of a machine code game. It's relatively short and simple, but it does show how the various routines combine to produce an arcade game.

Program I is the assembly language version of the program. You'll have met many of the routines before earlier in the series.

Program II is the Basic version, where the machine code is contained in data statements which are read and poked into the memory. There are rather a lot, so take care when entering them.

The game involves potting balloons with a pea shooter as they float skywards. If you manage to hit one you will be rewarded with a pop. The space bar is used as the fire button.

The balloons are placed randomly at the bottom of the screen and float gently up. A quick and easy way of finding a small random number is to look at the memory refresh register, R.

This is provided to refresh dynamic memories automatically. Unless you're repeating the same piece of code over and over again it effectively contains a random number between 0 and 255.

```
LD A,R
```

will load the A register with a random number. This is used as the x coordinate. The y coordinate is always the same at the start.

The game starts at &808D by putting the man with the pea shooter on the screen. The main loop starts at &80A2 and after a short random delay calls the routine to play the game at &80B6.

Instead of using the official frame flyback routine via the firmware call at &BD19, I have incorporated my own faster routine which does not involve switching the lower ROM in and out.

As far as machine code games are concerned, steer clear of operating systems as much as possible, they're too general.

And don't bother with interrupts if you are after speed.

The sprite print routine is at &8000. I've made a few slight changes since the October issue when it was listed. It's now even better. The collision detection is at &8053.

That's all there is to it. Writing an arcade game isn't as difficult as you think. Adding the sound effects and score is fairly straightforward, so I'll leave that up to you.

I hope you've enjoyed this short series and learnt a few new techniques. Think of me when you're earning thousands of pounds from your super zap 'em mega arcade game!

Program I

```
RAM Assembler V.3

Pass... 2           ORG &8000


8000:               .new=&802A
8000:               .old=&8005
8000:               .newdata=&802D
8000:               .olddata=&8008

8000:               .print
8000:22 7F 80       LD (rows),HL
8003:4D             LD C,L
8004:21 00 00       LD HL,0
8007:11 00 00       LD DE,0
800A:F3             DI
800B:               .loop1
800B:3A 80 00       LD A,(columns)
800E:47             LD B,A
800F:E5             PUSH HL
8010:               .loop2
8010:1A             LD A,(DE)
8011:AE             XOR (HL)
8012:77             LD (HL),A
8013:23             INC HL
8014:13             INC DE
8015:10 F9          DJNZ loop2
8017:E1             POP HL
8018:7C             LD A,H
8019:C6 08          ADD A,&8
801B:67             LD H,A
801C:D2 25 80       JP NC,nextrow1
801F:79             LD A,C
8020:01 50 C0       LD BC,&C050
8023:09             ADD HL,BC
8024:4F             LD C,A
8025:               .nextrow1
8025:0D             DEC C
8026:C2 0B 80       JP NZ,loop1
8029:               .put
8029:21 00 00       LD HL,0
802C:11 00 00       LD DE,0
802F:3A 7F 80       LD A,(rows)
8032:4F             LD C,A
```

```
8033:                .loop3
8033:3A 80 80        LD A,(columns)
8036:47              LD B,A
8037:E5              PUSH HL
8038:                .loop4
8038:1A              LD A,(DE)
8039:AE              XOR (HL)
803A:77              LD (HL),A
803B:23              INC HL
803C:13              INC DE
803D:10 F9           DJNZ loop4
803F:E1              POP HL
8040:7C              LD A,H
8041:C6 08           ADD A,&8
8043:67              LD H,A
8044:D2 4D 80        JP NC,nextrow2
8047:79              LD A,C
8048:01 50 C0        LD BC,&C050
804B:09              ADD HL,BC
804C:4F              LD C,A
804D:                .nextrow2
804D:0D              DEC C
804E:C2 33 80        JP NZ,loop3
8051:FB              EI
8052:C9              RET

8053:                .bumped
8053:21 87 80        LD HL,spr2x
8056:3A 85 80        LD A,(spr1x)
8059:BE              CP  (HL)
805A:38 0A           JR C,c1
805C:7E              LD A,(HL)
805D:80              ADD A,B
805E:47              LD B,A
805F:3A 85 80        LD A,(spr1x)
8062:90              SUB B
8063:D0              RET NC
8064:18 05           JR checky
8066:                .c1
8066:82              ADD A,D
8067:57              LD D,A
8068:7E              LD A,(HL)
8069:92              SUB D
806A:D0              RET NC
806B:                .checky
806B:23              INC HL
806C:3A 86 80        LD A,(spr1y)
806F:BE              CP  (HL)
8070:38 08           JR C,c2
8072:7E              LD A,(HL)
8073:81              ADD A,C
8074:4F              LD C,A
8075:3A 86 80        LD A,(spr1y)
8078:91              SUB C
8079:C9              RET
807A:                .c2
807A:83              ADD A,E
807B:5F              LD E,A
807C:7E              LD A,(HL)
807D:93              SUB E
807E:C9              RET

807F:                .rows
807F:00              DEFB 0
8080:                .columns
8080:00              DEFB 0
8081:                .address
8081:00 00           DEFW 0
8083:                .yourxy
8083:00 00           DEFW 0
8085:                .spr1x
8085:00              DEFB 0
8086:                .spr1y
8086:00              DEFB 0
8087:                .spr2x
8087:00              DEFB 0
8088:                .spr2y
8088:00              DEFB 0
8089:                .peas
8089:00 00           DEFW 0
808B:                .peaxy
808B:00 00           DEFW 0


Put pea shooter on screen
808D:21 30 C2        LD HL,&C230
8090:22 2A 80        LD (new),HL
8093:21 DC 90        LD HL,&90DC
8096:22 2D 80        LD (newdata),HL
8099:21 18 05        LD HL,&0518
809C:22 7F 80        LD (rows),HL
809F:CD 29 80        CALL put
80A2:                .start
80A2:ED 5F           LD A,R
80A4:47              LD B,A
80A5:                .delay
80A5:CD C8 81        CALL frame
80A8:10 FB           DJNZ delay
80AA:CD B6 80        CALL game
80AD:3E 12           LD A,18
80AF:CD 1E BB        CALL &BB1E
80B2:CA A2 80        JP Z,start
80B5:C9              RET

80B6:                .game
80B6:AF              XOR A
80B7:32 8B 80        LD (peaxy),A
80BA:ED 5F           LD A,R
80BC:E6 3F           AND %00111111
80BE:C6 08           ADD A,8
80C0:5F              LD E,A
80C1:16 A8           LD D,&A8
80C3:ED 53 83 80     LD (yourxy),DE
80C7:16 00           LD D,0
80C9:21 90 C6        LD HL,&C690
80CC:19              ADD HL,DE
80CD:22 81 80        LD (address),HL
80D0:CD D4 81        CALL putballoon

80D3:                .up
80D3:21 00 90        LD HL,&9000
80D6:22 08 80        LD (olddata),HL
80D9:22 2D 80        LD (newdata),HL
80DC:2A 81 80        LD HL,(address)
80DF:22 05 80        LD (old),HL
80E2:ED 5B 83 80     LD DE,(yourxy)
80E6:7A              LD A,D
80E7:A7              AND A
80E8:C2 F9 80        JP NZ,nottop
80EB:CD DB 81        CALL pb1
80EE:                .peasoff
80EE:3A 8B 80        LD A,(peaxy)
80F1:A7              AND A
80F2:C8              RET Z
80F3:2A 89 80        LD HL,(peas)
80F6:C3 E7 81        JP putpeas
80F9:                .nottop
80F9:15              DEC D
80FA:ED 53 83 80     LD (yourxy),DE
80FE:7C              LD A,H
80FF:D6 08           SUB &08
8101:67              LD H,A
8102:D6 C0           SUB &C0
8104:30 04           JR NC,here
8106:01 B0 3F        LD BC,&3FB0
8109:09              ADD HL,BC
810A:                .here
810A:ED 53 83 80     LD (yourxy),DE
810E:22 81 80        LD (address),HL
8111:22 2A 80        LD (new),HL
8114:21 16 05        LD HL,&0516
8117:CD C8 81        CALL frame
811A:CD 00 80        CALL print

811D:3A 8B 80        LD A,(peaxy)
8120:A7              AND A
8121:C2 3E 81        JP NZ,fire

                     Shoot ?
8124:3E 2F           LD A,47
8126:CD 1E BB        CALL &BB1E
8129:CA D3 80        JP Z,up
812C:21 06 3C        LD HL,&3C06
812F:22 8B 80        LD (peaxy),HL
8132:21 36 E2        LD HL,&E236
8135:22 89 80        LD (peas),HL
8138:CD E7 81        CALL putpeas
813B:C3 D3 80        JP up
```

```
813E:                   .fire
813E:21 54 91           LD HL,&9154
8141:22 08 80           LD (olddata),HL
8144:22 2D 80           LD (newdata),HL
8147:2A 89 80           LD HL,(peas)
814A:22 05 80           LD (old),HL
814D:3A 8B 80           LD A,(peaxy)
8150:FE 4C              CP  &4C
8152:C2 62 81           JP NZ,peasok
8155:22 2A 80           LD (new),HL
8158:AF                 XOR A
8159:32 8B 80           LD (peaxy),A
815C:CD F1 81           CALL pe1
815F:C3 D3 80           JP up
8162:                   .peasok
8162:3C                 INC A
8163:32 8B 80           LD (peaxy),A
8166:23                 INC HL
8167:22 89 80           LD (peas),HL
816A:22 2A 80           LD (new),HL
816D:21 01 04           LD HL,&0401
8170:CD 00 80           CALL print


                        Check if hit
8173:                   .collision
8173:2A 83 80           LD HL,(yourxy)
8176:22 85 80           LD (spr1x),HL
8179:2A 8B 80           LD HL,(peaxy)
817C:22 87 80           LD (spr2x),HL
817F:11 16 05           LD DE,&0516
8182:01 01 04           LD BC,&0401
8185:CD 53 80           CALL bumped
8188:D2 D3 80           JP NC,up
818B:2A 81 80           LD HL,(address)
818E:22 2A 80           LD (new),HL
8191:22 05 80           LD (old),HL
8194:21 00 90           LD HL,&9000
8197:22 08 80           LD (olddata),HL
819A:21 6E 90           LD HL,&906E
819D:22 2D 80           LD (newdata),HL
81A0:21 16 05           LD HL,&0516
81A3:CD C8 81           CALL frame
81A6:CD 00 80           CALL print
81A9:06 19              LD B,25
81AB:                   .check
81AB:CD C8 81           CALL frame
81AE:10 FB              DJNZ check
81B0:21 6E 90           LD HL,&906E
81B3:22 2D 80           LD (newdata),HL
81B6:2A 81 80           LD HL,(address)
81B9:22 2A 80           LD (new),HL
81BC:21 16 05           LD HL,&0516
81BF:22 7F 80           LD (rows),HL
81C2:CD 29 80           CALL put
81C5:C3 EE 80           JP peasoff

Wait for frame flyback
81C8:                   .frame
81C8:F5                 PUSH AF
81C9:C5                 PUSH BC
81CA:06 F5              LD B,&F5
81CC:                   .f1
81CC:ED 78              IN A,(C)
81CE:1F                 RRA
81CF:30 FB              JR NC,f1
81D1:C1                 POP BC
81D2:F1                 POP AF
81D3:C9                 RET

Put balloon on screen
81D4:                   .putballoon
81D4:11 00 90           LD DE,&9000
81D7:ED 53 2D 80        LD (newdata),DE
81DB:                   .pb1
81DB:22 2A 80           LD (new),HL
81DE:21 16 05           LD HL,&0516
81E1:22 7F 80           LD (rows),HL
81E4:C3 29 80           JP put

                        Put peas on screen
81E7:                   .putpeas
81E7:11 54 91           LD DE,&9154
81EA:ED 53 2D 80        LD (newdata),DE
81EE:22 2A 80           LD (new),HL
81F1:                   .pe1
81F1:21 01 04           LD HL,&0401
81F4:22 7F 80           LD (rows),HL
81F7:C3 29 80           JP put
81FA:                   END
```

Program 11

```
10 REM Example Machine Code Game
20 REM By R.A.Waddilove
30 REM(c)Computing With The Amstrad
40 MEMORY &7FFF
50 MODE 1:PRINT "Press the space bar
to fire...":PRINT:PRINT "Hold down EN
TER(464)/RETURN(6128) to    return to
 Basic.":PRINT:PRINT:PRINT "Thinking"
;
60 a=&8000
70 FOR i=1 TO 46
80 PRINT ".";
90 sum=0:READ a$,b$
100 FOR j=1 TO 21 STEP 2
110 k=VAL("&"+MID$(a$,j,2)):POKE a,k
120 sum=sum+k:a=a+1
130 NEXT
140 IF sum<>VAL("&"+b$) THEN PRINT "E
rror in line";150+i*10:STOP
150 NEXT
160 DATA 227F804D2100001100008F3,293
170 DATA 3A8088047E51AAE77231310,3EB
180 DATA F9E17CC6B867D225807981,57C
190 DATA 50C8094F8DC2B9B2110000,2E3
200 DATA 1100003A7F804F3A808047,31A
210 DATA E51AAE77231310F9E17CC6,586
220 DATA 0B67D24D80790150C0094F,3F8
230 DATA 0DC23380FBC92187803A85,52D
240 DATA 80BE380A7E80473A858090,494
250 DATA D0180582577E92D0233A86,489
260 DATA 80BE38087E814F3A868091,49D
270 DATA C9835F7E93C9000000000,385
280 DATA 0000000000000000002130,051
290 DATA C2222A8021DC90222D8021,40B
300 DATA 1805227F80CD2980ED5F47,447
310 DATA CDC88110FBCDB6803E12CD,641
320 DATA 1EBBCAA280C9AF328B80ED,667
330 DATA 5FE63FC6085F16A8ED5383,532
340 DATA 8016002190C61922810CD,416
350 DATA D4812100902208802228D80,37F
360 DATA 2A818022058ED5B83807A,497
370 DATA A7C2F980CDDB813A8B80A7,6F7
380 DATA C82A8980C3E78115ED5383,5FE
390 DATA 807CD60867D6C0300401B0,4BC
400 DATA 3F09ED53838022810222A,3FA
410 DATA 8021160SCDC881CD00803A,459
420 DATA 8B80A7C23E813E2FCD1EBB,546
430 DATA CAD38021063C228B802136,404
440 DATA E2228980CDE781C3D38021,679
450 DATA 5491220880222D802A8980,391
460 DATA 2205803A8B80FE4CC26281,4DB
470 DATA 222A80AF328B80CDF181C3,5BA
480 DATA D3803C328B8023228980222,43C
490 DATA 2A80210104CD08802A8380,34A
500 DATA 2285802A8B8022878011 16,3AC
510 DATA 05010104CD5380D2D3802A,3FA
520 DATA 8180222A80220580210890,325
530 DATA 220880216E90222D802116,2CF
540 DATA 05CDC881CD00800619CDC8,51C
550 DATA 8110FB216E90222D802A81,425
560 DATA 80222A8021160S227F80CD,376
570 DATA 2980C3EE80F5C506F5ED78,6F4
580 DATA 1F30FBC1F1C9110090ED53,5A6
590 DATA 2D80222A8021160S227F80,2D6
600 DATA C3298011549 1ED5320D8022,471
610 DATA 2A80210104227F80C32980,35D
620 FOR i=0 TO 15
630 READ j:INK i,j
640 NEXT
650 DATA 0,18,6,24,2,8,20,26,15,16,7,
9,13,22,2,26
660 REM --------- Graphics ---------
670 sum=0
680 FOR i=0 TO 343
690 READ j
700 sum=sum+j
```

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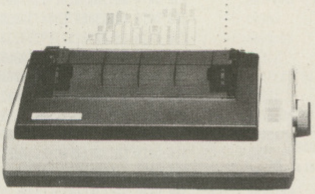

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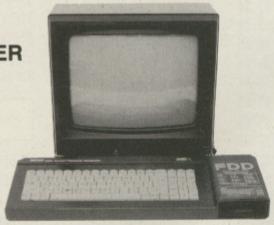

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Machine Code Graphics

```
710 POKE &9000+i,j
720 NEXT
730 IF sum<>27275 THEN PRINT "Error i
n graphic data...":STOP
740 REM ballon
750 REM Rows=22/Columns=5
760 DATA 0,68,232,128,0,0,236,196,200
,0,68,212,236,197,138,236,204,192,236
770 DATA 207,236,252,204,192,207,220,
204,212,197,207,236,232,236,196,207,2
36
780 DATA 220,192,197,207,252,200,204,
204,207,68,236,212,192,138,68,220,204
790 DATA 197,138,0,200,200,196,0,0,25
2,212,200,0,0,64,204,138,0,0,84,200,1
36
800 DATA 0,0,0,232,0,0,0,0,204,0,0,0,
0,200,0,0,0,0,12,0,0,0,0,12,0,0,0,0,1
2
810 DATA 0,0,0,0,12,0,0
820 REM Pop!
830 REM Rows=22/Columns=5
840 DATA 0,168,200,64,0,168,68,0,128,
69,68,0,196,0,138,168,0,0,69,69,68,68
850 DATA 0,136,138,136,168,51,69,69,0
,0,51,0,0,68,64,0,128,138,168,168,0,6
8
860 DATA 69,68,17,0,34,138,168,0,200,
17,69,17,68,0,128,34,0,168,0,69,17,68
870 DATA 64,0,128,138,0,64,0,128,0,0,
0,192,0,0,0,0,192,0,4,4,0,192,0,0,0,8
880 DATA 12,4,0,0,0,12,0,4,0,0,12,0,0
,8,8,12,4,4
890 REM Pea shooter
900 REM Rows=24/Columns=5
910 DATA 0,51,0,0,0,17,51,34,0,0,51,5
0,130,0,0,51,99,195,0,0,51,195,130,0,
0
920 DATA 51,195,4,195,0,17,195,130,19
5,0,0,195,0,192,0,0,195,0,192,0,64,19
2
930 DATA 0,192,0,128,64,128,192,0,128
,0,192,64,0,192,0,0,64,0,192,0,0,64,0
940 DATA 128,192,192,128,0,128,0,128,
0,0,192,192,128,0,0,224,192,160,0,0,2
40
950 DATA 240,0,0,0,80,240,0,0,0,0,240
,0,0,0,0,240,0,0,0,0,48,0,0,0,0,48,32
960 DATA 0,0
970 REM Peas
980 REM Rows=1/Columns=4
990 DATA 204,136,68,68
1000 REM --------- The Game --------
1010 MODE 0:BORDER 0
1020 PAPER 12:PEN 11:LOCATE 1,25:PRIN
T STRING$(20,207);
1030 LOCATE 1,11:PRINT CHR$(216)
1040 PAPER 0
1050 CALL &800D
```

Give your fingers a rest . . .

All the listings from this month's issue are available on cassette.

See our special offer on Page 93.

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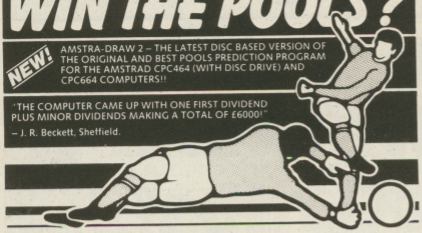

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Making light of penmanship

DORENE COX tries her hand with four light pens

CHRISTMAS came early for me this year and a lot of fun it was too, playing with a bundle of light pens for the Amstrad.

Under scrutiny were the Amstrad LP–1 at £19.95, DK'Tronics Graphic Lightpen at £24.95, the Electric Studio Light Pen at £19.95 (tape) or £26.95 (disc), and Dart Electronics Light Pen at £39.95, henceforth referred to as "LP", "DK", "Electric" and "Dart".

The LP is colour monitor/TV only, won't work with a serial interface or speech synthesiser present, and plugs into the joystick port.

The others use the disc port and include a green monitor facility. Dart's and DK's interfaces resemble the disc interface, matching the computer livery, and with a through connector for add-ons.

Electric's interface is only slightly larger than the port and has no through connector on the tape version.

Each pen comes with a software graphics package. Dart has built-in disc transfer and relocatable pen code. The LP and DK are deliberately unprotected, intending their routines to be used in your own lightpen programs and encouraging back-up copy or transfer to disc.

Electric protects against accidental break, and 464 owners will gnash teeth at their inability to connect discs.

All the pens look much the same, like a black biro without the refill. When pointed close to the screen they detect refreshment – and I don't mean beer.

You see, faster than your eye can see, every pixel position is constantly being switched off, updated with the latest information and switched on again.

The pen detects the off/on and signals the computer, which calculates the pen position by the difference in time between start of refreshment and pen signal.

When you consider we're dealing in microseconds here, the wonder is that the position calculation is as near as it is.

But don't expect pinpoint accuracy, although Dart comes very close. The others let you switch to cursor control when you need the extra detail.

Electric allows joystick control as well, but cursor is more accurate. And note that dark backgrounds make pen light detection difficult, although careful screen organisation can overcome this.

All of the packages can operate in Mode 0. The LP offers Mode 1 as well, plus a small light pen game, and Dart provides all modes.

The LP has two full screen menus, with a little white "touch here" box beside each function, taking you to the alternate screen menu, a colour change menu, or the draw screen. Pressing Enter twice returns you to the menu.

Dart has a full screen black on white menu, called by M, with a touch box beside each item which turns blue on selection. Escape returns to Draw Screen.

DK's are ikon driven, overlaying the draw screen centre when called. Each contains three to five pictures – an artist's palette for colour change, a water tap for fill – and includes entrance to the next menu.

As the pen is pointed, large flashing brackets surround the indicated ikon and Enter confirms selection, forwarding to another menu or Draw Screen. Escape returns to the last or previous menu at any time.

Electric is also ikon driven and covers 60 items – including the colour palette – in a single menu, with choice of display left or right of the draw screen.

You point the pen, and when the chosen ikon centre flashes, press Space bar to select function and remove menu. Enter returns to menu.

The lightpens vary considerably when it comes to the manner of DRAWing.

Amstrad expects you to select approximate positions by penpoint and Space bar, providing a small flashing point which can be manipulated by the cursor key.

A large flashing band rushes in from screen edge to leave the small flashing point. Although alarming, it's the reason why dark backgrounds are no problem to the LP pen.

DK provides a small character cross-hair cursor, following pen or cursor as selected and fixed by Enter, although the Space bar sometimes has an extra use.

Electric's cursor is a full screen cross which sometimes looks out of focus and jitters madly. Space bar fixes points and Enter ends functions and returns to menu.

Dart's cursor is a single pixel point, steady enough to allow pixel editing on screen. Functions are switched on/off by specified keys, such as D for Draw and E for Elastic.

In free hand draw, Dart performs superbly, but I couldn't control the others. In

fairness, longer familiarity with the pens would probably give better results.

DK and Electric offer re-calibration, but cursor jitter probably makes this purely cosmetic. Electric clearly says use cursor keys on brushes, spraycans and textures.

Only the LP and Dart allow the full choice of 16 from 27 colours although the LP's advantage is somewhat outweighed by their SAVE method which needs a fair degree of programming knowledge to finally heave the saved screen into your own program.

DK confines you to their selection of 10. Not a bad choice, but the two blues look alike on TV.

Electric offers 15 ink colours – chosen by them – and all 27 as paper colours. Again, the choice includes blues and greens which look much the same on TV.

But a listing given in the manual allows the full range – DK, please note. The Clr key step-changes through the ink colours in some functions.

The LP lightpen offers none of the brushes, spraycans and textures users of lightpens on other micros will be used to.

Dart on the other hand has three pen widths, two spraycan widths and a superb thick and thin (depending on direction) pen.

DK has four widths of pen, usable in all directions, and a superb spraycan effect.

Electric's brushes operate up and down only, but have nine widths, obtained from the numeric pad. The original nine width, dot adjustable spraycan indicated in the manual has been altered to a single spraycan with better coverage.

Only Electric offers textures, vertical/horizontal bars, plus two checkerboard types, each varying further via the numeric pad and small Enter. To be honest, some variations look like multi-coloured garbage, but produce interesting patterns. Sadly, there's no texture fill.

The problem here was remembering the controls. With most Electric functions, Space bar turns the function on then follows the pen or cursor, and enter returns to menu.

With texture, however, you Space bar "on", which drops one character space full of texture, Space bar "off", move to the next position, and repeat the process.

If, as is only too easy, you press Space bar and start to move pen or cursor, half the first square is dragged to the second.

The effect can be quite useful, providing you do it on purpose. If not, the air turns an interesting colour without computer aid.

Electric's fleck colour confines its file of splatter patterns to the few colour mixes displayed, and is difficult to control.

With any lightpen package the acid test is the paint fill. Hours of work can be lost if a fill leaks through one open pixel, so it's useful to be able to take quick remedial action.

LP and Dart score full marks for a Delete last fill function, although LP's fill can be a bit hesitant.

DK's fill will stop if you press Escape fast enough, so damage can be minimised.

But if Electric leaks you've had it. And, unlike the others, Electric demands that the outline be the same colour as the fill. This makes filling their 3D shapes in colour a tedious job of changing the colour of every pixel in the outline by hand.

Filling a different colour will often work, but you're playing Russian roulette.

I found banding the most useful function because I am not your "three quick strokes and it's all there" type artist.

I know the right line when I see it, but it sometimes takes hours and many wrong lines to find it. The screens accompanying this article owe everything to banding.

On LP you plot two points, draw a line between, plot another point, and the line continues from the previous point, making shapes and curves relatively easy.

DK go even better with rubber banding. An elastic line follows your pen or cursor, making it easy to see the eventual shape, and you can plot up to 20 points at a time, deleting backwards should you change your mind, and making complex shapes a doddle.

Electric and Dart also have elastic lines, but operating between two points only. To continue to a third you need to plot number two again first.

And if you forget, repositioning to the last plot again is tricky and can lead to leaky filling points.

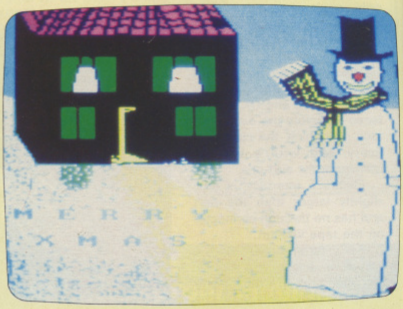
But Electric also offers the ability to plot 12 points and have them transformed into either a 3D figure or a Bezier geometric plane.

Another test of a lightpen package is its range of filled shapes.

Dart provides only circles and rectangles, while the others offer triangles as well, and Electric and the LP include rays.

The LP makes its shapes by plotting opposite corners, or centres and radius, and allows delete. DK happily relies upon its rubber band facility.

All Electric's shapes, ellipses, diamonds, pentagons, hexagons and octagons, are elastic. Plot an approximate



point and the shape appears.

You can then reduce, enlarge, squeeze and elongate with numeric keys, and cursor move to the accurate position before Space bar fixing.

A very nice feature is the 3D box and triangle.

Having drawn your picture, you often want to write on it. LP, Dart and Electric let you type any keyboard available alphanumeric in any position, although Electric has a nasty bug which they're "looking into".

Be warned. You can adjust to the cursor setting jumping forward one space when you Space bar "on" – but the unwanted printed space caused by Space bar "off" means repair work.

DK offers normal and sideways printing in any position, including all the non-keyboard symbols by using Tab with Ascii code. And it would be simple to user-design these before loading.

Excepting Dart, they all zoom. This is, they can blow up a small selected area of the screen for editing.

LP and DK use the whole screen, Electric uses a smaller overlay on the draw screen and is sometimes inaccurate in return.

Again excepting Dart, they all copy small areas of screen to other positions, but only LP and DK offer a reduce/enlarge by a factor of four function.

Dart has a useful eraser and

Sprites – actually a screen size designer board using a 24 by 24 pixel grid, with all colours to hand. The design can then be placed anywhere on the draw screen.

Deleting dark colours in the first vertical gridline was difficult.

Electric allows small areas to be dragged to a different position, which can be achieved by a combination of functions on the others.

Only Electric has flip/reverse, where you could, for instance, draw one corner ornamentation and process it to match all four corners.

And having created our masterpiece, it's always useful to dump it to a printer. The LP's dump works on the Amstrad DMP-1 only, dumping black/white without shading. A listing for other printers is available from Amsoft. Really it should have been included.

DK gives a separate machine code program, the manual providing enough listings and information to make it work on most printers. The printout is nicely shaded and can be varied in size.

Electric's option is built-in and gives a one size black/white printout without toning.

The Electric has some additional features not found in other packages, such as optional displays of pen/paper numbers, dot or grid backgrounds and cursor x,y positions, which are handy for accurate positioning.

There's also a colourmask facility which changes one colour to another over the whole screen. The vertical/horizontal parallel lines are useful, but the eraser needs practice and the "transfer control to joystick" is a menace if you have no joystick.

"With packages as potentially powerful as lightpens, the in-screen instructions and accompanying manuals are very important.

The LP's on-screen instructions offer terse information on lightpen use and programming. The 12-page manual covers the software functions adequately, gives cassette to disc conversion notes and precious little else.

Dart's six page leaflet has DIY listings for putting screens and the relocatable pen operating code into your own programs. It explains the few functions clearly.

DK's 30 pages go step-by-step over all features, give back-up and discs conversion notes, have lots of information on pen and screens, but require you to type in many listings.

Electric's 24 pages explain the functions and offer listings to use the pen or screens in your own programs.

There are some curious omissions. You're left to guess where the pen plugs in, or how to edit in zoom, for instance.

THE BOTTOM LINE...

DART should be ashamed of their graphics package. It works – but I've seen more facilities in magazine listings. The pen does not work on the pixel edge of the screen, which can leave leaky gaps.

On the other hand, it is streets ahead of the others in overall accuracy and control but, comparing graphic packages, is grossly overpriced.

The remaining three pens appear to share the same, lower level of accuracy, differing only in graphic packages.

The LP's non-frilly package has a full colour range and no dark background problems.

But using created screens is difficult and an uninvited, self-printing arrow, apparently due to the joystick port connection, is a nuisance both in loading and editing the program listing.

DK's package is easy to use and offers many frills. Its large ikons make selection reliable and information is generous. But it falls down on its small colour selection and lack of an integral printer dump.

Electric's weakness is its menu. 60 items in 5 by 25 character spaces makes each ikon extremely small and, hindered by cursor jitter, you all too often unknowingly trigger the wrong one and the result can be disastrous.

Monitors improve, but don't cure this problem. And having to fill an area in the same colour fill as its outline is a bore.

But there's a lot of goodies here to make up for the inconvenience of frequent safety saving.

Which would I choose? Well, if we've talking strictly about hardware, I'd go for the Dart because of its accuracy.

However software is a vital part of a lightpen package, so I'd choose the DK'Tronics pen because of its versatility and reliability.

DORENE COX

Help Haggy through Santa's Grotty

IT'S Christmas Eve, and Santa's out on the town doing what Santa's best at during the festive season. He's also delivering presents to the kiddies.

He left home just as it went dark, but in his rush to get the job started left quite a few Christmas stars lying around the place.

That's not unusual, but the trouble is that the monsters from the infamous Grotty, that incredible lonely dark, dank land of the unbeliever, have gone out on the prowl, broken into his house and stolen the stars to sell on the "white" market.

You play the part of Haggy, Santa's right hand witch and part-time guardian of the Grotty. Your job is to get the stars back before anybody finds out they're missing.

To retrieve the stars you must enter the Grotty in your jet-pack powered suit, avoiding all the Meanies. You have to collect them all before the mists of darkness descend, as all caverns entered thereafter will be pitch black, and you won't be able to see your hand in front of your ugly face.

Good luck Haggy, you're going to need it.

VARIABLES

x,y	Haggy's coordinates.
x1,y1 x2,y2 x3,y3	Monsters' coordinates.
gra1 gra2 gra3	Monsters' shape number.
ll1,hl1 ll2,hl2 ll3,hl3	High and low limit of monsters' movement.
dir1,dir2 dir3,dir4	Monsters' direction: 1 = increase x, 2 = decrease x, 3 = increase y, 4 = decrease y.
star	Number of stars collected.
score	End score based on time and number of stars.
hs	High scores.
na$	High score names.
screen	Current screen number.
ti	Time left before darkness descends.

The Keys

Z	Left
X	Right
Space	Thrust

The sensational search for Santa's stars

By ARAMELLO CHAPMAN

SUBROUTINES

70	Main loop.
230	Moves Haggy.
700	Moves hazards.
990	Congratulations.
1040	End of game.
1180	Sets up screen.
1420	Initialises variables.
1480	Sets up screen border.
1650	Instructions.
1790	Sets up UDGs.
2050	Initial set up.
2870	High score.

```
1 REM Santas Grotty
2 REM By A.Chapman
3 REM Graphics Routine
4 REM By R.A.Waddilove
5 REM(c)Computing with the Amstrad
6 ON ERROR GOTO 30000
10 GOSUB 1790:REM U.D.G's
20 GOSUB 2050:REM Initial Set Up
30 GOSUB 1650:REM Instructions
40 GOSUB 1480:REM Set Up Border & Tit
le
50 GOSUB 1420:REM Variables
60 GOSUB 1180:REM Set Up Screen
70 REM**********Main Loop***********
80 th=0
90 GOSUB 230
100 IF exit=1 THEN exit=0:GOTO 60
110 GOSUB 940
120 GOSUB 700
130 GOSUB 940
140 IF star=0 THEN POKE 34857,3:POKE
34868,3:IF screen=5 THEN LOCATE 11,2:
PRINT" ":LOCATE 11,3:PRINT" "
150 IF star=19 THEN POKE 36297,3
160 IF star=28 THEN 990
170 IF lives<1 THEN 1040
180 ti=ti-1:IF ti<0 THEN ti=0
190 PAPER#1,14:PEN#1,0
200 IF ti>-1 THEN LOCATE #1,14,17:PRI
NT#1,ti
210 IF st=1 THEN LOCATE #1,15,14:PAPE
R#1,14:PEN#1,0:PRINT#1,star:st=0
220 GOTO 70
230 REM*********Move Haggy***********
240 IF INKEY(71)<>0 AND INKEY(63)<>0
AND INKEY(47)<>0 THEN GOTO 280
250 IF INKEY(71)=0 THEN GOSUB 400:GOT
O 280
260 IF INKEY(63)=0 THEN GOSUB 500:GOT
O 280
270 IF INKEY(47)=0 THEN GOSUB 600
280 IF j=19 THEN 330
290 IF y>16 THEN 310
300 GOSUB 690:IF PEEK(s+(po+22))=4 TH
EN star=star+1:POKE(s+(po+22)),3:st=1
310 IF PEEK(s+(po+22))=3 THEN j=j+1:p
o=po+11
320 IF j<20 THEN 360
330 IF loc(screen,2)=0 THEN 360
340 f=screen:screen=loc(screen,2):GOS
UB 690:IF PEEK(s+(x-1))<>3 OR PEEK(s+
11+(x-1))<>3 THEN screen=f:GOTO 360
350 po=i-1:j=2:exit=1
360 IF exit=1 THEN CALL &A000,x,y,x,y
,3:CALL &A000,x,y+1,x,y+1,3:GOTO 380
370 IF th=1 THEN CALL &A000,x,y,i,j,p
ic:CALL &A000,x,y+1,i,j+1,pic+1 ELSE
IF th=0 THEN CALL &A000,x,y+1,i,j+1,p
ic+1:CALL &A000,x,y,i,j,pic
380 x=i:y=j
390 RETURN
400 pic=6:IF i=2 THEN 450
410 SOUND 132,0,15,3,1,4
420 GOSUB 690:IF PEEK(s+po-1)=4 THEN
star=star+1:POKE (s+po-1),3:st=1 ELSE
 IF PEEK(s+po+10)=4 THEN star=star+1:
POKE (s+po+10),3:st=1
430 IF PEEK(s+po-1)<>3 OR PEEK(s+(po+
10))<>3 THEN RETURN
440 i=i-1:po=po-1:RETURN
450 IF loc(screen,4)=0 THEN RETURN
460 f=screen:screen=loc(screen,4)
470 GOSUB 690:IF PEEK(s+(po+10))<>3 O
R PEEK(s+(po+21))<>3 THEN screen=f:RE
TURN
480 po=po-1
490 i=12:j=j-1:exit=1:RETURN
500 pic=4:IF i=12 THEN 550
510 SOUND 132,0,15,3,1,4
520 GOSUB 690:IF PEEK(s+po+1)=4 THEN
star=star+1:POKE (s+po+1),3:st=1 ELSE
 IF PEEK(s+(po+11)+1)=4 THEN star=sta
r+1:POKE (s+(po+11)+1),3:st=1
530 IF PEEK(s+po+1)<>3 OR PEEK(s+(po+
12))<>3 THEN RETURN
540 i=i+1:po=po+1:RETURN
550 IF loc(screen,3)=0 THEN RETURN
560 f=screen:screen=loc(screen,3)
570 GOSUB 690:IF PEEK(s+(po-10))<>3 O
R PEEK(s+(po+1))<>3 THEN screen=f:RET
URN
580 po=po-10
590 i=2:exit=1:RETURN
600 SOUND 130,0,15,10,3,0,1:IF j=2 TH
EN 640
610 GOSUB 690:IF PEEK(s+(po-11))=4 TH
EN star=star+1:POKE(s+(po-11)),3:st=1
620 IF PEEK(s+(po-11))<>3 THEN RETURN
630 j=j-2:po=po-22:th=1:RETURN
640 IF loc(screen,1)=0 THEN RETURN
650 f=screen:screen=loc(screen,1)
660 GOSUB 690:IF PEEK(s+(198+(x-1)))(
>3 OR PEEK(s+(187+(x-1)))<>3 THEN scr
een=f:RETURN
670 po=176+(i-1)
680 j=18:exit=1:RETURN
690 s=33999+((screen-1)*209):RETURN
700 REM********Move hazards**********
710 LET x4=x1:i1=x1:y4=y1:j1=y1:h1=h1
1:dir=dir1:l1=111
720 ON dir1 GOSUB 860,880,900,920
730 CALL &A000,x1,y1,i1,j1,gra1
740 x1=i1:y1=j1:dir1=dir
750 IF x2=0 THEN RETURN
760 LET x4=x2:i1=x2:y4=y2:j1=y2:h1=h1
2:dir=dir2:l1=112
770 ON dir2 GOSUB 860,880,900,920
780 CALL &A000,x2,y2,i1,j1,gra2
790 x2=i1:y2=j1:dir2=dir
800 IF x3=0 THEN RETURN
810 LET x4=x3:i1=x3:y4=y3:j1=y3:h1=h1
3:dir=dir3:l1=113
820 ON dir3 GOSUB 860,880,900,920
830 CALL &A000,x3,y3,i1,j1,gra3
840 x3=i1:y3=j1:dir3=dir
850 RETURN
860 i1=x4+1:IF i1=h1 THEN dir=2:IF sc
reen=2 THEN j1=j1+1 ELSE IF screen=11
 OR screen=13 THEN i1=l1:dir=1
870 RETURN
880 i1=x4-1:IF i1=l1 THEN dir=1:IF sc
reen=2 THEN j1=j1-1
890 RETURN
900 j1=y4+1:IF j1=h1 THEN dir=4
910 RETURN
920 j1=y4-1:IF j1=l1 THEN dir=3
930 RETURN
940 IF (x=x1 AND (y=y1 OR y+1=y1)) OR
 (x=x2 AND (y=y2 OR y+1=y2)) OR (x=x3
 AND (y=y3 OR y+1=y3)) THEN GOSUB 960
950 RETURN
960 lives=lives-1:IF lives<1 THEN RET
URN
970 OUT &BC00,8:OUT &BD00,1:SOUND 130
,0,50,15,1,1,3:LOCATE #1,13+lives,20:
PAPER #1,14:PRINT#1," ":LOCATE #1,13+
lives,21:PRINT#1," ":OUT &BC00,8:OUT
&BD00,0
980 RETURN
990 REM********Congratulations********
1000 RESTORE 1030:FOR f=1 TO 24:READ
n:SOUND 4,n,20,15,1:NEXT
1010 LET score=(star*100)+(ti*2)
1020 PRINT STRING$(32,11):LOCATE 2,7:
PRINT"WELL DONE":FOR f=1 TO 2000:NEXT
 f:GOTO 2870
1030 DATA 60,53,47,45,60,0,0,45,47,45,4
0,53,0,53,47,45,36,40,40,45,45,47,53,
47,60
1040 REM*********End of game**********
*
1050 LOCATE i-1,j-1:PEN 3:PRINT CHR$(
236):LOCATE i-1,j:PRINT CHR$(236)
1060 FOR f=1 TO 200:NEXT
1070 SOUND 132,0,15,15,0,0,1
1080 LOCATE i-1,j-1:PRINT CHR$(235):L
OCATE i-1,j:PRINT CHR$(235)
1090 SOUND 132,0,15,11,0,0,1
1100 FOR f=1 TO 200:NEXT
1110 LOCATE i-1,j-1:PRINT CHR$(234):L
OCATE i-1,j:PRINT CHR$(234):SOUND 132
,0,15,8,0,0,1
1120 FOR f=1 TO 200:NEXT
1130 LOCATE i-1,j-1:PRINT" ":LOCATE i
-1,j:PRINT" ":FOR f=1 TO 200:NEXT
1140 FOR g=1 TO 2:RESTORE 1160:FOR f=
1 TO 11:READ d,n:SOUND 1,n,d,7:SOUND
```

```
4,n+2,d,7:SOUND 5,0,3,0:NEXT f,g
1150 LET score=(star*100)
1160 DATA 50,1016,37,1016,12,1016,50,
1016,25,850,25,899,25,899,25,1016,25,
1016,25,1136,100,1016
1170 PRINT STRING$(40,11):LOCATE 2,7:
PRINT"GAME OVER":FOR f=1 TO 2000:NEXT
f:GOTO 2870
1180 REM********Set Up Screen********
*
1190 PAPER 0:CLS
1200 IF ti=0 THEN GOTO 1240
1210 IF screen)6 AND screen<12 THEN R
ESTORE 2340 ELSE RESTORE 2190
1220 FOR f=0 TO 159:READ n$:POKE &A10
0+f,VAL("&"+n$):NEXT f
1230 LET s=33999+((screen-1)*209):FOR
f=2 TO 20:FOR g=2 TO 12:s=s+1:CALL &
A000,g,f,g,f,PEEK(s):NEXT g,f
1240 LOCATE#1,2,22:PAPER#1,10:PEN#1,4
:PRINT#1,STRING$(11," "):LOCATE #1,2,
22:PRINT#1,sn$(screen):PEN 1
1250 RESTORE 2240
1260 FOR f=0 TO 31:READ n$:POKE &A180
+f,VAL("&"+n$):NEXT f
1270 IF screen)10 THEN GOSUB 1310 ELS
E GOSUB 1300
1280 GOSUB 1340
1290 RETURN
1300 addr=&A100:RESTORE 2280:GOSUB 13
20::addr=&A120:RESTORE 2290:GOSUB 132
0::addr=&A140:RESTORE 2300:GOSUB 1320:
RETURN
1310 addr=&A100:RESTORE 2310:GOSUB 13
20::addr=&A120:RESTORE 2320:GOSUB 1320
::addr=&A140:RESTORE 2330:GOSUB 1320:R
ETURN
1320 FOR f=0 TO 32:READ n$:POKE addr+
f,VAL("&"+n$):NEXT f
1330 RETURN
1340 no=((screen-1)*18)-5
1350 y1=ene(no+(6)):x1=ene(no+(6)+1)
1360 gra1=ene(no+(6)+2):dir1=ene(no+(
6)+3):l11=ene(no+(6)+4):h11=ene(no+(6
)+5)
1370 y2=ene(no+(12)):x2=ene(no+(12)+1
)
1380 gra2=ene(no+(12)+2):dir2=ene(no+
(12)+3):l12=ene(no+(12)+4):h12=ene(no
+(12)+5)
1390 y3=ene(no+(18)):x3=ene(no+(18)+1
)
1400 gra3=ene(no+(18)+2):dir3=ene(no+
(18)+3):l13=ene(no+(18)+4):h13=ene(no
+(18)+5)
1410 RETURN
1420 REM********Variables***********
1430 screen=1:lives=7
1440 x=6:y=15:i=6:j=15
1450 star=0:pic=4:score=0
1460 ti=2000:po=148
1470 RETURN
1480 REM****Set Up Screen border*****
1490 MODE 0
1500 LOCATE 1,1:PAPER 1:PEN 3:PRINT S
TRING$(20,CHR$(240))
1510 FOR f=2 TO 22:LOCATE 1,f:PRINT C
HR$(240):LOCATE 13,f:PRINT CHR$(240):
LOCATE 20,f:PRINT CHR$(240):NEXT
1520 LOCATE 1,23:PRINT STRING$(20,CHR
$(240)):LOCATE 1,21:PRINT STRING$(12,
CHR$(240)):LOCATE 14,22:PRINT STRING$
(6,CHR$(240))
1530 PAPER 15:FOR f=2 TO 11:LOCATE 14
,f:PRINT STRING$(6,CHR$(238)):NEXT
1540 LOCATE 14,12:PAPER 1:PEN 3:PRINT
STRING$(6,CHR$(240)):PAPER 2
1550 PEN 3:LOCATE 14,2:PRINT CHR$(241
):LOCATE 14,3:PRINT CHR$(242)CHR$(243
):LOCATE 14,4:PRINT " "CHR$(244)CHR$(
245)
1560 LOCATE 14,5:PRINT CHR$(249)" "CH
R$(246)CHR$(247):LOCATE 14,6:PRINT CH
R$(250)CHR$(251)" "CHR$(248)CHR$(243)
:LOCATE 18,7:PRINT CHR$(244)CHR$(241)
:LOCATE 19,8:PRINT CHR$(242)
1570 LOCATE 15,7:PRINT CHR$(252)CHR$(
253)" ":LOCATE 16,8:PRINT CHR$(254)CH
R$(247)" ":LOCATE 17,9:PRINT CHR$(248
)CHR$(247)" ":LOCATE 18,10:PRINT CHR$
(248)CHR$(255):LOCATE 19,11:PRINT CHR
$(239)
1580 FOR f=13 TO 21:PAPER 14:LOCATE 1
4,f:PRINT STRING$(6," "):NEXT:LOCATE
2,22:PAPER 10:PRINT STRING$(11," ")
1590 LOCATE 14,13:PAPER 1:PEN 5:PRINT
"STARS:"
1600 LOCATE 14,19:PRINT"SUITS:"
1610 LOCATE 14,16:PRINT" TIME "
1620 FOR f=1 TO 6:CALL &A000,13+f,20,
13+f,20,4:CALL &A000,13+f,21,13+f,21,
5:NEXT
1630 WINDOW #1,2,12,2,20:WINDOW SWAP
0,1
1640 RETURN
1650 REM**********Instructions*******
1660 MODE 1:INK 14,15:INK 15,24:INK 1
,18:INK 12,2,26
1670 LOCATE 1,1:PEN 1:PAPER 3:PRINT S
TRING$(40,CHR$(240)):FOR f=2 TO 5:LOC
ATE 1,f:PRINT CHR$(240):LOCATE 40,f:P
RINT CHR$(240):NEXT f:LOCATE 1,6:PRIN
T STRING$(40,CHR$(240))
1680 LOCATE 15,3:PEN 3:PAPER 0:PRINT"
SANTAS GROTTY":LOCATE 15,4:PEN 2:PRIN
T STRING$(13,CHR$(131))
1690 LOCATE 1,8
1700 PEN 1:PRINT"Guide Haggy around t
he caverns of SantasGrotty and collec
t all the stars which  Santa has left
 behind."
1710 PEN 3:PRINT"Beware of all who mo
ve as they are very dangerous and wil
l destroy one of your  suits every ti
me you hit them.
1720 PEN 2:PRINT"When the time counte
r reaches zero the  mists of darkness
 will descend leaving  new caverns in
visible."
1730 LOCATE 17,18:PEN 3:PRINT"THE KEY
S":LOCATE 17,19:PEN 2:PRINT STRING$(8
,CHR$(131))
1740 LOCATE 1,21:PEN 1:PRINT"'Z'-LEFT
    ";:PEN 2:PRINT"'(SPACE)'-THRUST
";:PEN 3:PRINT"'X'-RIGHT"
1750 LOCATE 1,22:PAPER 3:PEN 1:PRINT
STRING$(40,CHR$(240))
1760 LOCATE 1,23:PRINT CHR$(240):LOCA
TE 40,23:PRINT CHR$(240):LOCATE 1,24:
PRINT STRING$(40,CHR$(240))
1770 LOCATE 9,23:PEN 3:PAPER 0:PRINT"
Press (SPACE) to continue.."
1780 GOSUB 2650:GOTO 2870
1790 REM***********U.D.Gs************
1795 ON ERROR GOTO 1805
1800 SYMBOL AFTER 230
1805 ON ERROR GOTO 30000
1810 SYMBOL 240,66,165,90,60,60,90,16
5,66
1820 SYMBOL 241,126,255,255,231,226,2
24,224,254
1830 SYMBOL 242,255,127,7,71,231,255,
255,126
1840 SYMBOL 243,24,60,126,255,231,231
,231,231
1850 SYMBOL 244,255,231,231,231,231,2
31,231,102
1860 SYMBOL 245,0,24,60,126,231,231,2
31,231
1870 SYMBOL 246,231,231,231,231,231,2
31,231,66
1880 SYMBOL 247,0,56,56,56,254,254,56
,56
1890 SYMBOL 248,56,56,56,56,57,63,62,
60
1900 SYMBOL 249,126,255,255,230,224,2
24,224,224
1910 SYMBOL 250,224,239,239,230,230,2
54,254,124
1920 SYMBOL 251,62,127,231,231,231,25
5,254,240
1930 SYMBOL 252,248,248,236,236,230,2
30,227,227
1940 SYMBOL 253,24,60,126,231,231,231
,231,231
1950 SYMBOL 254,231,231,231,231,231,1
26,60,24
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1960 SYMBOL 255,195,199,230,238,124,6
0,28,28
1970 SYMBOL 239,28,28,56,48,112,96,22
4,192
1980 SYMBOL 238,254,254,254,0,239,239
,239,0
1990 SYMBOL 237,146,84,56,254,56,84,1
46,0
2000 SYMBOL 236,144,70,16,132,66,20,8
0,137
2010 SYMBOL 235,0,68,0,136,1,16,132,1
2020 SYMBOL 234,8,0,34,0,0,8,65,0
2030 SYMBOL 233,198,165,198,165,6,40,
40,16
2040 RETURN
2050 REM********Initial Set Up********
2060 INK 0,0:BORDER 0:PAPER 0:CLS:LOC
ATE 15,10:PEN 2:PRINT"PLEASE WAIT!!"
2070 RESTORE 2140
2080 MEMORY &84CF:check=0
2090 ENV 3,3,2,2,3,-2,2:ENT 4,5,-18,2
0,1,0,5:ENT 1,30,10,1:ENV 1,10,-1,2
2100 FOR f=0 TO 98
2110 READ n$:POKE &A000+f,VAL("&"+n$)
2120 check=check+VAL("&"+n$)
2130 NEXT
2140 DATA dd,7e,00,87,87,87,87,87,32,
47,a0,26,c0,dd,7e,04,3d,87,87,6f,11,5
0,00,dd,46,02,05,19,10,fd,e5,26,c0,dd
2150 DATA 7e,00,3d,87,87,6f,11,50,00,
dd,46,06,05,19,10,fd,11,fd,07,06,00,3
6,00,23,36,00,23,36,00,23,36,00
2160 DATA 19,10,f2,e1,11,00,a1,06,88,
1a,77,13,23,1a,77,13,23,1a,77,13,23,1
a,77,13,78,81,fd,87,09,47,10,e9,c9
2170 IF check<>7948 THEN LOCATE 10,10
:PRINT"ERROR IN DATA":PRINT CHR$(7):E
ND
2180 RESTORE 2240:FOR f=0 TO 128:READ
 n$:POKE &A180+f,VAL("&"+n$):NEXT
2190 DATA cd,cd,cd,cd,6a,6a,bf,95,bf,
95,95,bf,cd,bf,6a,6a,95,cd,95,6a,cd,8
0,cd,80,40,80,40,80,40,80,80
2200 DATA cf,cf,cf,cf,ff,ca,cd,df,95,
df,df,df,cd,ca,cd,df,bf,9f,7f,ca,cf,c
f,cf,cf,df,cd,9f,ea,df,7f,ca,d5
2210 DATA 6e,cc,cc,9d,3d,cc,cc,3e,3c,
6e,9d,3c,3c,6e,9d,3c,3c,6e,9d,3c,3c,6
e,9d,3c,3d,cc,cc,3e,6e,cc,cc,9d
2220 DATA 00,00,00,00,00,00,00,00,00,
00,00,00,00,00,00,00,00,00,00,00,00,0
0,00,00,00,00,00,00,00,00,00,00,00,00
2230 DATA 22,11,00,22,11,11,11,11,00,
33,22,00,33,33,33,22,00,33,22,00,11,1
1,11,00,22,11,00,22,00,00,00,00
2240 DATA 00,30,20,00,30,30,30,20,75,
25,88,20,71,64,cc,20,75,64,88,20,35,3
0,88,20,10,30,30,20,10,30,20,00
2250 DATA 10,71,20,00,3a,71,20,00,3f,
71,f3,e6,3f,30,20,00,3f,30,20,00,3a,3
0,30,20,00,00,10,20,00,00,40,c0
2260 DATA 00,10,30,00,10,30,30,30,10,
44,1a,ba,10,cc,98,b2,10,44,98,ba,10,4
4,30,3a,10,30,30,20,00,10,30,20
2270 DATA 00,10,b2,20,00,10,b2,35,d9,
f3,b2,3f,00,10,30,3f,00,10,30,3f,10,3
0,30,35,10,20,00,00,c0,00,00,00
2280 DATA 00,51,a2,00,00,f3,f3,00,51,
ab,57,a2,3f,3a,35,1f,2f,0f,0f,2f,05,8
f,4f,0a,00,8a,45,00,00,8a,45,00
2290 DATA 00,04,00,04,04,00,04,00,04,
aa,55,00,00,00,00,04,04,44,00,00,04,0
0,04,00,0c,04,00,0c,00,00,00,04
2300 DATA 20,00,00,10,10,00,00,20,30,
1a,25,30,25,0f,0f,1a,30,1a,25,30,10,3
0,30,20,00,3f,3f,00,44,ee,dd,88
2310 DATA 00,00,00,00,00,30,00,00,10,
30,20,00,30,71,64,cc,30,30,64,cc,10,3
0,20,00,00,30,00,00,00,30,20,00
2320 DATA 10,25,30,00,30,25,30,20,30,
25,30,20,30,25,0f,20,30,30,30,20,30,3
0,30,20,30,30,30,20,30,30,25
2330 DATA 40,c0,c0,80,00,00,00,40,cc,
88,44,cc,d5,10,00,ea,80,10,00,40,80,1
0,30,40,95,00,00,40,95,3f,6a,c0
2340 DATA 0d,00,00,0e,0e,0e,0a,05,0d,05,
0d,0e,0a,00,0e,0d,00,00,0e,0d,00,05,0
d,0e,0a,0e,0a,05,0d,0d,00,00,0e
2350 DATA 3f,3f,b7,3f,7b,7b,fb,3f,f3,
f3,f3,fb,51,5b,f3,a2,51,f3,fb,00,00,f
b,a2,00,00,51,00,00,00,00,00,00
2360 DATA 00,40,00,00,00,40,00,00,00,
c0,80,00,00,c0,80,00,40,6a,6a,00,40,9
0,c0,00,d5,d5,d5,40,cc,cc,cc,cc
2370 DATA 00,00,00,00,00,00,00,00,00,
00,00,00,00,00,00,00,00,00,00,00,00,0
0,00,00,00,00,00,00,00,00,00,00
2380 DATA 22,11,00,22,11,11,11,00,00,
33,22,00,33,33,33,22,00,33,22,00,11,1
1,11,00,22,11,00,22,00,00,00,00
2390 RESTORE 2410
2400 no=33996:FOR f=1 TO 13:FOR g=0 T
O 52:no=no+4:READ n:POKE no,n\64:POKE
 no+1,(n AND 63)\16:POKE no+2,(n AND
15)\4:POKE no+3,n AND 3:NEXT g:no=no-
3:NEXT f
2410 DATA 170,170,171,127,255,252,255
,255,254,255,240,212,3,255,95,255,252
,63,255,255,42,63,255,63,255,255,255,
255,255,240,42,175,255,255,252,3,255,
255,255,255,255,255,85,255,253,255,25
5,247,254,160,0,0,0
2420 DATA 42,128,3,170,255,255,255,25
5,255,255,255,149,127,2,255,255,251,2
55,255,229,92,15,191,255,254,255,255,
249,87,255,239,255,255,191,240,2,255,
255,251,255,255,239,3,255,191,255,254
,255,255,245,95,85,86
2430 DATA 170,250,170,255,255,235,255
,255,160,0,14,191,255,250,3,255,235,2
52,0,175,255,254,191,255,250,0,0,235,
255,255,175,255,254,191,15,250,243,20
7,235,31,79,175,125,254,191,247,250,2
55,223,234,170,170,168
2440 DATA 128,0,2,255,255,248,255,243
,239,51,255,188,243,254,213,85,91,255
,255,239,255,255,181,85,94,223,255,12
3,127,253,236,255,243,188,255,62,252,
243,251,255,255,237,255,247,191,125,2
54,255,255,250,170,170,186
2450 DATA 170,170,171,255,255,239,255
,255,144,16,18,127,127,121,253,253,23
1,119,247,157,207,206,119,247,249,223
,223,224,0,7,191,255,222,0,0,59,255,2
55,239,255,255,191,255,254,0,0,251,25
5,255,234,170,170,186
2460 DATA 170,170,171,253,85,95,240,0
,47,255,255,179,255,254,252,0,27,255,
255,99,255,253,191,64,2,253,255,251,5
5,255,239,16,16,191,63,62,63,255,251,
255,127,111,192,0,191,255,246,255,255
,216,0,48,53
2470 DATA 85,87,87,255,255,207,255,25
5,63,255,252,254,171,243,240,15,207,2
07,63,63,60,252,255,255,243,207,255,2
07,254,255,48,0,252,255,255,243,243,2
55,207,255,255,63,63,252,255,255,242,
170,170,128,0,0,48
2480 DATA 0,0,3,255,255,255,255,255,2
34,175,254,255,255,247,255,255,245,95
,255,220,255,254,252,255,247,252,255,
252,252,255,240,252,250,112,252,195,2
55,255,15,255,188,63,236,0,255,48,0,2
36,192,0,0,0,48
2490 DATA 0,0,0,255,255,243,255,255,2
07,252,0,63,243,252,255,207,243,253,8
5,79,255,255,63,255,252,255,170,163,2
55,255,207,255,255,63,213,84,255,255,
243,235,255,207,3,59,48,0,12,0,0,0,0,
0,63
2500 DATA 255,255,51,255,252,206,174,
171,48,48,12,192,240,49,3,192,192,7,3
,0,60,12,85,245,115,255,252,207,255,3
,0,0,252,255,255,243,255,254,202,162,
135,63,95,252,255,255,243,191,238,192
,15,0,48
2510 DATA 255,63,255,252,255,252,3,0,
51,255,255,207,255,255,255,255,255,24
5,87,255,255,255,87,255,255,255,255,2
55,255,255,255,255,191,255,251,191,25
5,188,255,251,254,245,79,243,255,255,
243,255,255,197,85,85,127
2520 DATA 255,255,253,95,253,95,192,1
5,255,247,255,252,0,255,251,123,255,2
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53,255,255,255,255,252,0,255,255,255,
255,253,255,213,127,255,255,247,127,2
55,93,255,253,117,255,196,215,247,207
,79,95,253,212,48,195,63
2530 DATA 255,255,255,235,235,255,255
,255,255,240,0,127,255,254,127,255,25
5,124,63,253,255,255,189,255,254,247,
195,251,7,255,239,223,240,191,223,254
,223,127,250,173,255,239,243,255,191,
255,254,223,255,208,0,0,0
2540 DIM ene(234):RESTORE 2550:FOR f=
1 TO 234:READ ene(f):NEXT f
2550 DATA 11,4,0,1,2,11,3,6,0,1,4,12,
14,4,1,3,14,19,4,8,2,1,4,12,8,8,1,2,6
,12,10,8,2,1,4,12,6,5,1,1,3,10,10,5,1
,2,3,10,0,0,0,0,0,0,10,3,0,3,5,19,10,
12,0,4,8,19,16,5,1,1,4,9,10,11,2,4,6,
19,0,3,0,0,0,0,0,0,0,0,0,0,5,5,1,3,3,
12,19,3,0,1,3,10,0,0,0,0,0,0,0
2560 DATA 7,3,0,3,3,12,10,10,0,1,2,11
,0,0,0,0,0,0,4,5,2,1,2,12,6,9,2,2,2,1
0,10,10,2,3,3,15,3,5,0,1,3,10,9,5,0,2
,3,12,12,5,0,1,3,10,2,5,2,2,9,11,4,
1,1,2,9,10,11,2,3,2,19,18,5,0,1,5,11,
19,5,1,1,5,11,7,7,2,1,2,12,9,7,2,1,3,
11,11,7,2,2,2,12,0,0,0,0,0,0
2570 DATA 18,5,0,1,5,12,19,5,1,1,5,12
,4,2,2,1,2,12
2580 RESTORE 2590:DIM sn$(15),loc(15,
4),na$(8),hs(8),x1(3),x2(3),dir(3),gr
a(3),l1(3),h1(3),j1(3),i1(3):FOR f=1
TO 15:READ sn$(f):NEXT
2590 DATA Haggies Pit,The Slobby,Bods
 Hobble,The Sewer,Confused???,Hello W
orld,Low down,The Pits,The Thrips,Bim
bleBom,The Eggloo,Mt.Chapman,Santa's
Hut
2600 RESTORE 2610:FOR f=1 TO 15:FOR g
=1 TO 4:READ loc(f,g):NEXT g,f
2610 DATA 0,0,5,2,0,3,1,4,2,0,0,0,0,0
,2,0,0,0,6,1,0,7,10,5,6,0,0,0,0,0,7,9
,0,0,0,0,11,3,0,6,12,10,0,13,0,11,0,0
,0,0,11,0
2620 FOR f=1 TO 8:na$(f)="BIG SCORES"
:hs(f)=3500-(400*f):NEXT
2630 te=0.6:o=1
2640 RETURN
2650 RESTORE 2800
2660 READ p,d:IF p=999 THEN RESTORE 2
800:GOTO 2660
2670 GOSUB 2770
2680 SOUND 1,pn,d*0.5,15,1
2690 p=100:GOSUB 2770
2700 SOUND 1,pn,5,15,1
2710 WHILE INKEY$()"":WEND
2720 IF INKEY(47)<>0 THEN 2660
2730 RESTORE 2860:FOR f=1 TO 28:READ
g,f1:POKE 33999+((g-1)*209)+f1,4:NEXT
 f
2740 POKE 34857,2:POKE 34868,2:POKE 3
6297,2
2750 LOCATE 1,1:PRINT STRING$(26,11)
2760 RETURN
2770 fr=440*(2^(0+((p-10)/12)))
2780 pn=ROUND(125000/fr)
2790 RETURN
2800 DATA 5,40,5,40,12,40,12,40,10,40
,8,40,7,40,5,40,3,40,5,40
2810 DATA 7,40,8,40,10,40,12,80,5,40,
5,40,12,40,12,40,10,40,8,40,7,40,5,40
,3,40,5,40,7,40,8,40,10,40
2820 DATA 12,80,12,40,13,40,10,40,12,
40,13,40,15,40,17,40,12,40,10,40
2830 DATA 8,40,5,40,7,40,8,40,10,80,8
,40,10,40,12,80,13,40,12,40,12,40,10,
40,8,40,7,40,5,80,8,20,7,20,5,40
2840 DATA 10,80,8,40,10,40,12,40,13,4
0,15,40,17,40,12,40,10,40,8,40,7,40,5
,80
2850 DATA 999,999
2860 DATA 1,59,1,110,2,68,2,90,3,148,
4,104,4,107,5,101,6,76,6,105,7,71,7,7
2,8,157,8,158,8,151,9,52,9,165,9,154,
10,166,11,178,11,140,12,33,12,23,12,6
0,12,62,13,9,13,67,13,68
2870 REM*********High Score*********
2880 MODE 1
2890 LOCATE 4,5:PEN 3:PRINT CHR$(150)
;STRING$(32,CHR$(154));CHR$(156)
2900 LOCATE 16,3:PEN 2:PRINT"HIGH SCO
RE":PEN 3
2910 FOR f=6 TO 15:LOCATE 4,f:PRINT C
HR$(149):LOCATE 37,f:PRINT CHR$(149):
NEXT
2920 LOCATE 4,16:PRINT CHR$(147);STRI
NG$(32,CHR$(154));CHR$(153)
2930 FOR f=1 TO 8
2940 IF score>hs(f) THEN GOSUB 3030:f
=10
2950 NEXT
2960 FOR f=1 TO 8:PEN 1:LOCATE 8,f+6:
PRINT na$(f):LOCATE 18,f+6:PEN 3:PRIN
T".....";hs(f):NEXT
2970 LOCATE 1,17:PRINT STRING$(220,"
")
2980 IF INKEY$<>"" THEN GOTO 2980
2990 PEN 2:LOCATE 1,20:PRINT STRING$(
40,CHR$(154));:LOCATE 1,22:PRINT STRIN
G$(40,CHR$(154));:PEN 1
3000 LOCATE 1,23:PRINT STRING$(40," "
)
3010 LOCATE 11,21:PEN 3:PRINT"PRESS";
:PEN 1:PRINT"< SPACE >";:PEN 3:PRINT"
TO PLAY.":PEN 1
3020 GOSUB 2650:GOTO 40
3030 a$="ABCDEFGHIJKLMNOPQRSTUVWXYZ .
#%&()!()?*+"+CHR$(233)
3040 c=19:LOCATE 1,20:PEN 1:PRINT a$
3050 LOCATE 3,17:PEN 1:PRINT"USE CURS
OR KEY'S LEFT,RIGHT AND COPY":LOCATE
4,18:PRINT"TO SELECT LETTERS.(MAXIMUM
 OF 10.)":PEN 2:LOCATE 1,19:PRINT STR
ING$(40,CHR$(154));:LOCATE 1,22:PRINT
STRING$(40,CHR$(154))
3060 LOCATE 12,23:PEN 3:PRINT"PRESS";
:PEN 1:PRINT"< 'X' >";:PEN 3:PRINT"TO
 EXIT.":PEN 1
3070 x$=""
3080 FOR z=1 TO 10
3090 LOCATE c,21:PEN 2:PRINT" "
3100 IF INKEY(1)=0 AND c<40 THEN c=c+
1
3110 IF INKEY(8)=0 AND c>1 THEN c=c-1
3120 IF INKEY(9)=0 AND c=40 THEN LOCA
TE 7,f+6:PRINT"              ":z=100:GOT
O 3170
3130 IF INKEY(63)=0 THEN z=11:GOTO 31
70
3140 IF INKEY(9)<>0 THEN LOCATE c,21:
PRINT"*":FOR a=1 TO 50:NEXT:GOTO 3090
3150 x$=x$+MID$(a$,c,1):LOCATE 7+z,f+
6:PEN 1:PRINT MID$(a$,c,1)
3160 FOR a=1 TO 200:NEXT
3170 NEXT
3180 IF z=101 THEN GOTO 3070
3190 hs(8)=score:na$(8)=x$
3200 f=0
3210 FOR z=1 TO 7
3220 IF hs(z)<hs(z+1) THEN t=hs(z+1):
hs(z+1)=hs(z):hs(z)=t:a$=na$(z+1):na$
(z+1)=na$(z):na$(z)=a$:f=1
3230 NEXT
3240 IF f=1 THEN GOTO 3200
3250 fr=FRE("")
3260 RETURN
30000 MODE 1
30001 INK 1,24:PAPER 0:PEN 1:PRINT "E
rror...";ERR;"at line";ERL
30002 END
```

Give your fingers a rest . . .

All the listings from this month's issue are available on cassette.

See our special offer on Page 93.

BASICALLY ABOUT STRINGS

JOHN HUGHES takes a look at string-handling techniques on the Amstrad, with special emphasis on garbage problems

THERE are three kinds of variable in Basic – two are "numeric", namely integers and real numbers, and one is "literal", that is, it is made up of strings of characters which will not be operated upon mathematically.

Because of this, users of Basic generally refer to the last simply as "string variables".

Some other languages, by the way, have other types of variable. For example, Fortran has "double precision" numbers, to improve the accuracy with which very large and very small numbers are stored. And in Pascal there are "pointers", which are data items which store the address of other items.

When you load a Basic program into your Amstrad, the program itself is stored at the bottom of the user memory. When the program is run, the numeric variables are stored in RAM immediately after the program, and a fixed amount of space is allotted to them depending on whether they are real or integer.

But space for literal variables has to be allocated in a different way – after all, how long is a string?

They are located as high up in memory as possible – immediately below HIMEM in fact. You can show this by forcing a hard reset – Ctrl+Shift+Escape – then type in the following line in immediate mode:

```
A$="Jack"
```

Then enter the following, also in immediate mode:

```
FOR J=HIMEM-3 TO HIMEM:PRIN
T CHR$(PEEK(J));NEXT
```

and the screen will show "Jack" – that is, the characters which make up A$, stored in four bytes immediately below HIMEM.

At this point, the story becomes rather murky. Assuming you've got a CPC464 and are still in immediate mode, enter:

```
A$="Fred"
```

and follow it with the same FOR . . . NEXT loop as before – and the screen will show "Jack" again.

This is because the characters which make up the new A$ have been stored in memory immediately below the previous A$, rather than in the same place – you can see this by amending the loop to read:

```
FOR J=HIMEM-7 TO HIMEM:PRIN
T CHR$(PEEK(J));NEXT
```

'and sure enough the screen displays "FredJack".

However, if you've got a CPC664, things work differently. You see, the CPC664 and CPC464 store their strings in slightly different ways below HIMEM. The 464 simply places the strings in the memory, whereas the 664 also places the length and a zero byte followed by the string.

This means that if you try to print the strings below HIMEM by peeking the memory you'll have to skip over the length and zero bytes. Try this:

```
NEW
A$="Jack"
B$="FRED"
FOR J=HIMEM-11 TO
HIMEM:PRINT PEEK(J):NEXT
```

It prints the contents of the 12 bytes below HIMEM instead of their Ascii values.

"So what?" I hear you cry. "What difference does it make to us where the strings are kept, as long as we can retrieve them when we want to?"

The answer to that is that, in certain circumstances, it can matter a good deal, especially if you want your string handling programs to run efficiently.

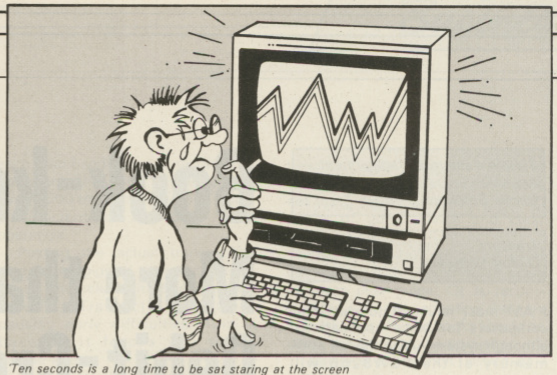
The reason is that every time you create a new string, or tack something on to an old one, the computer immediately grabs enough space to store the new string *without giving up the space it needed for the old one.*

Thus, for example, if you were writing a word processing program in Basic and it simply added each new character on to an existing string, you would find that you would waste an enormous amount of memory – a line 80 characters in length would require 80 bytes for its final version, *plus* 79 for the version before that, *plus* 78 and so on down to the original 1-byte version that existed when the first key had been pressed – and if you don't feel like working it out, that comes to over 3200 bytes!

In such circumstances, it takes hardly any time for even 64k to fill up, as the rapidly multiplying strings at the top of memory meet the numeric variables crowding up from the bottom.

And when the computer senses this, it enters a state called, rather evocatively, "garbage collection" – which simply means that it ignores all input until it has checked which strings are still current and which can be thrown away, and reorganised the whole of its string storage to take account of this.

If you have a lot of strings to sort through, this process can take ten seconds or longer, which is a long time to sit staring at the screen



'Ten seconds is a long time to be sat staring at the screen wondering if the compuer has broken down'

wondering if the computer has broken down or if the program has become locked in an endless loop.

Happily, there are a number of solutions to this problem – some of which can be used on other machines, and some which are peculiar to the Amstrad.

The simplest, and often the most effective one, is to force a number of mini garbage collections at times when they will not be too obtrusive. This can be done by using the FRE("") command, as illustrated in the user manual.

A second technique involves by-passing some of the string-handling commands of Basic altogether, and POKEing the Ascii values of the characters directly into memory.

To do this, of course, you need to know exactly where to put them. Fortunately, Locomotive Basic has a very simple structure to do this – not too different, in concept at least, from the pointers used in Pascal which were mentioned earlier.

Reset the computer again and enter the familiar line:

```
A$="Jack"
```

Then type in:

```
PRINT @A$
```

and press Enter. The answer will take the form of a number, probably 374, which is the address, in base 10, of the first memory location at which information about A$ is stored.

Altogether, three bytes are allocated for this information. They are the byte given in response to:

```
PRINT @A$
```

and the two bytes immediately following it.

Now enter:

```
PRINT PEEK(374);PEEK(375);P
EEK(376)
```

or whatever is appropriate for the output you got from your last input.

The exact response to this will vary depending on the amount of memory available to you – that is, whether you have a disc interface fitted. If you have, the computer will display:

4 120 166

and if not, it will print:

4 124 171

The meaning of these numbers is fairly straightforward. The first figure refers to the number of bytes allocated to A$, that is the length of the string, and it is to this that the computer refers when it comes upon a LEN(A$) statement.

The second and third figure together represent the location in RAM of the first character of A$. All you need to do is to multiply the last number by 256 and add the middle number to it.

For instance, in the first example given above, the first character of A$ will be stored at location (166*256 + 120) – that is, 42616. You can check this by entering, in immediate mode:

```
PRINT CHR$(PEEK(166*256+120))
```

and the computer will respond with "J".

It would therefore be possible, if there were no alternative, to avoid the garbage collection problem altogether by POKEing the Ascii codes for the various characters directly into a blank string which you have already created by means of a SPACE$ command.

Fortunately, however, Locomotive Basic provides an easier route to the same goal by using MID$.

In most Basics, MID$, like its near relatives LEFT$ and RIGHT$, exists only as a function – that is, it is very useful for "string slicing" when it occurs to the *right* of an equals sign.

For example, if:

```
A$="Jack"
```

then:

```
B$=MID$(A$,1,1)
```

will give B$ the value "J" – that is a string one character in length taken from A$, beginning with the first character.

Locomotive Basic, on the other hand, allows MID$ to be used additionally as a command, making possible an operation similar to the POKEing described above. You can try this for yourself by resetting the computer and then creating a four-character blank string by means of the command:

```
A$=SPACE$(4)
```

Then enter:

```
MID$(A$,1,1)="J"
```

and follow it with our familiar.

```
FOR J=HIMEM-3 TO HIMEM:PRIN
T CHR$(PEEK(J));NEXT
```

and the computer will return "J" followed by three spaces. Add:

```
MID$(A$,1,1)="a"
```

and the same loop will print "Ja" followed by two spaces. No doubt you can work out for yourself how, by varying the second parameter of MID$, you can complete turning A$ into "Jack", and have no garbage collection problem to worry about at all.

What all this proves is that in computer programming there are often several different ways of achieving the same goal, and that the most obvious is often not the best.

A second moral is that when you move from one model of computer to another, it is well worth spending some time in exploring its Basic implementation in detail, as there are often buried in it some highly-ingenious solutions to the various problems that crop up from time to time.

Simple Accounts/Management Analysis
Cornix Software

Transact
Dialog Software

Book-keeping: More than just Debit-Credit-Plonk

JO STORK examines two packages aimed at removing the mystique that often surrounds accounting systems

I AM most reluctant to use small computers for some applications, although systems using the full 256k memory of the PCW8256 will probably change my views. Book-keeping is however ideal, hence the many software houses competing for your money.

Despite the mystique that has built up round the subject, it is exceptionally simple, only needing plenty of attention.

This point arose when I mentioned to a friend that I review business software as a sideline to my normal work.

The canny entrepreneur asked: "But what's there to review? Accounts are only debit – credit – plonk. Now reviewing boats, that would be fun, since they're all different".

This chat, and receiving two book-keeping systems for comment, set me wondering how many readers understand my role. Let us go back to first principles and proceed logically.

The only way to get software that precisely suits your business is to write it yourself or provide precise specifications for others to follow. Anything else is a compromise.

Shop-bought software is merely designed to meet most requirements for the majority of customers. Since I cannot test all the available products, nor can I know your business needs, all I can achieve in these reviews is to:

- Indicate what constitutes good business software.
- Explain whether the software meets these criteria.
- Aid the reader considering systems not mentioned in the pages how to assess business software for themselves.

Occasionally I receive absolute stinkers. This is usually because the compromises ultimately make the system impractical or the designer shoe-horned a package on to an Amstrad so that the only user-friendly action is to destroy your copy.

At other times, as with both these examples, the decisions about inclusions and omissions are perfect.

Either system is a wise purchase. Both do the same basic task and yet there are many differences between them. Hopefully what follows will tell you which is right for your organisation.

No matter how objective they try to be, all prospective purchasers with several apparently suitable products to choose from are heavily biased towards those manufactured by well-known companies.

Similarly, glamorously packaged products tend to be selected in preference to items which look dull. Canny shopkeepers therefore place brand leaders in the most prominent positions and display the remainder as attractively as possible.

All this conspires against small companies setting out in business, especially those with limited budgets for pushing their products.

We all miss many fine products because of this, and I fear Cornix's systems will find few retailers, or be pushed to the back of the topmost shelf.

Transact is the one potential customers will find. I base this on Cornix being a new name to me and the disc I received for review having a hand-written label. It also appeared to be an early pre-production version.

And yet everything, except the packaging, was superb. From the moment I opened the Simple Accounts handbook I was impressed. A plain bound set of photocopied sheets it may be, yet any software producer should regard it as essential reading.

The document is a model of helpfulness and pertinent information, which I have never seen bettered. This attitude is also available for user service.

Moving on to what both these systems offer, I will treat both Cornix offerings as a single package. While either will prove excellent if purchased separately, it is in combination that they are most valuable.

Simple Accounts consists of two separate programs, one to enter the transactions and post the accounts while the other reports this data in a variety of ways.

Management Analysis considerably extends these reports, also producing bar and pie charts. What Transact's single program loses in reduced reporting and not providing graphics it gains with an extra dimension to its data entry.

The differences between them go much deeper than this. Yet either, plus Amsoft's Entrepreneur – reviewed in the November issue of *Computing with the Amstrad* – a word processor and a spreadsheet would provide all the essential business software.

Transact posts transactions to a maximum of 100 different headings, which is enough for a major company. Of these 10 are used by the system

itself, the remainder being allocated to a maximum of nine major accounts of your choice.

These nine groups can each contain up to 10 further sub-headings within them – expenses could be split into petrol, hotels, meals and so on. This provides sufficient flexibility for the most pernickity accountant.

Had I not met Simple Accounts I would have written that the procedure for creating these headings could not be easier.

I would however strongly recommend that before sitting at the keyboard you spend an evening deciding exactly how these accounts should be organised.

Simple Accounts, with a maximum of only 20 such headings, actually makes this decision more difficult. With either system some accounts will be for revenue, while the remainder will be for expenditure.

Both systems allow extra headings, up to any maximum, to be added as needed, although alteration of existing accounts once the system is running is definitely unwise.

Do not be too quick to dismiss 20 different accounts as too few. One repeatedly hears businessmen bemoaning the time it takes to do the books.

They get a system which offers a host of seemingly essential facilities or attractive analyses and then object to the hours spent pumping data into it.

I prefer having a few meaningful accounts rather than many highly specific ones, most of which only contain a few pounds at year end.

Nevertheless, one plans a business system with a life span of at least three years. Organisations plan to grow in this time. Therefore if close to a system's maximum capacity from the outset they could be faced with an early conversion workload.

Another decision is also needed before starting data entry. This is which period each cluster of transactions, properly called a folio, will span.

Simple Accounts permits up to 150 transactions per folio, keeping track of up to 15 folios.

Transact handles an unlimited number of folios, since if one wishes to list the transactions they represent, each is loaded as required. However each folio handles fewer records per batch. In either case, this represents over 1,500 transactions a year, which is sufficient for a CPC664-sized operation.

Posting the actual transactions reveals the biggest difference of all. Those unfamiliar with book-keeping may find Transact's chief merit causing early difficulties. This is because it forces you to do double-entry.

The easiest way of achieving this is to post an amount to one of the 10 system accounts and then post an equal amount to one or more of the accounts you created (see Figure I).

Only when the amount posted to the System Account equals the sum of the postings to the user accounts does Transact let you proceed.

To gain familiarity with this operation, and observe double-entry in action, Transact contains a couple of small data files for use in experimentation and learning.

Simple Accounts does not attempt double-entry, hence transactions are quickly entered and allocated to one of the headings. Most definitely this system removes most of the chore from "doing the books", including the dreaded VAT.

With both systems, once all transactions are entered a comprehensive set of reports may be selected including profit/loss and VAT liability.

They have another similarity I like to see in any book-keeping system. This is that if a transaction is verified as complete in a folio there is no way of altering it. If an error is later found, a new correction posting must be made.

I praised Simple Account's handbook, but Transact's is up to Amsoft's usual high standard. It does not teach double-entry, but gives 20 pages of good advice and clear operating notes.

You will even find the vital comment which should be in every business user guide: "It is recommended that after adopting the new system, your existing books should be run in parallel for some time after. . ."

Now for the crunch. Which do I prefer?

- If an organisation has even a part time book-keeper, then the advantages of double-entry cannot be denied. In this situation I would choose Transact with maybe 12 to 18 user accounts.
- For one-man businesses, clubs and so on, I give my vote to the Cornix combined package. Its user-friendliness will help the individual keep up to date.
- Larger organisations, with slightly more staff, sites or products will possibly need over 20 account headings within the three year life. Their choice is forced towards Transact, although conversion of Simple Accounts to the CPC6128, allowing even 10 more headings, would make me call it a dead heat.

Returning to my boat-owning friend, he was looking for a book-keeping system. Transact would have been ideal for him. Unfortunately he has another computer.

I completely ruined his day by saying: "You could get whichever boat you could afford, test drive it even".

The same cannot be said of business software. Now do you believe reviews might be useful?

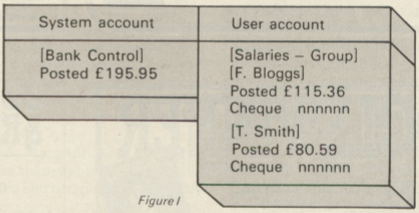


Figure I

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Adventuring with Gandalf

OVER the last few weeks I have been looking at Kuma's latest releases, two budget-priced adventures.

In North Sea Bullion Adventure you are the captain of a tug and your task is to locate a sunken ship and salvage its valuable cargo.

In Shadow of the Bear you are the pilot of a spy plane that has crash landed in Siberia and you have to escape to a friendly country.

Both games follow much the same pattern in that there is a graphic display and usage of the cursor keys for movement and a separate mode for inputting commands such as TAKE, DROP and so on.

Both are written in Basic though the graphics are quite quickly drawn, noticeably so in Shadow. Both feature random events, such as storms and icebergs, and so every game is different.

One thing I felt would improve them would be a wider vocabulary.

In Bullion, for instance, your No. 1 engine keeps cutting out through fuel starvation. The words CLEAN FUEL PIPE have to be used to rectify the situation, which is important because the game has a time limit and losing an engine means more time is taken getting to other locations.

No variation on these words is accepted and it took me a long time to discover the exact wording, though maybe this adds to the difficulty of the game.

I don't think either of these adventures are as good as Gems of Stradus, though at half the price that isn't really surprising. Overall, probably ideal for the novice and certainly good value for money.

Dave Carr has written in this month with a suggestion and two problems. He says to try typing Hugh in the Sorcery high score table. Does anyone else have any other names that produce amusing replies? A free adventure for the best one.

His problems are with Brawn Free and Smuggler's Cove. In the first, he needs the tomahawk to get past the wooden door and in the second he wants to know what command to use to dig. He has tried the obvious, DIG WITH SPADE, DIG TUNNEL, and so on. Can anyone help him?

Dawn Nightingale has sent in a complete solution to Gems of Stradus, though I should point out that it is written – there is no map with it. Apparently she tried to make a map but the rooms got too confused.

If anyone else can supply a map I will be grateful and, of course, you will get a mention in the column and my prayers.

David Marshall has sent in a complete map and solution to Forest at Worlds End and promises to do the same with the rest of the Interceptor adventures. Thank you, David.

Tommy Daffin has sent in a hint sheet for Knightlore, though to be fair it is a very basic one. Anyone wanting a copy of any of these should write in enclosing an sae.

Alan Singleton has asked for help with Forest at World's End and Message from Andromeda. He says he doesn't know what to do and he keeps going round in circles.

I am more than willing to help anyone who writes in, assuming I know the answers if they tell me where they are stuck, or send a map showing me the locations they have visited and their inventory. Please write back in with more information, Alan.

Aubrey Sinden has explained his method of mapping. He uses a card index system with the location as the heading and lists the directions open from each location and their destination. Does anyone else use a method other than the standard "boxes on paper" one?

Mark Schofield is having problems with Knightlore. He says that he knows he has to go to the wizard to see what object to collect to break the spell, but he doesn't understand how to give the object to the wizard. Any Knightlorers out there know the answer?

D.P. Watts says that if you type in EXAMINE ROOM in Fantasia Diamond you are told "I see no room" and C.R. Snowden says that he is getting two responses in Interceptor's adventures that he can't work out the meaning of, namely: "Please be more specific" and "Please rephrase that".

Broadly speaking all these responses are generated by the way the program concerned handles player input. In the first instance the room descriptions are held as DATA statements and are printed on the screen when the player position corresponds to them so that on each move the location description is up-dated.

However the objects used or recognised by the program are held

as a separate series of DATA statements and unless the object, in this case a room, is in both sets of data it won't be recognised.

Generally the routine that handles input will be programmed something like this: IF (verb recognised) THEN GOTO (part of program that deals with verbs).

Then the verb concerned, in this case "examine", will be programmed to return a response to a known object but will go to a general line for an unknown object, thus: IF (object) = (one of the objects programmed) THEN (respond) ELSE GOTO (unknown object line).

The unknown object line will simply return a pre-programmed response ON (unknown object) PRINT "I see no"; (player input).

The other two responses are also handling unknown verbs and objects, probably with "Be more specific" meaning that the verb is recognised but not the object and "Rephrase" meaning that the object is recognised but not the verb.

By using combinations of known verbs and objects you can identify what the responses mean, which can be useful in determining what words are recognised at a later stage of the game.

Paul Bell has written in to say that he finds the adventures he has tackled so far, Forest at Worlds End and Emerald Isle, to be too easy and asks my opinion as to a suitable next adventure.

I think Interceptor adventures are extremely good and they are also the ones that I get the most letters about and some of the highest marks for, though Forest is probably the easiest of them.

However, you can't really go wrong with Level 9 and so I suggest that you work your way through the series starting with Colossal Adventure. Dungeon Adventure is probably the most complex if you want to get stuck in to a really hard one.

Finally, Linda Wright has sent in marks for The Wild Bunch and Crystal Theft, and I notice that she has solved Smugglers Cove.

Please send me a map and solution Linda, I'm baffled by it.

SOS Dept

Graham Redmond would like to know how to dispose of the pirate and serpent and open the giant clam in *Heroes of Karn*. I haven't got to this one yet so can anyone help?

D.P. Watts can't get past the statue in *Fantasia Diamond* and I have to confess that I can't either, so can anyone put us out of our misery?

M. Fiaz is having problems with *Snowball*. He says he has the visor and has found that the screen lights up and shows a menu, but he doesn't know what to do next. He has also left the passenger side of the Snowball but wants to know how to open the security door in the Snowball Hilton. Has any ace adventurer solved these problems?

Hints Dept

AUBREY Sinden, Darren Stephens, Wendy Smith, Stewart McCone, Luke Edwards and Lesley Napier have all written in with problems in Jewels of Babylon. *The lion is more at home in the sea and that should give you an idea of the kind of present he likes.*

The crocodile has big JAWS, ideal for catching things, so fill them and then see if you can match it.

The crab has poor hearing so try to make sure that you speak loud enough.

The cannibals are easily distracted by things they have never seen before, so watch it! The key can be found after you have crossed the pit past the underground warren of passages.

Andrew Feeley, David Lomas, B. Higginbottom and Kate Glennister have asked how to get past the mirrored room in Message from Andromeda. *The plate is the thing to concentrate on, so spare the rod and don't point if you want a polite ending.*

Susie Menzies says that she can get no further than the chasm in Forest at Worlds End. *A bridge can be created from the woodman's clearing.*

C.R. Snowden and Wendy Smith want to know how to get the key from the witch's hovel. *Get first aid from the wood nymph and you will gain the means to enter.*

Steven Ward has problems getting into the volcano and with Marl's gateway. *A knotty problem this, but string along with me and you will work it out. I don't see the problem with the gateway, try making a map and you'll find you have no problem. The centaur by the way, is a spy put in by Interceptor to make sure that you don't cheat and, aside from that, plays no part in the game.*

Two problems that turn up almost daily are how to cross the river and how to get out of the caves below the manhole in Fantasia Diamond. *This time Kate Glennister, R. Ineson and Richard Jones among many others have written in for the answers.*

Forget the river for the time being, you can't cross it. As for the caves, go to the dingy cellar and polish the black window.

Aubrey Sinden and M. Fiaz have got some questions about Adventure Quest. *The white dots mark the locations of teleport destinations. To get past the sandworm – yes I also tried riding it at first – simply stop moving and do something else.*

I agree with you Aubrey about the similarity with Dune, but remember what attracted the sandworms in the first place. To get past the sphinx use what you have learnt about the sandworm's movements.

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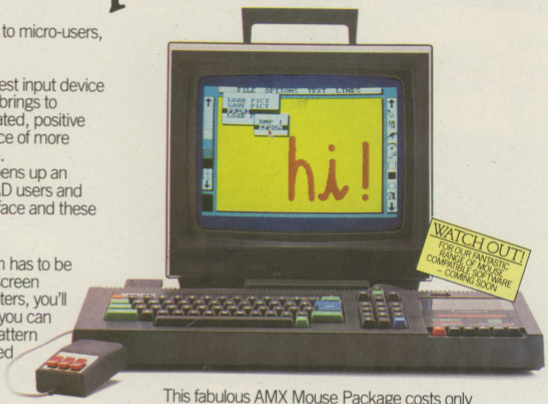

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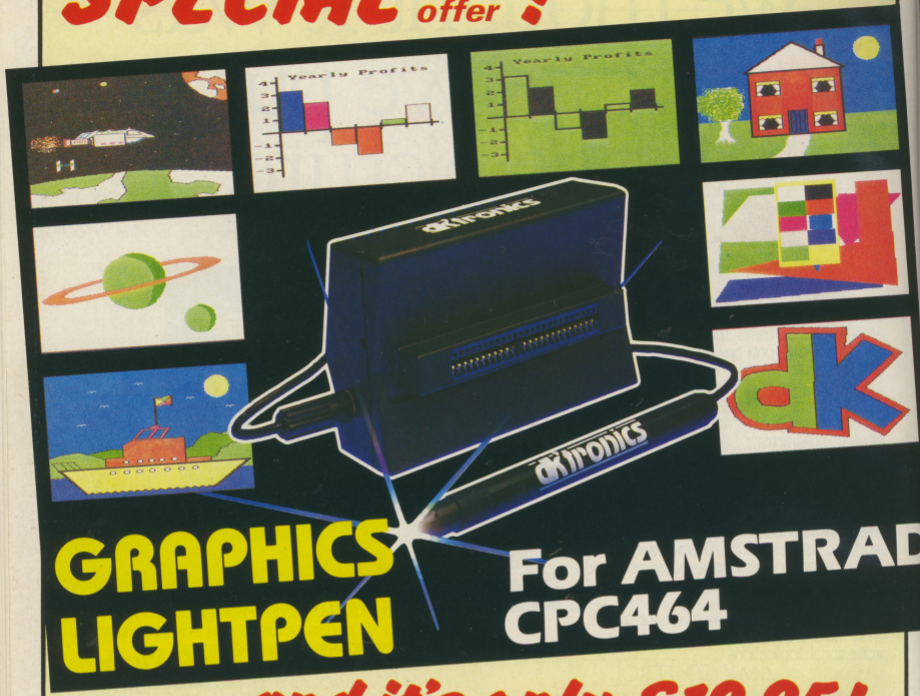

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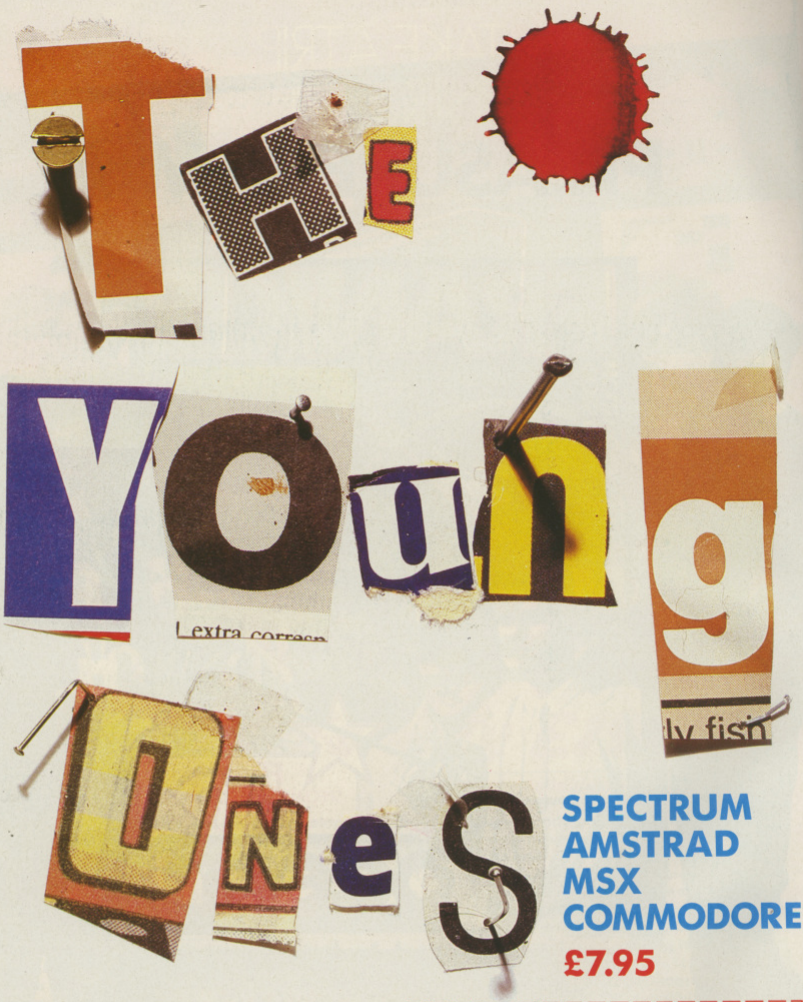

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Train your 6845 CRTC to perform NEAT TRICKS

By KEVIN EDWARDS

THE three different screen modes on the Amstrad are defined by two chips – the 6845 Cathode Ray Tube Controller – CRTC for short – and the Uncommitted Logic Array, ULA.

While the ULA can only be programmed to change the screen mode and colour palette, the 6845 can be programmed to perform some neat tricks.

For instance, if you use the 6845 correctly you'll be able to scroll screens, turn the display on and off, switch between two screens and many other things.

The 6845 consists of 18 registers which are listed in Table I.

Registers 0 to 13 are write only, which means that their previous state cannot be examined. Registers 14 and 15 can be written to or read from. The final two registers are read only.

Registers 0 to 9 never change. On power up, the Amstrad initialises them with certain values which are defined in the Operating System – OS. The default values are given in Table II.

The remainder of the registers are un-defined and can be changed by the OS at anytime.

The registers are accessed with the Basic command *OUT*, when writing, and *INP* when reading. You'll probably never need to read the registers, though.

If you wish to alter a register you must first select the register, then write the new value.

A 6845 register, *X*, is selected with *OUT &BC00,X*. Once the register has been selected in this way the register's new value, *Y*, can be written by issuing the command *OUT &BD00,Y*. If you are reading a register you would use something like *A=INP(&BD00)* – *A* will now contain the result.

For example, to change the value of register 1 to 15 we would use the following commands:

```
OUT &BC00,1:OUT &BD00,15
```

Register	Register name
0	Horizontal total
1	Horizontal displayed
2	Horizontal sync position
3	Horizontal sync width
4	Vertical total
5	Vertical total adjust
6	Vertical displayed
7	Vertical sync position
8	Interlace mode
9	Max scan line address
10	Cursor start
11	Cursor end
12	Start address (high)
13	Start address (low)
14	Cursor (high)
15	Cursor (low)
16	Light pen (high)
17	Light pen (low)

Table I: 6845 registers

Register	Default value
0	63
1	40
2	46
3	&8E
4	38
5	0
6	25
7	30
8	0
9	7

Table II: Register default values

```
10 REM 6845 test program
20 REM By Kevin Edwards
30 MODE 1
40 WHILE 1=1
50 INPUT"Enter register";reg
60 INPUT"Enter value  ";byte
70 IF (reg OR byte)=0 THEN 100
80 OUT &BC00,reg
90 OUT &BD00,byte
100 WEND
```

Program I

Program I is for 6845 "doodling". All it does is request a register and value which it then writes to the 6845.

You'll find that altering certain registers can cause the screen display and Amstrad to do some unusual things. Some will "lock up" your Amstrad while others cause the screen to "roll". Don't be surprised if you have to turn your Amstrad off then on again to regain control – you'll lose your program, don't forget!

Only a few of the 6845 registers have any real value to the programmer. It is for this reason that only the useful registers shall be discussed. Altering the others will usually cause

the screen display to collapse or something similar.

It's sometimes easier to see the effect of the examples if you change the border colour to black. You can do this with the command *BORDER 0*.

Most of the registers don't use all eight bits of the byte sent to them. In these cases the number of relevant bits will be indicated.

Register 1 contains the number of character units displayed per row, one character unit in Mode 1 being one character cell. Therefore, in Mode

```
10 REM register 1
20 REM chars per line
30 REM By Kevin Edwards
40 MODE 1
50 FOR loop=0 TO 22
60 PRINT"This is demonstration of reg
ister 1 !"
70 NEXT
80 FOR chars=0 TO 40
90 OUT &BC00,1
100 OUT &BD00,chars
110 FOR delay=1 TO 200:NEXT
120 NEXT
```

Program II

1, if 1 is written to this register the whole display will become one character wide. But if the same is done in Mode 0 the screen will be only half a character wide. See if you can work out the number of characters displayed for Mode 2.

By using a loop from 0 to 40 to write values to register 1 a screen of text can be displayed in a more interesting way – try Program II. As the loop number increases so does the width of the screen display until the width becomes 40 – its normal value.

Register 6 (7 bit) determines the number of displayed character rows. Changing this register to 0 will turn the screen display off – a much neater way than using several *INK* commands to blank things out. The screen can be restored to normal with the value 25, indicating that all 25 rows are to be displayed.

Program III demonstrates how register 6 can be used to hide then reveal the display one character row at a time.

Register 7 (7 bit) is used to change the vertical position of the display,

```
10 REM register 6
20 REM character rows per screen
30 REM By Kevin Edwards
40 MODE 1
50 FOR row=1 TO 24
60 PRINT"this is row ...."row
70 NEXT
80 WHILE 1=1
90 FOR rows=24 TO 0 STEP-1
100 OUT &BC00,6:OUT &BD00,rows
110 GOSUB 180
120 NEXT
130 FOR rows=0 TO 24
140 OUT &BC00,6:OUT &BD00,rows
150 GOSUB 180
160 NEXT
170 WEND
180 FOR delay=1 TO 50:NEXT
190 RETURN
```

Program III

```
10 REM register 7
20 WHILE 1=1
30 SOUND 1,INT(30+RND(1))+150,1,15,0,
0,15
40 OUT &BC00,7:OUT &BD00,31
50 OUT &BC00,7:OUT &BD00,32
60 WEND
```

Program IV

rather like the vertical position control present on most televisions. This can be used to vibrate the screen during an explosion in a game.

Program IV shows this in action. If you write a value greater than 38 to this register the screen will roll.

Registers 12 and 13 (6 bit, 8 bit) are the most useful of the 6845 registers as they define the screen start address. Programming them with the correct values will allow the screen to be scrolled.

The address written to the registers is rather complex to calculate so get ready to bruise your brain a little.

For more information about the screen layout, see the excellent machine code graphics article in the August issue of *Computing with the Amstrad*.

The 16k required for the screen memory can be positioned in any one of four blocks in the Amstrad's 64k memory – &0000, &4000, &8000 or &C000. Normally the screen display starts at &C000. The selected block is

Register 12 Bit 5	Bit 4	Screen Base and End Addresses
0	0	&0000-&3FFF
0	1	&4000-&7FFF
1	0	&8000-&BFFF
1	1	&C000-&FFFF

Table III: Screen block bit patterns

defined by the two most significant bits of register 12. Table III shows the bit patterns for each block.

The remaining bits of register 12 and all the bits in register 13 define the offset address divided by two. Therefore, two byte scrolling is the smoothest that can be achieved since the offset is divided by two.

The registers are best explained with an example.

Suppose we wish to alter the screen start address to &C400. The first step is to find the block address of the start location – see Table III. &C400 is in the final block so bits 5 and 4 are %11.

Next we need to calculate the offset from the block start address and divide it by 2.

```
&C400-&C000 = &0400
&0400/2     = &0200
```

At this stage register 13's value is known – it's the Least Significant Byte – LSB – of &200, which is 0 or 00 if you prefer.

And finally, the block address bits are combined with the Most Significant Byte – MSB – of the offset in the following way:

```
&02 =%00000010  MSB of offset
    %xx11       Block address bits
    ----------
    %00110010   = &32 = Result
    ----------
```

The *xx* indicates bits which are unused by the 6845. Now all that remains is to send the bytes to the 6845.

This is done with four OUT commands:

```
OUT &BC00,12:OUT &BD00,&32:OUT &BC00,
13:OUT &BD00,0
```

Once the screen offset becomes a multiple of &800 – when the start

address is &C800, for example – the screen is restored to its normal position.

This is because the Amstrad's screen memory map doesn't allow the screen to be shifted by pixel rows, as would be the case if the screen started at an address greater than &C7FF – see Figure I.

In other words, the offset register is only effective if it's between 0 and &7FF. &800 to &FFF will produce the same results.

Program V demonstrates how registers 12 and 13 can be used to scroll the screen from right to left under key control. Notice that the text on the left edge wraps round to the right side of the screen one character row higher.

This is a feature of the 6845 and cannot be stopped. The only way round it is to erase the left edge of the screen before scrolling it. This should be done in machine code as Basic is much too slow.

Program VI allows a large pyramid to be scrolled left and right using the cursor arrows. It shows how large

```
10 REM simple scroll
20 REM By Kevin Edwards
30 MODE 1
40 FOR row=0 TO 20
50 PRINT"hello......"row
60 NEXT
70 DEFREAL s
80 FOR start=12288 TO 16383
90 OUT &BC00,12
100 OUT &BD00,INT(start/256)
110 OUT &BC00,13
120 OUT &BD00,start-256*INT(start/256
)
130 a$=INKEY$:IF a$="" THEN 130
140 NEXT
```

Program V

characters can be moved without re-drawing them.

Program VII uses the registers in a different way and allows two Mode 0 screens to be displayed – one containing text, the other graphics.

Registers 12 and 13 are now altered to point at &4000 – the start of the text screen – then &C000, the start of the graphics, which flicks between the two screens held in memory. You should also note that storing two Mode 0 screens in this

	&C000	&C001	&C002
	&C800	&C801	&C802
	&D000	&D001	&D002
row 1	&D800	&D801	&D802
	&E000	&E001	&E002
	&E800	&E801	&E802
	&F000	&F001	&F002
	&F800	&F801	&F802
	&C050	&C051	&C052
	&C850	&C851	&C852
	&D050	&D051	&D052
row 2	&D850	&D851	&D852
	&E050	&E051	&E052
	&E850	&E851	&E852
	&F050	&F051	&F052
	&F850	&F851	&F852

Figure I: Memory map for top left corner of the screen.

way requires 32k of RAM . . .

This screen switching could be used in Computer Aided Design programs which require dual screens, one containing instructions and the other graphics.

A clever OS routine at &BC08 makes this possible because it allows the screen RAM to be moved to a different area of memory – in this case &4000.

On entry the Z80 accumulator should contain the high byte of the new start address. This must be either 0, &40, &80 or &C0. In fact, 0 and &80 shouldn't be used because vital OS workspace will be corrupted.

Once the screen has been moved, all text and graphics commands will affect the new screen, leaving the other in its original state.

Program VII uses a small machine code routine at &3000 to select &4000 as the screen base address. All it does is load the accumulator with &40 then jump to &BC08.

That completes the description of the more useful 6845 registers. As you can see there's plenty of things you can do, especially with registers 12 and 13. If you conjure up anything interesting, send it in and let us have a look.

```
10 REM PYRAMID SCROLL
20 REM By Kevin Edwards
30 MODE 1
40 LOCATE 26,5:PRINT"H E L L O"
50 FOR block=0 TO 10
60 LOCATE 31-block,block+10
70 PRINT STRING$(2*block,CHR$(143))
80 NEXT
90 DEFREAL s
100 start=12288
110 WHILE 1=1
120 strel=0
130 IF INKEY(8)=0 THEN strel=1
140 IF INKEY(1)=0 THEN strel=-1
150 IF strel<>0 THEN GOSUB 170
160 WEND
170 IF start+strel<12288 THEN RETURN
180 IF start+strel>12308 THEN RETURN
190 start=start+strel
200 OUT &BC00,12
210 OUT &BD00,INT(start/256)
220 OUT &BC00,13
230 OUT &BD00,start-256*INT(start/256
)
240 RETURN
```

Program VI

```
10 REM dual screens
20 REM By Kevin Edwards
30 MODE 0
40 GOSUB 260
50 FOR loop=1 TO 100
60 DRAW INT(RND(1)*640+1),INT(RND(1)*
400+1),INT(RND(1)*16)
70 NEXT
80 PRINT"Mode 0 graphics"
90 CALL &3000
100 CLS
110 FOR loop=1 TO 22
120 PRINT "Mode 0 text screen"
130 NEXT
140 WHILE 1=1
150 a$=INKEY$:IF a$="" THEN 150
160 OUT &BC00,12
170 OUT &BD00,&30
180 OUT &BC00,13
190 OUT &BD00,0
200 a$=INKEY$:IF a$="" THEN 200
210 OUT &BC00,12
220 OUT &BD00,&10
230 OUT &BC00,13
240 OUT &BD00,0
250 WEND
260 FOR acode=0 TO 4
270 READ byte:POKE &3000+acode,byte
280 NEXT
290 RETURN
300 DATA &3e,&40,&c3,&08,&bc
```

Program VII

Plotting the celestial spheres

MOST people know that the familiar seven days of the week are named after the planets. Thus we have (together with the French for comparison):

Sunday	Sun	Dimanche
Monday	Moon	Lundi
Tuesday	Mars	Mardi
Wednesday	Mercury	Mercredi
Thursday	Jupiter	Jeudi
Friday	Venus	Vendredi
Saturday	Saturn	Samedi

But why are they in this particular order? Well, it was defined by the Romans over 2000 years ago.

They believed that the faster a planet appeared to move the nearer it was. This was a very sensible belief because the moon, the fastest mover, could eclipse all the others. Their order of distance was therefore as shown in Table I.

Still not the right order? This is because the Romans named each day, beginning with Saturday, after the first hour of that day.

That is, if you share out all twenty four hours in a day between the seven days of the week, the day the *next* hour – that is the first hour of a new day – lands on is the next day in our sequence. (It's a sort of MODULO 7 division.) If you count through the planets in 24s, noting where a 1 falls, you'll get the familiar sequence.

Now it is a great pity that humans are slightly short sighted because it is just possible to see the next planet beyond Saturn if you know where to look.

However the main reason for missing Uranus is because it travels so slowly. Nevertheless 8 planets plus 8 fingers and 2 thumbs would have ensured binary and octal counting long before computers appeared.

In order to locate and identify a planet we need a reference point, and the most convenient is obtained from the most obvious, namely the Sun. This star follows the same path through the "fixed" star background almost once a year.

This path is called the ecliptic and the position of the Sun at the spring equinox – on or about March 21 when day and night are of equal length – is called the First Point of Aries.

It is from this point, now actually in the constellation of Aquarius (that's why we live in the "Age of Aquarius"), that the position of ALL celestial bodies is measured.

The Sun's position over the whole year is therefore quite simply how many degrees to the left of Aries 0. Consider Figure I where its path has been split into the familiar 12 zones of the Zodiac, each zone equal to 30 degrees.

An important point to appreciate is that the Sun appears to rise in the east and set in the west because of the earth's rotation but also appears to move from west to east against the stars, (or Zodiac), because the earth is revolving around the Sun.

This west to east movement is, on the whole, true for all the planets and can be seen in real time when the Moon eclipses the Sun, another planet or a star.

By and large the planets tend also to travel along the ecliptic. Therefore we can simply define their positions as just a longitude (how far to the left of the first point of Aries).

Calculating these longitudes is done in three stages:

- We have to know where they were relative to the Sun's point of view on a given date plus their period of revolution around the Sun, eccentricity of orbit and so on.
- From this information we can apply simple Newtonian celestial mechanics to calculate where the planets were or will be in their orbits around the Sun at a chosen date.
- Finally we must move the "point of view" from the Sun to where we have calculated the Earth must be.

Some simple trigonometry does this, but note that all we have to do for the Sun's position is to add or subtract 180 degrees to or from the

Farthest	SATURN	(1*) 8 15 22 — Slowest planet
	JUPITER	2 9 16 23
	MARS	3 10 17 24
	SUN	4 11 18 (1) ◁—First hour of Sunday
	VENUS	5 12 19 2
	MERCURY	6 13 20 3
Nearest	MOON	7 14 21 4 — Fastest planet

**Start sharing out the 24 hours here*

Table I: The order of the planets according to the Romans

DAYS=–1014.25		Day of week
Sun	2	Ari2
Mercury	17	Ari17
Venus	47	Tau17
Mars	57	Tau27
Jupiter	276	Cap6
Saturn	62	Gem2
Uranus	197	Lib17
Neptune	245	Sag5
Pluto	182	Lib2

Table II: Result from example program

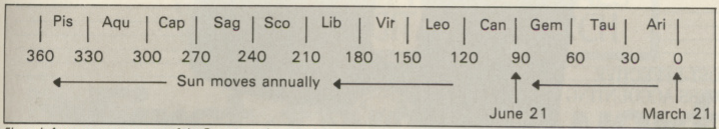

Figure I: Apparent movement of the Sun along the ecliptic

Earth's longitude position since it is really the Earth that defines the path of the ecliptic and is just out of phase by 180 degrees.

I have written a very simple program – 50 lines and no machine code – to perform these calculations based on the planetary data for December 31, 1974.

Although simple, it is accurate to two or three degrees per century and therefore quite adequate for naked eye location and identification. No Moon, I'm afraid, as that requires quite different and more complex calculations.

Enter it in Mode 2 and test it by entering the data as 6pm GMT on March 21 1972 thus: 21.75,3,1972 The result should be as in Table II.

Drawing this result on to the first quarter of the Zodiac we then get the picture shown in Figure II.

So if we had looked to the west at 6pm on that date we would have seen the Sun just setting exactly due west

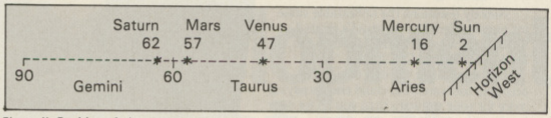

Figure II: Position of planets along the ecliptic at 6pm GMT, March 21, 1972

(because it was just past the equinox) with planets Mercury, Venus, Mars and Saturn strung out from the Sun along the line the Sun had just followed in the previous 4 hours (=60 degrees).

As a bonus the program also tells you the day of the week, but its real use is to help identify planets and also help you to "see" how they move.

For example, get their positions each week over a period of one year and plot them against the star background. You will see that the Sun moves steadily to the left with Mercury and Venus revolving around it, whereas the other planets, particularly Mars and Jupiter, "retrograde" – that is move to the right for a short time each year. This is because the Earth is passing them on the "inside track" at a higher angular velocity.

Another application of the program is in astrology and drawing up horoscopes. If, however, you take this subject seriously then the program is far too crude to be of any use.

To differentiate between people you must have their date of birth down to a few minutes and the planet positions to within a few fractions of a second, otherwise it doesn't work.

Aleatoire

```
10 DEG:REM PLANETS ECLIPTIC POSITION
ON DD,MM,YYYY
20 DIM Z$(12)
30 FOR P=0 TO 8
40 READ P$(P),PRD(P),L75(P),L6P(P),EC
C(P),SMA(P)
50 NEXT P
60 FOR P=0 TO 12:READ Z$(P):NEXT P
70 FOR P=0 TO 6 :READ D$(P):NEXT P
80 INPUT"DATE  D,M,MM,YYYY ",DAY,MONT
H,YEAR
90 LEAPYEAR=YEAR-INT(YEAR/4)*4
100 D=INT((MONTH+1)*30.61)-63
110 IF LEAPYEAR=0 THEN D=D+1
120 IF MONTH=1 THEN D=0
130 IF MONTH=2 THEN D=31
140 DAYS=(YEAR-1875)*365+INT((YEAR-18
73)/4)+D+DAY-36525
150 IF DAYS<-27333 THEN DAYS=DAYS+1
160 D=DAYS MOD 7:IF D<0 THEN D=D+7
170 PRINT"DAYS=";DAYS,D$(D);"day"
180 FOR P=0 TO 8
190 NP=360/365.25*DAYS/PRD(P)
200 WHILE NP>360:NP=NP-360:WEND
210 WHILE NP<0  :NP=NP+360:WEND
220 L6=NP+360*ECC(P)/PI*SIN(NP+L75(P)
-L6P(P))+L75(P)
230 WHILE L6>360:L6=L6-360:WEND
240 WHILE L6<0  :L6=L6+360:WEND
250 R=SMA(P)*(1-ECC(P)^2)/(1+ECC(P)*C
OS(L6-L6P(P)))
260 IF P>0 THEN 310
270 D=R
280 L=L6
290 IF L>180 THEN EP=L-180 ELSE EP=L+
180
300 GOTO 350
310 EP=ATN(D*SIN(L6-L)/(R-D*COS(L6-L)
))+L6
320 IF P<3 THEN EP=ATN(R*SIN(L-L6)/(D
-R*COS(L-L6)))+L+180
330 WHILE EP>360:EP=EP-360:WEND
340 WHILE EP<0  :EP=EP+360:WEND
350 EP=INT(EP+0.5)
360 PRINT P$(P),EP;" ";Z$(INT(EP/30))
;EP MOD 30
370 NEXT P
380 GOTO 80
390 REM  Planet  Period     Long75
    LongPeri    Eccen       Distance
400 DATA Sun    ,1.000040,   99.53431
,   102.5104,   0.016720,    1.000000
410 DATA Mercury,0.240850,   328.6631
,   77.06645,   0.205629,    0.387099

420 DATA Venus  ,0.615210,   318.9745
,   131.2193,   0.006785,    0.723332
430 DATA Mars   ,1.880890,   249.6292
,   335.5988,   0.093382,    1.523691
440 DATA Jupiter,11.86224,   355.2141
,   13.91992,   0.048460,    5.202804
450 DATA Saturn ,29.45771,   104.1728
,   92.55833,   0.055630,    9.538844

460 DATA Uranus ,84.01247,   285.7829
,   170.2547,   0.047250,    19.18185
470 DATA Neptune,164.7956,   249.9146
,   44.40592,   0.008586,    30.05796

480 DATA Pluto  ,246.3780,   280.3345
,   224.2580,   0.246115,    39.29976

490 DATA  Ari, Tau, Gem,Can,Leo,Vir,L
ib,Sco,Sag,Cap,Aqu,Pis, Ari
500 DATA Tues,Wednes,Thurs,Fri,Satur,
Sun,Mon
```

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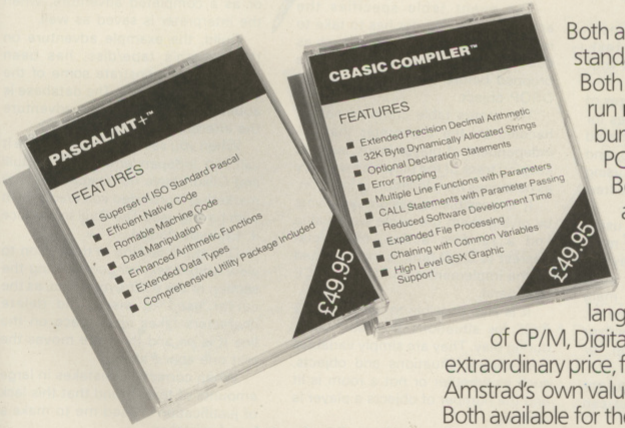

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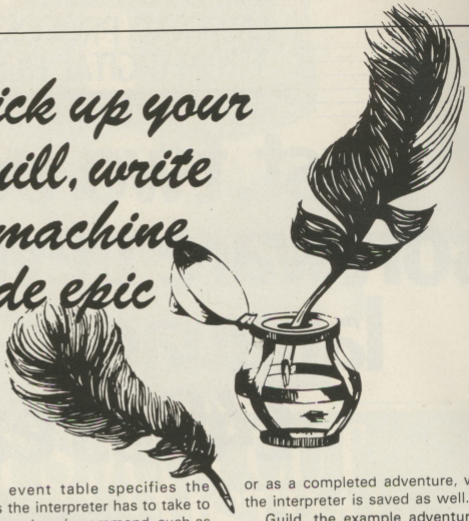

GILSOFT are modest enough to call The Quill an adventure writer's utility. I would go a lot further than that. If you can't program in machine code, then The Quill is an absolute must.

It is an adventure creator, but produces machine code not Basic games. It consists of three parts – a database, database editor and interpreter. When the program loads you are into the two main menus that control access to all the utilities you need, such as saving, testing and loading your creation.

Sub-menus cover printing, amending and inserting all the text, movement and status values for your adventure.

Some other interesting features of the main menus include facilities for changing the text and background colours, including inverse video, and the option of choosing between using tape and disc to save your masterpiece.

Your adventure is created using the tables available from the main menus in the editor mode. They are very easy to use. Text for your locations is selected from the main menu. Then, from the sub menu, you can either insert new text, with or without specifying a location, or amend text already entered.

After entering your text you are returned to the sub menu and can then view it or get a printout.

Text aside, you also need to insert the data relating to the events that take place during the game. This is done via three further tables – movement, event and status.

The movement table is used to set the directions the player may use from each location and the room that each move will take him to.

YOU can see exactly how good The Quill is by playing Guild, the free adventure that is included with this month's *Computing with the Amstrad* disc and tape. It is written entirely with The Quill.

The event table specifies the actions the interpreter has to take to reply to a player's command, such as deciding whether an object can be dropped before allowing a player to DROP object.

The status table contains entries handled by the interpreter that are independent of player input, such as keeping track of the player's inventory as he moves from location to location.

It is possible to assign synonyms by giving them the same word value and a random action, of special interest to D&D fans, is incorporated by the implementation of a CHANCE command.

It is also possible to use up to 33 flags for situations that can occur during play. They are simply variables that control situations and objects, such as whether or not a room is lit and the number of objects a player is carrying.

Of these, flags 11 to 29 are user-definable for situations or hazards used to enhance your adventure. It is possible to view these values and you are given the option of doing this whenever you test the adventure.

The Quill allows a maximum of 252 locations and about the same number of objects and messages, so it is possible to create quite a large adventure.

If you go for large amounts of text though, you will find that memory shortage is a limitation.

You can save your work in two ways – as a database, in which case you can load it back in and test it later, or as a completed adventure, when the interpreter is saved as well.

Guild, the example adventure on this month's tape/disc, has been written to demonstrate some of the features of The Quill. The database is about 10k long and as an adventure the interpreter adds another 2k.

When you save a complete game it will run independently of The Quill and Gilsoft have no objection to you marketing it provided you credit them with having used The Quill to produce it. I hereby do so!

One thing lacking is the option to view edited text without leaving the section of the editor you are in, as the cursor used to insert and delete characters takes up a space on the line it is on and therefore moves the text one space along.

When correcting mistakes in large amounts of text I found that this lack of justification caused me to make a lot of mistakes.

Deleting a space from the text, for instance, pulls all the text back one space so you have to go all through it to re-justify it. Aside from this, I can't fault it.

The Quill is a superb utility, the next best thing to writing in machine code.

It overcomes most of the memory limitations imposed by programming in Basic and must be an absolute godsend to people who have the imagination but not the programming ability for creating adventures.

I cannot recommend it too highly.

Gandalf

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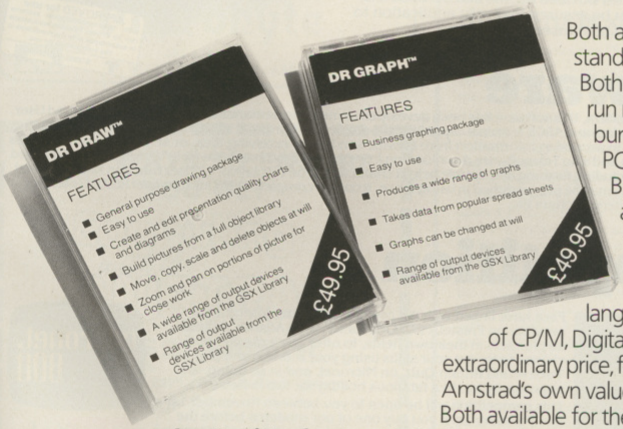

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MNEMONICS MAKE LIFE SO MUCH SIMPLER..

..and labels do wonders for your code

HAVE a look at Program I. Familiar? It should be – it's our favourite loop, which we've met several times. The only difference is that in this incarnation it's stored in memory at &8000, not &3000 where we've always located it previously.

Compare it with the listing of it last month, where it appeared as Program VI. As we've said, the address it's stored at is different, but if you look at the actual code in there you won't find a lot of difference.

In fact the only bit of the program that depends on where it's stored is the branch back to *here*. And since we're using relative branching, with

```
address  hex code      mnemonics
 8000    3E 20           LD A,&20
 8002    CD 5A BB  here CALL &BB5A
 8005    C6 01          ADD A,1
 8007    30 F9          JR NC,here
 8009    C9             RET
```

Program I

its offset specifying the number of bytes to be branched – not an address – the code remains unaltered. Wherever the code is stored you're still branching over the same number of bytes.

If we'd used JP NC instead of JR NC, we would have had to specify the actual address – &8002 – of the byte we're branching back to, which would make the code different from last month's version even if the idea's the same. If you recall, last month we were branching back to &3002.

Now take a look at Program II. Very different, isn't it? Or is it? Actually, the code is identical to Program I, though I admit it's very well disguised.

What I have done is to enter the code on an assembler, a program that takes all the heartache out of entering machine code.

The good thing about an assembler is that it lets you enter the code in mnemonics. To heck with remembering hex opcodes – just enter LD A,&20 or whatever and the assembler translates it into hex for you automatically – and without making mistakes.

So if you were using an assembler to enter Program II you'd type in only the right hand column. The assembler itself works out what you see in the left column.

You see, the idea behind assemblers is that we humans function better working with words than with numbers. And not only do they allow you to use mnemonics instead of hex opcodes, they let you use labels.

So what? Well, labels:

- Make your code far more understandable.
- Make your code far more adjustable.
- Do the work of calculating those error-prone relative branches for you.

For instance, in Program I we've labelled the address &8002 *here*. If we were typing this program with an assembler this is how we'd mark the branch – with a word to show where you're branching to.

We've also used *here* in the instruction JR NC,here. Our mnemonics can include such labels instead of directly referring to a memory location by its number.

When the Amstrad encounters *here* in a branch instruction, it knows where it's got to go to, calculates the hex number needed to specify the branch and places it in memory.

Various assemblers differ as to how you use labels – the number of letters allowed, whether preceded by full stops or colons and so on – but they all allow them.

In Program II you should be able to pick out *here* quite easily. When we mark an address with a label we say

```
Pass... 2              ORG &8000


8000:                  .space=&20
8000:                  .increment=1
8000:                  .charout=&BB5A


8000:                  .start
8000:3E 20             LD A,space
8002:                  .here
8002:CD 5A BB          CALL charout
8005:C6 01             ADD A,increment
8007:30 F9             JR NC,here
8009:C9                RET
800A:                  END
```

Program II

Part XI of MIKE BIBBY'S series on machine code

we're defining that label. Any label that's defined can be referred to in the mnemonics.

Notice that where I've defined *here* I've put the label on a separate line and preceded it with a full stop. This is because I'm using Roland Waddilove's amazing assembler, RAW.

The full listing is in our July issue, and I suggest you type it in or get the tape, since that's the one I'll be using for the rest of the series.

Some assemblers let you mark a branch address by putting a label directly in front of the mnemonic you're branching to, on the same line.

'An assembler does the translation into machine code in two steps or passes'

Every assembler has its own peculiarities – get used to one and stick with it.

Taking a closer look at Program II, you'll see on the top left Pass 2. This is because an assembler does the translation into machine code in two steps or passes.

The first time it goes through what you've entered – known as the source code – and makes a list of the labels that have been defined and the addresses they refer to.

Once it's got these, it makes its second pass through the opcode, translating the mnemonics and their associated labels into the hex opcodes – the object code – and storing them in memory.

The assembler knows where to put the code because you give it an address, or origin, to start from, hence the line at the top of the code ORG &8000.

I've located the code at &8000 rather than our usual &3000 because RAW uses more memory than Hexer. Incidentally, if you want to combine both programs – and I suggest you do – the July issue contains full details, as well as the listings of RAW. Hexer itself was listed in our March issue.

Returning to Program II, the next three lines are interesting, since they show us how to give a label a value. You see, labels don't have to mark addresses, they can be used to refer to numbers as well. For instance, the line:

```
.space=&20
```

means that from now on when the assembler encounters *space* in a suitable place it knows we mean &20.

This method of giving a value to labels by using = is known as explicitly defining the variables. You don't just wait for the assembler to come across a label at a certain point in the source file and give it the value of the address reached – you tell it beforehand what it's going to be. The assembler includes these in the list it makes during the first pass.

Of course I chose *space* to label the value &20, because this is the Ascii code for space.

I've also labelled the amount the A register is increased each time (1) as *increment*, and the address of our print character routine (&BB5A) as *charout*. I think you'll agree that this makes the following lines from Program II's source code:

```
CALL charout
ADD A,increment
JR NC,here
```

far more readable than their equivalents without labels:

```
CALL &BB5A
ADD A,1
JR NC,&8002
```

Here's another nice feature: Suppose I thought the Ascii for space was &0D and accordingly put:

```
.space=&0D
```

in my source code. Instead of having to go through hundreds of lines of code, replacing each &0D with &20 when required, I simply alter one line so that:

```
.space=&20
```

replaces the erroneous

```
.space=&0D
```

I then pass it through the assembler again – we say "reassemble the code" – and let it do the replacements for me.

Then again, I might decide to increase the Ascii code of the characters I'm printing in steps of three. Simple, just alter the relevant line to:

```
.increment=3
```

A more realistic case might be where I've used the official *charout* routine while developing my code, but have decided that now I've got it working I'll use my own less general but faster routine.

All I have to do is change the value assigned to *charout* at the beginning of the program to the address of my home grown routine and all's well.

Alternatively I might simply delete the line:

```
.charout=&BB5A
```

and precede my new routine with:

```
.charout
```

The effect is the same – defining *charout* as the address of the new routine. However this way if the address of the routine changes, the assembler automatically takes it into account when compiling its list of address labels. No problem.

'The ability to insert or delete lines of text with ease is another advantage of assemblers'

With the first method though, *charout* isn't changed automatically, since you've given it a fixed value.

Why should addresses change like this, you might wonder? Well, having got your code working you might decide that it would work better if you

```
Pass... 2           ORG &8000

8000:               .start=1
8000:               .toobig?=9

8000:               .return=&0D
8000:               .linefeed=&0A
8000:               .asterisk=&2A

8000:               .charout=&BB5A

8000:0E 01          LD C,start
8002:               .back
8002:41             LD B,C
8003:               .over
8003:3E 2A          LD A,asterisk
8005:CD 5A BB       CALL charout
8008:05             DEC B
8009:C2 03 80       JP NZ,over
800C:3E 0A          LD A,linefeed
800E:CD 5A BB       CALL charout
8011:3E 0D          LD A,return
8013:CD 5A BB       CALL charout
8016:0C             INC C
8017:79             LD A,C
8018:FE 09          CP  toobig?
801A:20 E6          JR NZ,back
801C:C9             RET
801D:               END
```

Program III

just added a few more lines of source code.

Of course more source code means more opcodes, so the bytes that follow those you've inserted get moved along in memory. This in turn means that the addresses of your routines change.

If your routines are labelled the assembler simply calculates them as part of its normal action. If you've been rash enough to define them explicitly at the beginning, you'll have to type in their new values.

Hint – only use explicitly defined labels with constants, such as the value of space, or ROM routines such as &BB5A.

Actually this ability to insert, and delete, lines of text with ease is another advantage of assemblers. If you've ever worked out the opcodes for a long listing and found out that you had to recalculate the code because you've missed out some vital opcodes from the middle of relative branches, you'll appreciate this. If not, just be grateful you haven't had the experience and accept it on trust!

When we alter text like this we say we're editing it. Every assembler allows some correcting or editing, some better than others.

On more sophisticated assemblers the editor is a separate sub-program or even program where you type in your source code in word processor fashion. Once you've got it right you then submit it to the assembler to convert it into hex or source code.

As well as taking the tedium out of machine code, assemblers add considerably to the clarity and consequent ease of understanding of programs. Take a look at Program III. It shouldn't take you too long to work out what it does, because of the extra clarity labels give you. Anyway, you've met it before!

As a last example of our new assembler techniques, try Program IV. The idea here is to put a coloured

```
Pass... 2           ORG &8000

8000:               .pattern=&CC
8000:               .screenstart=&C000
8000:               .zero=0

8000:21 00 C0       LD HL,screenstart
8003:               .notdone
8003:3E CC          LD A,pattern
8005:77             LD(HL),A
8006:23             INC HL
8007:7C             LD A,H
8008:FE 00          CP  zero
800A:20 F7          JR NZ,notdone
800C:C9             RET
800D:               END
```

Program IV

pattern on the screen. You see, what appears on your monitor is determined by the contents of what's known as screen memory. This is the range of memory locations from &C000 to &FFFF. The Amstrad – in ways too complex to go into here – uses these bytes to create the picture you see on your screen.

All we need to know is that if you change these bytes you change what appears on the screen. All Program IV does, therefore, is to poke a byte *(pattern)* into successive screen memory locations.

To do this we load A with *pattern* and HL with the address of the beginning of screen memory with LD (HL),A. Next we increment HL to point to the next location and – if we haven't finished – loop back to *notdone* in order to poke *pattern* into the next screen location.

We haven't met INC HL before. As you'll have guessed it increments the value of the HL register pair. In general INC rr and DEC rr exist, as you'll see from Table I. There's one drawback to using them, though – they don't affect the flags.

So how do we test for having filled all of screen memory? Well when HL reaches &FFFF – the last byte of screen memory – we poke *pattern* into that location and increase HL as usual, taking it "round the clock" to &0000.

This means that both the H and L registers, considered separately, contain zero. When you think about it, since we started with HL equal to &C000, which gave H the value &C0, this is the first time during our program that H can contain zero. It's previously held &C0, &C1, &C2 ... &FF, increasing each time L has cycled past 255.

In other words, when we increase HL from &FFFF to &0000, the H register becomes zero for the first time. We check for this with:

```
LD A,H
CP zero
JR NZ,notdone
```

and if it is zero we've covered all of screen memory and drop out of the loop.

Try altering the value of *pattern* and observing the effects in different modes.

● *Next month it's sums and register pairs. Meanwhile, get some practice in with your assembler.*

register pair	INC	DEC
BC	&03	&0B
DE	&13	&1B
HL	&23	&2B

Table I: Opcodes for INC rr and DEC rr

ROLAND WADDILOVE tells you how to

Step up in class with Upgrade!

ONE of the first things I did when I got my hands on a CPC664 was to have a look at its much-vaunted newer version of Basic. In fact Basic 1.1 on board the new CPC664 is very much the same as the old Basic 1.0 in the CPC464, except in the graphics department, which contains many new commands.

There was a notable absence of graphics commands in Basic 1.0. This has now been rectified by the addition of several new and powerful routines.

Unfortunately this may cause compatibility problems as some software written for the new machine will not run on the old, although CPC464 programs will have less trouble running on the 664.

There's not much you can do with commercial software as it's nearly always in machine code and heavily protected. But it's possible to modify Basic programs to run on the old machine without too much difficulty. RSXs can be used to add the new commands to Basic 1.0 to (almost) bring it up to the standard of Basic 1.1.

Upgrade will enable you to run CPC664 Basic programs with very few modifications. The syntax of RSXs aren't quite the same as Basic commands and they aren't quite as flexible. However, their syntax and function have been made as similar as possible though, and you shouldn't have too much trouble translating programs.

The rules are simple. When entering or converting a CPC664 listing for your 464, precede the new commands with the vertical bar and join commands which consist of two words with a full-stop. A comma must follow the command if there are parameters. These can be expressions or actual values if numeric, or the address of a string variable.

For example:

```
GRAPHICS PEN 2
```

should be converted to:

```
|GRAPHICS.PEN,2
```

Most of the new commands take several parameters, some being optional. These are all compulsory with the RSXs. With the MOVE, PLOT and DRAW commands the old ones are still available, so these can be used if you don't need the extra parameters.

The fill command is only a simple version of the fast and powerful fill of Basic 1.1. I've taken the fill from the RSX article in the May issue of *Computing with the Amstrad* and modified it so that it has the same syntax and function as the CPC664 version.

Several move and fill commands may be needed to fill a complex shape which Basic 1.1 would fill with one. This is only a minor inconvenience, though.

Make sure that the mask is set to 255 so that all pixels are plotted and that the graphics write mode is 0. This doesn't matter with the 664 version, but is a consequence of the way MASK has been implemented in Basic.

Upgrade's version of COPY CHR$(#stream) isn't quite the same, due to restrictions in the way RSXs work. This command returns as a string the character at the current cursor position in the specified stream.

For example:

```
PRINT ASC(COPYCHR$(#3))
```

is quite acceptable in Basic 1.1 but is impossible with an RSX. The equivalent using Upgrade would be:

```
a$=CHR$(0)
|COPYCHR,3,@a$
PRINT ASC(a$)
```

The character read is placed in *a$* which can then be used and manipulated in the same way as COPYCHR$(#stream).

Table I contains a full summary of the commands available with Upgrade.

Upgrade will set HIMEM to &9FFF and store the machine code from &A000 onwards. To enable the new commands CALL &A000, (only call this once). SYMBOL AFTER will produce an argument error if used after this program has been run. To get round this, first save the machine code with:

```
SAVE"664BASIC",B,&A000,&2A0
```

HIMEM can be moved down after SYMBOL AFTER and the machine code loaded with:

```
LOAD "664BASIC"
```

Then call &A000 to enable the RSXs.

The program is far too long to give a full assembly listing so you'll have to use a disassembler to find out how it works. &A023 is the start address of the jump table and &A04A is the name table, so the address of all the commands can be found by looking at these two areas of memory.

The SCR WRITE indirection is intercepted and the mask in the C register altered according to the mask given by the user. It then jumps to the old routine in the lower ROM to write the pixels to the screen. SCR SET MODE is also intercepted so that the mask routine knows which mode it's in.

These intercepts are set up at the same time as the RSX commands are enabled. Look at &A000 to &A01E to see how it's done.

And that's all there is to it. Now who's going to be the first to send us a program that takes full advantage of Upgrade's new commands?

!FRAME
Waits until the next TV frame for flicker-free graphics.

!GRAPHICS.PAPER,<ink>
Sets the graphics paper ink. This is useful when printing characters at the graphics cursor using TAG.

!GRAPHICS.PEN,<ink>
Sets the graphics pen ink. Again this is useful when printing characters at the graphics cursor using TAG.

!CLEAR.INPUT
Clears the input buffer. This can be used to remove garbage before, for example, the keyboard is read or an INPUT statement.

!COPYCHR,<stream>,<string address>
Reads the character at the current print position for the specified stream. This is the equivalent of COPYCHR$(#stream). The address of a non null string must be passed, the first character of the string is then replaced with the character read.

!CURSOR,<0 or 1>,<0 or 1>
The first parameter, the system switch, enables the cursor to be displayed. The second parameter, the user switch, places it on or removes it from the screen. Basic normally disables the cursor except during inputs.

!MASK,<0-255>,<0 or 1>
The bit pattern of the first parameter is used when plotting points or drawing lines. The mask is rotated and the next point plotted if the next bit is set in the mask.

!MOVE,<x>,<y>,<ink>,<plot mode>
!PLOT,<x>,<y>,<ink>,<plot mode>
!DRAW,<x>,<y>,<ink>,<plot mode>
!MOVER,<x>,<y>,<ink>,<plot mode>
!PLOTR,<x>,<y>,<ink>,<plot mode>
!DRAWR,<x>,<y>,<ink>,<plot mode>
The ink and plotting mode can now be set using any of the !MOVE, !PLOT or !DRAW commands.

!FILL,<ink>
The fill starts from the current graphics position and stops it when it hits either the current graphics ink or the fill ink.

Table I: The new commands available

```
10 REM Upgrade
20 REM By R.A.Waddilove
30 REM(c)Computing With The Amstrad
40 REM *** CALL &A000 to enable ***
50 MEMORY &9FFF:address=&A000
60 FOR i=1 TO 60
70 sum=0:READ code$,check$
80 FOR j=1 TO 21 STEP 2
90 byte=VAL("&"+MID$(code$,j,2))
100 POKE address,byte
110 sum=sum+byte:address=address+1
120 NEXT
130 IF sum<>VAL("&"+check$) THEN PRIN
T "Error in data in line ";140+i*10
140 NEXT
150 DATA 018CA1ED43E9BD2185A122,56D
160 DATA 0FBC3EC3320EBCCD11BC32,494
170 DATA 8BA101211A021A8A0C3D1BC,5A7
180 DATA 4DA0C319BBC3C4A0C3CEA0,6DC
190 DATA C3D8A0C3DEA0C301A1C31C,6C0
200 DATA A1C361A1C367A1C36DA1C3,6C5
210 DATA 73A1C379A1C37FA1C3DEA1,716
220 DATA 4652414DC5475241504849,3A6
230 DATA 43532E50415045D2475241,396
240 DATA 5048494353 2E5045CE434C,397
250 DATA 4541522E494E5055D4434F,3A8
260 DATA 5059434BD2435552534FD2,464
270 DATA 4D4153CB4D4F56C54D4F56,455
280 DATA 45D2445241D744524157D2,4C5
290 DATA 504C4FD4504C4F54D24649,45F
300 DATA 4CCC0000000000021B8A07E,30F
310 DATA A7C8CD5A8B2318F7525358,580
320 DATA 20657272 6F720A0D003DC2,360
330 DATA ACA0DD7E00C3E4BB3DC2AC,6B4
340 DATA A0DD7E00C3DEBBCD09BB38,620
350 DATA FBC9FE02C2ACA0DD6E00DD,6FA
360 DATA 6601DD7E027EA7CAACA023,522
370 DATA 4E2346CDB4BBF5CD6BBB02,5D2
380 DATA F1C3B4BBFE0220A7DD7E02,647
390 DATA A7F5C47BBBF1CC7EBBDD7E,7E7
400 DATA 00A7C481BBCC84BBC9FE02,67B
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720 DATA A220F92323ED5B91A2CDC0,609
730 DATA BBE1ED5B91A2CDF6BB2A91,750
740 DATA A2AFED4B97A247C9000000,4D2
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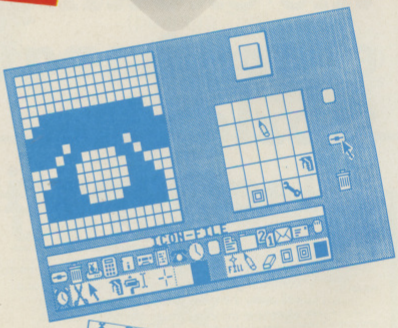

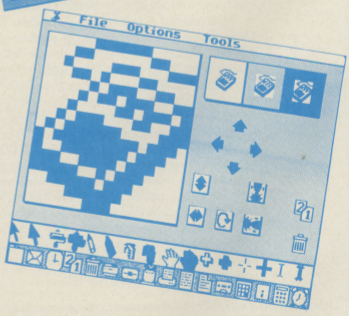

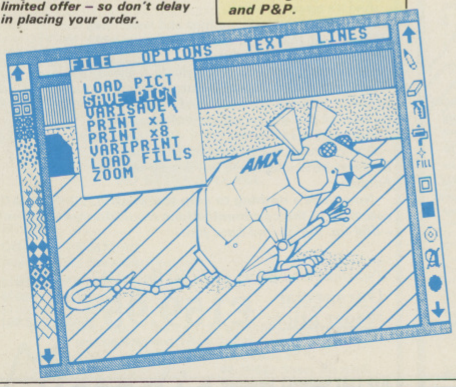

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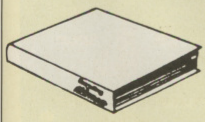

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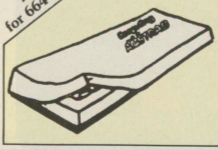

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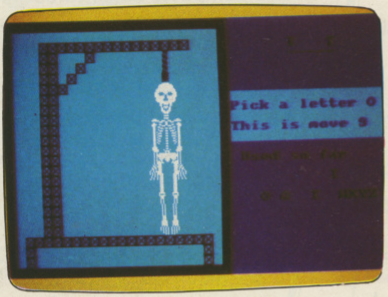

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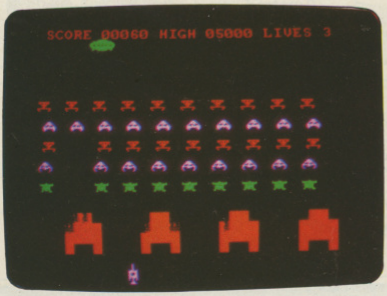

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Meeting a road block on column 24

AFTER reading the graphics article in the August 1985 issue of Computing with the Amstrad *I experimented with printing multi-character shapes several lines in depth on the screen.*

I found I could not LOCATE and PRINT beyond column 24 on any row. The following program illustrates this:

```
10 MODE 1
20 block$=CHR$(143)+CHR$(14
3)+CHR$(143)+CHR$(8)+CHR$(8
)+CHR$(8)+CHR$(10)+CHR$(143
)+CHR$(143)+CHR$(143)+CHR$(
8)+CHR$(8)+CHR$(8)+CHR$(10)
+CHR$(143)+CHR$(143)+CHR$(1
43)
30 y=1
40 FOR x=1 TO 25
50 LOCATE x,y
60 PRINT block$;
70 y=y+1
80 NEXT
```

Why does a carriage return occur before the last PRINT?

It would also appear that using TAG will not work. For example:

```
10 MODE 1
20 block$=CHR$(143)+CHR$(14
3)+CHR$(143)+CHR$(8)+CHR$(8
)+CHR$(8)+CHR$(10)+CHR$(143
)+CHR$(143)+CHR$(143)+CHR$(
8)+CHR$(8)+CHR$(8)+CHR$(10)
+CHR$(143)+CHR$(143)+CHR$(1
43)
30 TAG
40 PLOT 100,100
50 PRINT block$;
60 TAGOFF
```

Despite the semi-colon in line 50 the control characters, 28 and 10, print as arrows. I am desperate to overcome these problems. Is there any way?

Finally, can you explain with an example, the sentence on page 46 of Chapter 8 of the CPC464 User Instructions under SYMBOL:

A 0 in the row (an 8 bit number) indicates the paper colour to be used, and a 1 indicates that the pixel is to be set to the current ink colour.

Will an understanding of this help with the much-publicised problem of switching colours with the TAG, PLOT and DRAW commands? – **Philip Eva, Penarth, Glamorgan.**

■ One of the features(?) of Amstrad Basic is that any string that is too long to be printed at the current cursor position is printed on the next line. To prevent this use:

```
60 PRINT USING "&";block$;
```

TAG will always print control characters as graphic characters. For instance backspace – CHR$(8) – prints as a left arrow.

A character is made up of eight bytes of data. In binary if a bit is a 1, the corresponding pixel would be in the current pen, and if it is a 0 the corresponding pixel will be in the current paper colour.

The character designer in the May *Computing with the Amstrad* will help you to create your own characters, giving you all the examples you could wish for.

Clean out of memory

I AM a great fan of the Tasword word processor which must be the best WP package for the 464, especially as it is so easy to adapt for one's own needs, as it is partly written in unprotected Basic.

However it only leaves room for about 2,700 words, and it takes an annoyingly long time to load.

I would very much like to put Tasword onto an eprom, but I suspect that there are a great number of problems with any such plan.

Can I just load the Tasword onto an eprom, and how is the best way to relocate the machine code part of the program? – **D. Instone Brewer, Cardiff.**

■ If you are running out of memory then it's time to upgrade to a ROM-based word processor. It would be extremely difficult, if not impossible, to convert Tasword. And anyway, Tasman might be worried about their copyright.

Arnor's Protext should be suitable – there's a review coming up soon. First impressions are favourable, so look out for it.

Jibbing at SYMBOL

FIRST, thanks for a great magazine. Please keep the Beginner's articles running, whatever the "experienced users" say. I'd be lost without them.

I recently typed in the screen dump from the March issue, as I have invested in a Panasonic KX-P1091 printer.

It seems to work fine until a SYMBOL AFTER command appears in the program whose screen is to be dumped, at which point I get an "improper argument" message.

If I insert the CALL &AA00 before the program gets to this point, the screen is faithfully printed. If it is inserted after I get the problem.

I really don't think there is an error in my typing, as I was able to print my listing in a typeface identical to the one in the magazine, which was made for an easy and accurate comparison. Could you explain this?

While I'm writing this, I'd like to put in a quick word for the Panasonic. It really is a superb printer, well worth saving up for. For listings, it's fast and quiet, and the near-letter quality print is scarcely distinguishable from a daisywheel type.

I had the standard problem of double line feeds when I first set the printer up, but I didn't much like the idea of cutting one of the leads of my expensive ribbon cable. I got round this by carefully inserting a piece of cassette editing tape over the offending pin 14 on the connecting board.

Finally, please keep the excellent games listings going, as I really enjoy typing them in and trying to get them to work. I think it's true to say that most of my knowledge of Basic has been gained through the process of debugging. – **Rick Fielding, Sydenham, London.**

■ The reason you get the Arguments error is that the Amstrad won't allow the use of SYMBOL AFTER following a change of HIMEM unless you have a SYMBOL AFTER 256 before the change.

As you say, placing the SYMBOL AFTER command before the line that sets HIMEM, solves the problem.

Pleased with printer

I OWN an Amstrad CPC464 and have recently bought a printer for it. My main criteria was a good quality print, with reasonable cost, suitable for listings and word processing.

The printer I chose was an Ibico LTR-1, a letter quality printer costing £99. I find the quality extremely good, although I fully appreciate that it is rather slow (12cps) and has no graphic characters.

It produces all the Ascii characters of the Amstrad from 32 to 126, the only slight variation being that a £ and ¨ replace the bracket characters 123 and 125.

It uses normal A4 single

sheet paper, and is very cheap to run, the only replaceable part being an ink roll, which lasts 100,000 characters, at a cost of £4.75.

I have used the printer with the Easi-Amsword word processor, and it works extremely well.

Keep up the good work with the magazine, in particular the machine code series. Only one small grumble: How about some hardware reviews with regards to add-ons for the computer? – **B. Cook, Coventry, West Midlands.**

■ We're afraid we haven't come across this printer in the editorial office, but Mr Cook is obviously impressed with it. As for the hardware, as soon as it's out – and not just "pre-production" – we review it.

Country Cottages

APROPOS the letter from Martin Watkins in the September, 1985 issue of Computing with the Amstrad *with reference to the game "Country Cottages", I have been able to help him, and thought you might like the details in case you get any further enquiries.*

The author of the game is Dr. Brian James, and his address is 21 Lamond Place, Aberdeen, AB2 3UT, Scotland. He is now the sole distributor of his creation (which I can heartily recommend), Sterling Software having ceased trading in cassettes. – **William Smith, Windsor, Berkshire.**

Mid-program dump

THANK you for your excellent magazine. I read it avidly every month.

However I wonder if it would be possible for you to explain how you can do a screen dump to printer in the middle of a program.

I have had my Amstrad for nine months now, and not ever owning a computer before, I am slowly mastering it, but have failed to find the answer either in the manual, or by trial and error.

Keep up the good work, and let's have more of your informative articles. – **J.M. Dales, Poole, Dorset.**

■ Assuming you wish to use Roland Waddilove's screen dump from the March, 1985 issue you must first load it into memory and assemble it, for example, at &A00, after setting MEMORY=&9FFF.

If the following line is entered at the start of the main program loop or among the lines testing for any other key presses, pressing the D key will dump the screen to a printer.

```
IF INKEY(61)>-1 THEN CALL
&A000
```

Left in the lurch

I SHOULD like to endorse the views of Mr Winks (Postbag, October) with respect to Amstrads' withdrawal of the CPC664.

Alan Sugar and Co have certainly left many of their loyal customers in the lurch. I, like Mr Winks, upgraded from CPC464 to the 664 after much soul searching only to find within a matter of days that Mr Sugar was telling the computing world that this machine had been "overtaken by technology".

He cannot really claim that this was due to circumstances beyond his control as he did with the re-pricing of the CPC464.

I quote from the August edition of Computing with the Amstrad *when he said of the CPC6128 "we have no plans to sell the 6128 in the UK this year".*

On the strength of statements such as this from the head of the company I made my decision to go ahead with my purchase, and feel that I have been very shabbily treated by Amstrad.

Advance publicity of the CPC6128 was deliberately withheld, presumably to clear stocks of the CPC664, and then all of a sudden the machine was said to be obsolete literally days after unsuspecting customers had spent large sums of money on them.

If there are as few CPC664s left in the shops as they claim then production must have been run down quite some time ago.

In fairness to Amstrad, the CPC664 seems to be a good machine, but the fact that the 6128 is of higher specification and cheaper is extremely annoying.

The point is that the machine which I bought was obsolete before the ink was dry on the cheque and I didn't even know. Thanks a bunch Amstrad! – **Allan D. Mitchell, Ellon.**

★ ★ ★

I HEARTILY endorse the comments made by Mr G. Winks in the October Postbag.

In these competitive times we get used to computer manufacturers announcing better and cheaper machines, but for Amstrad to drop the 664 only four months after its introduction, to be replaced by the 6128 offering more for less outlay, is absolutely infuriating.

Amstrad was clearly aware that the 6128 was imminent when launching the 664, so why launch it at all?

Amstrad has an excellent record for having machines available in the shops when they are announced, but they will very soon lose their loyal following when buyers realise that the new machine they have just bought is likely to be discontinued within three or four months.

As you have the interests of Amstrad users at heart, how about putting some pressure on Amstrad for us angry 664 owners, to obtain a swap or upgrade? – **E.R.H. Clark, Dorking.**

Condensed directory

IN CP/M Mode Ctrl+O after Ctrl+P will dump the Screen Directory to a printer in condensed form.

This is a suitable size to use as an index for disc and cassette. – **J.E. Hammond, Scarborough, Yorkshire.**

Crashing at Le Mans

I HAVE spent several hours typing your Game of the Month, Le Mans, into my Amstrad 6128.

After spending several more hours checking for errors, I still cannot run the program satisfactorily.

All three cars tend to materialise on top of each other at the start, thus stopping the game and running through my three lives very quickly.

Could it be that the program will not run on the 6128? If so, are there any changes I can

Computing with the AMSTRAD Postbag

WE welcome letters from readers – about your experiences using the Amstrad, about tips you would like to pass on to other users . . . and about what you would like to see in future issues.

The address to write to is:

Postbag Editor
Computing with the Amstrad
Europa House
68 Chester Road
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Stockport SK7 5NY

make to overcome the problem?

On the other hand it may be a typographical error I have not spotted.

Whatever the cause, I do think that it would be extremely helpful if in future issues you state at the start of the program which Amstrad model it is compatible with.

This would avoid any unnecessary time spent typing listings which may not function on a particular model. – **R.G. Fleming, Swindon.**

■ We try to ensure that our listings are compatible with all Amstrad models (except the PCW8256).

Le Mans was written on a CPC6128 and runs on the CPC464 and CPC664 as well.

It sounds as if you have let a few typing errors creep in. Please check your listing very carefully.

Typewriter tips

I WONDER if your readers who possess disc drives and printers realise that with the use of the CP/M utilities they can turn their Amstrad into an excellent electronic typewriter.

You must first load the CP/M disc in the normal manner, then when the prompt appears type:

PIP LST:=CON:

This connects the keyboard to the printer then with the use of the following keys type away. The following should prove useful:

Ctrl+J = Line feed
Ctrl+I = Tab
Ctrl+H = Back space
Ctrl+M = Return
Ctrl+Z = Exit
Enter = Return

I have used this on the Smith-Corona TP-1 daisywheel and the DMP-1 printers. On the daisywheel each character is printed as typed; on the DMP-1 it prints out a line at a time.

This is a useful facility for anyone not possessing a word processing package (shame on them) or for doing small items. – **C.R. Jayne, Leeds, Yorkshire.**

■ Thanks for the hints. We're sure they will be useful to the increasing number of disc owners.

The right answer

I HAVE recently purchased an Amstrad 664 and enclose a copy of a program and its result.

I would be glad if you would let me know:

- *If the result is correct, why?*
- *Have I done something wrong? If so what?*
- *Is my computer faulty?*

– **R.S. Thomas, Lancaster.**

```
10 CLS
20 a$="123456789"
30 b=123456789
40 b$=STR$(b)
50 PRINT #8,LEFT$(a$,4),LEF
T$(b$,4)
60 PRINT #8,MID$(a$,4,4),MI
D$(b$,4,4)
70 PRINT #8,RIGHT$(a$,4),RI
GHT$(b$,4)
80 PRINT #8
90 PRINT #8,LEFT$(b$,5)
100 PRINT #8,RIGHT$(b$,4)

1234        123
4567        3456
6789        6789

 1234
6789
```

■ The result is correct. When the Amstrad turns a number into a string using STR$, it always puts a leading space before the first number. So in actual fact LEFT$(b$,4) prints three numbers preceded by a space.

Contact

I WOULD like to contact Amstrad users in my area, so could you publish my full address? – **Richard Hyams, age 15, 27 Coburg Road, Dorchester, DT1 2HN.**

Antilog formula

I AM in full agreement with Ian Townsend (Computing with the Amstrad, July 1985) who bemoans the lack of arcsine and arccos functions on the CPC464.

There is, however, another equally important function missing, namely antilog, base 10.

For a machine aimed at serious applications, the lack of these functions is surprising.

*There is fortunately an easy way to obtain antilog, based on the general formula for changing the base of logarithms: if x is the log, then antilog (x) = EXP (x*2.30258509).*

Readers may recognise the number in the brackets as "e", which among other things is the base of "natural" logarithms. – **P.H. McPherson, Wantage, Oxon.**

Garbage disposal

I HAVE problems with a program I wrote for my CPC464.

It has nine dimensioned string arrays for holding data loaded from a tape file and one array used for manipulating the data from any one of the nine arrays.

Data is first copied into the manipulating array from one of the nine, worked on and then re-assigned back.

The problem is that this can only be done for about 10 times before the computer takes about four minutes to continue.

After examination with FRE(0) I found that the available memory is less every time an array is assigned.

A FRE("") command takes about the same length of time, so is of no help as this is what the computer does anyway when it runs out of memory.

Erasing arrays is no help. Although it makes more memory available, this is quickly used up.

It seems I need a command similar to the RESTORE used when reading data lines as it appears that there is a pointer in memory that needs resetting.

Any ideas would be appreciated especially as the program is very long and works well apart from this. – **P. Whittaker, Barnsley.**

■ Place the FRE("") command in the main loop that manipulates the arrays. This should prevent garbage building up.

The right approach

HAVING read about the Amstrad PCW8256 in your October issue I decided it warranted a closer look.

Dixons informed me of availability late September (they now have stocks). So in the meantime I thought why not write to a few software houses about current and forthcoming software for this wonder machine.

Several have written back. Most sent a flimsy piece of paper with little detail, several sent a compliment slip stating "Nothing available" and some have not bothered to reply.

One in particular responded with a very impressive folder containing two files detailing two programs – Simple Accounts and Management Analysis.

The program details were written in plain English, examples of printouts and detailed search facilities were explained in depth.

I was very impressed, so I wrote back to that company, Cornix Software of Royston, Herts, and asked when these programs would be available for the PCW8256.

Within what must have been hours of receiving my letter I had a phone call from a Mr Allsop, who explained that these programs and others would be available early in the

New Year.

He asked what type of programs I was interested in and went on to explain further information regarding his company's accounts programs.

It was a refreshing experience to speak with someone obviously qualified and experienced enough to help and advise someone such as myself, relatively new to computer accounts.

He was extremely helpful and possessed the qualities of dealing with my enquiry in a way that so many companies and dealers sadly are lacking in. – **S.F. Grunnill, Skegness.**

Printer needed

I WISH to purchase a printer for my CPC464. Cost is my main concern.

I have come across three printers which, although very different, may suit my needs.

They are the new Epson P40, the Brother HR5 and the Smith Corona Fortext 80. Are they compatible with the CPC464? – **R.J. Unwin, London N4.**

■ The Amstrad can be used with any Epson compatible printer, this includes the Brother HR5. We use an Epson FX-80 for our listings. We haven't had any experience of the Smith Corona, so we can't say whether it is compatible.

You'll also find several printers recommended on these very pages.

Stereo solution

I RECENTLY bought a CPC6128 but found that I was unable to load or save programs to tape as I only had a stereo radio cassette player.

An audio lead with a 5 pin Din plug at one end and a 3 pin Din plug at the other end would load programs but would not save them.

After much trial and error I solved the problem by using an audio lead with a 5 pin Din plug at each end.

The two plugs must be wired 1 to 3, 4 to 5, 2 to 2, 5 to 4 and 3 to 1 (mirror image).

At one of the plugs I cut the wires to pins 1 and 3.

This ensures that one of the stereo channels from the cassette player is not connected to the remote control pins of the computer.

I also found that the volume control had to be near maximum but the tone control fairly low.

A jack plug in the phones socket of the cassette player will silence the loudspeaker.

It may be necessary to stop the tape until the picture is complete so that the start of the next block is not missed. **Tony Baker, Fareham.**

Hung-up bells

REFERENCE the game of Da Bells hang-up by Aramello Chapman in the June issue.

The memory full hang-up occurs because of improper use of GOSUBs. The following short program demonstrates such misuse of the GOSUB and "memory full" appears when a=84.

```
5 ZONE 10
10 MODE 1
20 a = a+1
30 PRINT a,
40 GOSUB 50
50 GOTO 20
60 RETURN
```

In the Da Bells program the culprit is in the subroutine starting at line 350 whereby in some cases the "return" at line 470 is never reached because it is directed by a GOTO to line 2670 and then another GOTO to line 120 which starts the program again.

To solve the problem, the following Da Bells program lines should be changed to:

```
180 GOTO 350
390 IF INKEY(47) = 0 THEN
560
470 GOTO 190
730 GOTO 420
```

– **Jon Goldingay, Redditch.**

Keyboard routine

HERE is a small routine which your readers may find of interest.

It is often necessary to input a string of characters from the keyboard to form a command string, however the normal INKEY$ routine does not allow for this. As a result, I developed this routine.

It also takes care of the DELETE problem when the input string is deleted back further than zero input, which would crash a program if not trapped.

There are more elegant ways of obtaining the same result but I have found this method effective.

The initial string is held in A$, which is familiar, with the result being accumulative in C$ and corrected.

It also takes care of the input of a carriage return which may be entered in response to a prompt and which would only be discarded by the main program.

I have found it useful when writing adventure programs.

Although originated for the Amstrad, it could prove useful to users of other makes. – **Bob Baxter, Burnham on Sea.**

```
10 GOSUB 90:REM Keyboard ro
utine
20 PRINT:PRINT c$:END:REM P
rint out result on return
30 REM
40 REM ********************
50 REM * Keyboard Routine *
60 REM *    By B.Baxter   *
70 REM ********************
80 REM
90 c$="":REM Clear c$ first
 time round
100 a$=INKEY$:IF a$="" THEN
 100:REM Set up inkey
110 IF ASC(a$)=13 AND LEN(c
$)=0 THEN 100:REM Check for
 CR first entry
120 IF ASC(a$)=13 THEN RETU
RN:REM Check for end of ent
ry and if valid return to m
ain program
130 IF ASC(a$)=127 AND LEN(
c$)=0 THEN 100:REM If illeg
al delete go back
140 IF ASC(a$)=127 THEN c$=
LEFT$(c$,LEN(c$)-1):PRINT C
HR$(8);CHR$(16);:GOTO 100:R
EM If delete, erase char an
d go back
150 PRINT a$;:REM Print out
 result
160 c$=c$+a$:GOTO 100:REM U
pdate c$ and go back for an
other entry
```

The sixth command

I HAVE been using Ches Jeske's excellent disc editor Dedit from issue 8 of Computing with the Amstrad *and while experimenting on different user directories I entered CP/M to erase a file.*

Out of sheer perversity I typed in "User 1". I was surprised when this did not generate an error message. I was even more surprised when DIR listed the User 1 directory.

The DD-1 user manual says that only five direct console commands are available under CP/M, SAVE, DIR, ERA, REN and TYPE.

A bit of train-spotting through the system tracks revealed a command table with the documented five commands and the undocumented USER command.

This may be in "A Guide to CP/M" but I have been unable to obtain a copy from Amstrad.

For those like myself who only have the user manual, the syntax of the command is |USER, command under number of the user and can be between 0 and 15.

It is, in fact, the same as the |USER, command under Amsdos except that the bar and comma are unnecessary. – **D.R. Halliwell, Oxton.**

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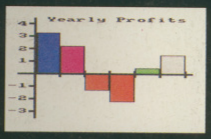

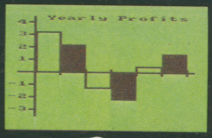

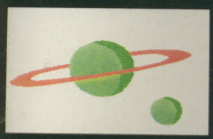

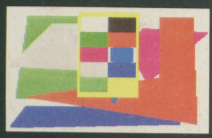

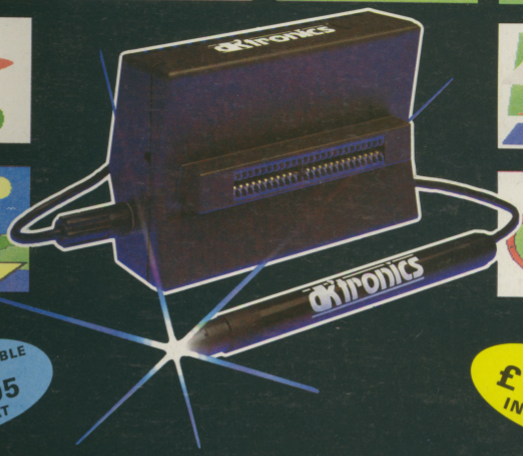

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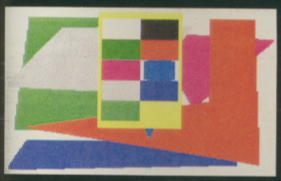

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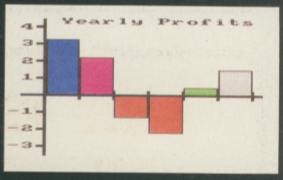
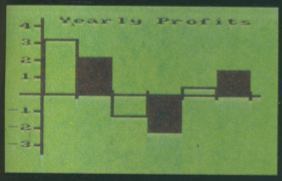
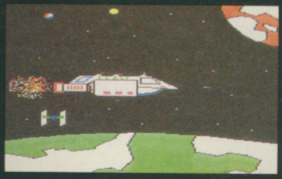


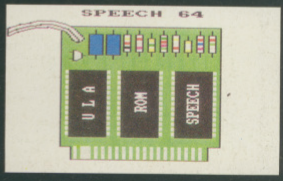
ADD TEXT



GREEN SCREEN COMPATIBLE



HIGH-RES COLOUR GRAPHICS



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