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15-21 August 1985

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Vol 4 No 33

Clive fights on as rescue fails

SINCLAIR is in trouble once more after Robert Maxwell's takeover bid has collapsed.

Following a £10m order from Dixons for the Spectrum Plus, QL and Flat-screen TV, however, Sir Clive Sinclair claims that no refinancing package for Sinclair Research is now necessary.

Dixon's is to sell the Spectrum Plus in a special pack together with a joystick, joystick interface, data recorder, and ten software titles, all for £139.99.

Publishing magnate Maxwell's decision to pull out of the rescue came after accountants Coopers and Lybrand

continued on page 4

SPECIAL RUNNING JUMPING FLYING ISSUE

Courtesy G and B Computers

Amstrad sneaks out 128K

AMSTRAD has – without any announcement – quietly slipped its new 128K disc-based micro, the CPC6128, into the stores – priced at £399 for the colour monitor version and £299 for the monochrome version.

The move has fuelled speculation that the 64K CPC464 model, only announced in April, may now be dropped. The CPC6128 prices actually undercut the CPC664 which sells for £499 (colour) and £349 (green screen).

G and B Computer Electronics of Tottenham Court Road in London, one of the first shops to actually have the 6128 on sale last Wednesday immediately cut the price of its colour 664 models in stock to the same price as the new machines – £399.

"We took ten of each ver-

continued on page 4 ▶

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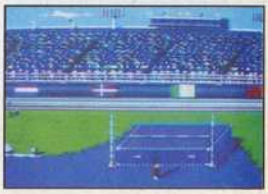

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EDITORIAL

With the news that the proposed take-over of Sinclair by Robert Maxwell has failed, the future of the UK's most famous micro company is once more in the balance.

That the negotiations have broken down is in itself no surprise. Right from the start even the basic details of the deal were clouded in mystery and in the last week or so the Maxwell camp had seemed to wish to distance itself from Sinclair.

Sir Clive himself is putting on a brave face. In one report he claimed he has already raised a replacement £12m from an unnamed alternative source without having to give up control of the company he founded because of "recent sales successes"—in particular the deal with Dixons. Despite the initial small-scale success of the QL in the US though, the company's cash problems have apparently hampered attempts to meet demand.

The uncertainty at Sinclair could not have come at a worse time for the company. It is now that it needs money to buy components to build the computers for the Christmas market and also to launch and promote this year's new products. It desperately needs to press ahead with plans for its 128K Spectrum and a new 512K micro based on the QL technology with a built-in disc drive wouldn't go amiss either. Yet it now isn't clear if Sinclair will be able to find the money to fund such schemes, especially as his problems with the C5 vehicle are also growing.

The substantial order from Dixons will undoubtedly help to ease the short-term cash problems. However, in the longer term only another top selling machine like the Spectrum will help.

And Sinclair has never been pressed so hard. Amstrad, sensing blood, has rushed out its 128K machine with built-in disc and monitor at an aggressive £399.

At that price Commodore must be sweating. Acorn with its BBC Plus with neither disc or display at £100 more ought to be quaking.

Sinclair's new micro will have to be pretty spectacular to match Amstrad's onslaught.

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Computer Trade Association Magazine of the Year

Acorn set for £20m loss

ACORN has announced an estimated loss of around £20.58m for the year to June 30. This compares with a profit of £10.8m for the previous year.

Turnover showed an estimated slump from £84.9m in the six months to December 31, 1984 to £22.89m.

The expected results were circulated at the same time as Acorn notified its shareholders of details of its second rescue by Olivetti (see *Popular Computing Weekly*, August 1). Under the new deal, Olivetti's share in Acorn will be increased from 49.3% to 79.8%, while the publicly owned portion of Acorn will fall from 10% to 6%.

Once the refinancing package has been implemented, Alex Reid is to resign as chairman, and Chris Curry and Hermann Hauser will resign as deputy chairmen. Alex Reid's place will be taken by Olivetti director Alex Uboldi, whose previous post as managing director has already been filled by Brian Long.

Amstrad 6128 sneaks out

continued from page 1

sion of the new machine, colour and monochrome monitors as a first order, and they all sold out within a day", said a spokesman for G and B. "They are proving very popular."

Laskys and Selfridges were also selling the Amstrad 6128 last week, while Boots and Rumbelows were expecting their orders to arrive within the next week or so.

Most retailers are now not planning to reorder 664s. Lasky's, which only began stocking the Amstrad range with the 464 and 6128 last week, has decided not to take the 664 at all.

Boots has never stocked the CPC664, although it has been selling the 464 for some months now, and it has ordered 6128s.

Terry Greenwood of Rumbelow's said, "We have no idea what we will be selling the 664 for, and our stock levels are not high. We won't be reordering the machine – I'd be surprised if anyone did.

"Amstrad is probably fully aware of the consequences of selling the 6128 at that price."

Amstrad has apparently been pressured into releasing the 6128 in this country somewhat ahead of schedule because of new 128K machines being planned for this autumn by Commodore and Sinclair.

Sinclair deal falls through

continued from page 1

reported to merchant bank Hill Samuel on the prospects for Sinclair. Maxwell said that the plan for Maxwell's company Hollis to buy a controlling stake in Sinclair "just did not gel" and Hill Samuel felt it could not recommend the rescue to Hollis shareholders.

The Sinclair board has been meeting major creditors this week to reschedule payment of debts. Sir Clive claims that the Dixon's deal obviates the need for any refinancing, and that sales of Sinclair products are now back to 80% of the figure for the same period last year. Much of this recovery is attributed by Sinclair to sales of the QL in the US, where it is available by mail order. About 25,000 people have requested more details of the QL.

Nigel Searle, who is heading up the US operation said, "We have been shipping the QL to customers since June. The demand has been high, although we have tailored our marketing efforts to match the extent of production. Sinclair's finances having been restricted.

"So far we have beens selling I think to enthusiasts — loyal Sinclair owners who had ZX80s and ZX81s. By the end of 1986 I expect we will have spread sales to general consumers."

left: Sir Clive Sinclair
right: Robert Maxwell

Sir Clive is, however still looking for investment for the wafer-scale integration plant planned with ICL chairman Robb Wilmot. Sir Clive also claims three other parties who expressed interest in Sinclair before Maxwell made his offer with whom he will now restart talks.

"We will continue to look for financing for the new products in the pipeline as before," said a Sinclair spokesman. "We're not saying now that everything's 'roses round the door', but there is light at the end of tunnel."

Anarchy looms as *Young Ones* sign up

THE YOUNG ONES television comedy series is to be turned into a computer game, to be released by Orpheus Software in October.

Orpheus's John Marshall explained the game takes the form of an interactive icon-driven adventure: "You choose which character you wish to be — Neil, Rik, Mike or Vyvyan — and the computer plays the others. There are always four characters in the game and the actions of each reflect their own particular view of the world."

The plot of the game is closely based on the original scripts from the TV series with additional material written specially for the game by the series' three script writers, Rik Mayall, Ben Elton and Lise Mayer.

Said Paul Kaufman at Orpheus, "Each time you play the game is different, because even if you select to play the same character every game, the other three computer controlled players don't do the same things.

"Neil, Rik, Mike and Vyvyan each have different tasks to perform, depending on their characters."

Nigel Planer as Neil

The game will be previewed at the *Personal Computer World* Show in September before release in october for the Commodore 64, Spectrum and Amstrad machines.

World Cup win for US Gold

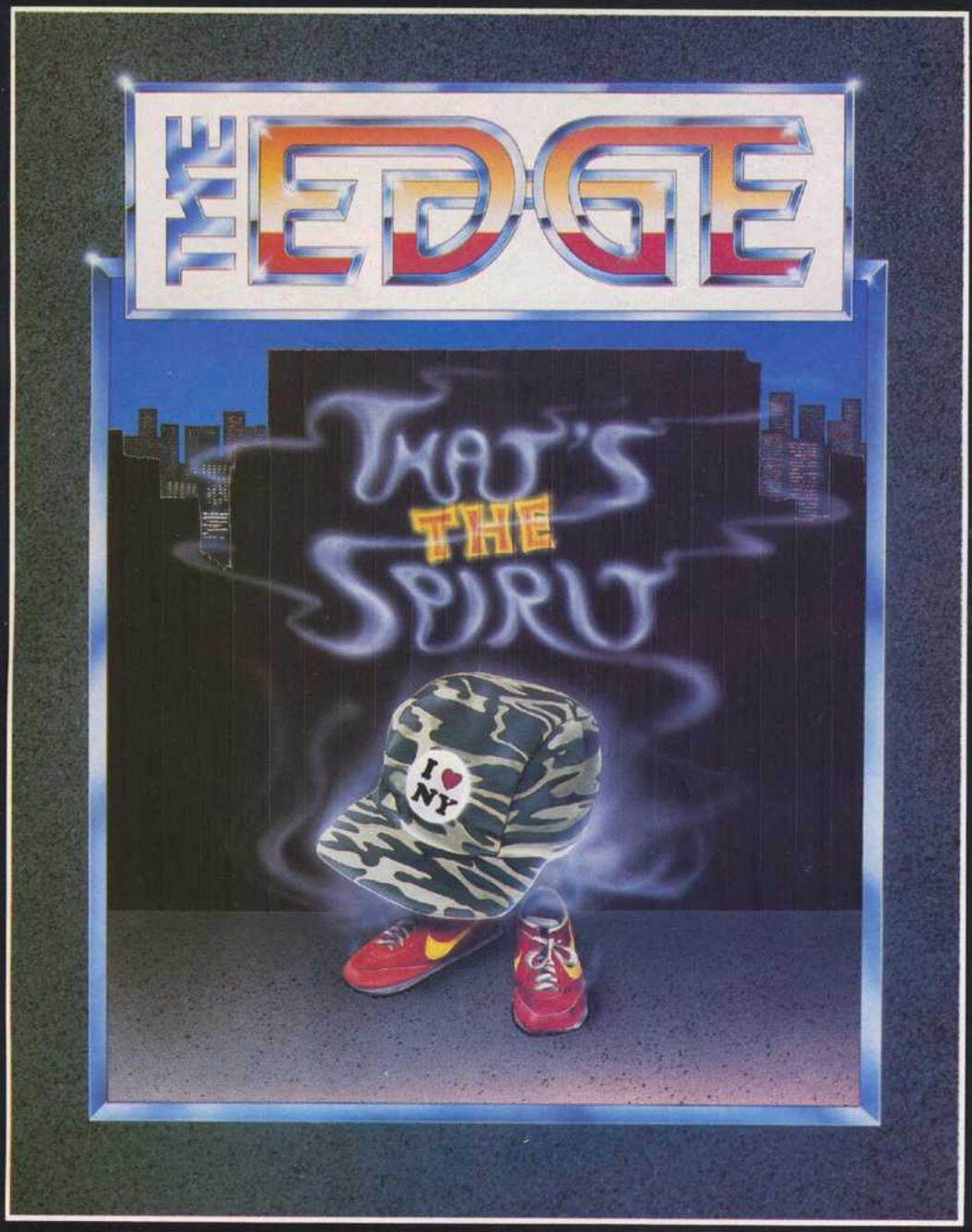
US GOLD has announced a licensing deal with the international football association, FIFA, for the official Mexico '86 World Cup computer game next year.

The game will actually appear on the UK Gold label, used by US Gold for British originated products.

US Gold plans that the game should be ready two weeks before the Mexico finals begin in summer 1986. As well as soccer games, it will have a World Cup winners betting forecast program.

Commodore, Spectrum and Amstrad versions are all planned at a provisional price of £8.95.

More news on page 6



SPECTRUM 48K

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British Telecom buys EDOS firm

ELECTRONIC Software distribution has been given a boost with the decision by British Telecom to take a majority shareholding in Program Express, the first UK company set up to introduce the system into retail stores.

Electronic distribution of software (EDOS) uses machines in each store which will down-load software from a central main-frame computer on to a blank tape, cartridge or disc.

Advantages of the system are that retailers will not suffer overstocking, shoplifting or selling-out problems. The EDOS machine will also keep a record of titles sold, and will invoice the store.

Program Express, which announced its system in July last year, had hoped that trial machines would be installed by the end of last year. However, the company has had difficulties in getting equipment from Inventory Transfer Systems in the US, which manufactures the machines, and as yet there are still no EDOS systems in the shops.

Under the new agreement, British Telecom—which owns the Firebird entertainment software label— will provide the financing for EDOS, while Program Express's directors, Grant Robertson, Bruce Neville and Gilmour Kennedy continue to run the company.

"We hope that EDOS will now reach some stores by the end of this year. In three to five years we plan to have penetrated all retail outlets," said a BT spokesman.

One chain that may take advantage of EDOS are British Telecom's own shops, selling mainly telecommunications equipment but also Firebird software. British Telecom is planning to expand its network of shops in the country to around 50.

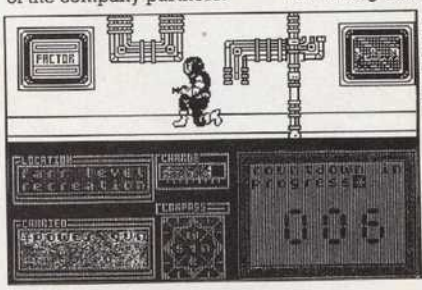
"Or, for the same price, you could have something in blue with a smaller memory."

Gargoyle goes for SF games

HAVING written a graphic authoring system for their new science fiction game, *Marsport* (see picture), Gargoyle Games plans to use it for a "just for fun" game, according to Greg Follis, one of the company partners.

"It's going to be called *Sweevo's World*," he said. "Sweevo stands for Self Willed Extreme Environment Vocational Organism. It's a little robot you have to control, but Sweevo has gone a bit wrong somewhere – he's clumsy and not all that bright, and he falls over a lot."

Sweevo's World will be released in early November on the Spectrum 48K and the Amstrad at £7.95.



Gargoyle's *Marsport*

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John Cook has been in (and out) of the pits all week

When is a simulation not a simulation? When you find yourself lying down inside a Formula Ford 1600 moving at what seems to be at least 350 miles per hour, six inches off the ground, and it feels like the Big Game Over could be just around the corner – that's when.

There's no doubt about it, the one thing that all racing simulations lack is the element of pure fear. On the other hand, if you do write off a car while playing, say, *Revs*, at least you don't have to pay out the large five figure sums for a new motor. And then there's playability. . . what's the point of having an ultra-realistic simulation that takes two years to master, and bores you to tears?

Bearing all this in mind, we decided to judge our survey of racing simulations using the three parameters of Realism, Fear Factor, and Playability. . . now read on.

Naturally, on the back of the grid we find the older games – fair in their time, but now. . . I guess they might just be showing their age.

Grid Position Ten. *Chequered Flag* from, of course, Psion, might be a contender for Grand-Daddy of them all, written for the Spectrum. At one time in the six-pack bundle, it is surprisingly still one of the few racing programs for the rubber-keyed wonder. Two years ago it was good, but now. . . well. . . two years is a long time, isn't it? Enough said. *Realism 5/10, Fear Factor 4/10, Playability 5/10.*

***Revs* from Acornsoft**

Grid Position Nine. *Enduro* – another oldie which first came out, I believe, for the Atari VCS games machine. Another early V-perspective job, with simple left/right, faster/slower controls. The object here is to overtake a set number of cars in a driving day, as driving conditions vary according to the terrain and time. This one certainly does capture the boredom of long-distance driving in a big way. The other cars act like moving brick walls, it's one player only and not really worth looking at nowadays. *Realism 8/10, Fear Factor 3/10, Playability 5/10.*

Grid Position Eight. The Amstrad is still short of a really decent racing game, although Amsoft promise that there is something special in the pipeline. At this time, however, you have to make do with *Grand Prix Rally II*. Coming out of the same conceptual stable as *Enduro*, you drive what looks like a souped-up Capri along various sections of road. Simple controls again. . . and more moving brick walls, but more colourful than *Enduro* itself. *Realism 6/10, Fear Factor 6/10, Playability 6/10.*

Grid Position Seven. Activision's *Great American Road Race* is yet another *Enduro* derivative, but as you would expect, more complex and polished. Your aim is to race across America over various stages. Low and high gears are included as well as left/right. Strategies are to avoid, 1) rush hours near towns (!) and 2) running out of fuel in between stages. Of its type, not bad. *Realism 6/10, Fear Factor 6/10, Playability 7/10.*

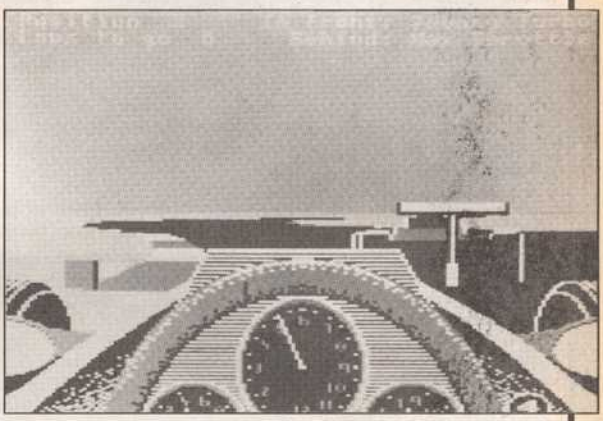
Grid Position Six. Ariolasoft's offering is *Racing Destruction Set* – not really a true simulation, but well worth an honourable mention. The display is two screens, one for each potential player, all in nice side-on 3-D showing a plan view of a section of track. This is really a simulation of a simulation – slot car racing – but its virtue lies in great playability, and flexible option selection. *Realism 5/10, Fear Factor 6/10, Playability 8/10.*

Grid Position Five. From Audiogenic comes *Talledega* – a kind of Indy 50 simulation where you spend most of your time travelling at 250 miles per hour. . . or 294 mph with the turbo on. A particularly noisy game and one with a few strategy elements, such as the need for pit stops to refuel, change tyres, or even change engine! Not bad at all. *Realism 6/10, Fear Factor 7/10, Playability 7/10.*

Grid Position Four. *Pole Position* was a hit in the arcades, and has converted quite well to Commodore, Atari and even Spectrum. You qualify, get a grid position, then race against a full field. Again, only low/high gears, but you skid pretty convincingly and crash spectacularly. What more do you want? *Realism 7/10, Fear Factor 7/10, Playability 8/10.*

Grid Position Three. Kempston are well known for their joysticks and interfaces – perhaps with *Chicane* (at present on BBC only) they might make a name for themselves with software. This program is a result of a collaboration between Kempston and a Formula Ford racing team. It feature a choice of six circuits to race around and quite a good 'out of the cockpit' view of the track. Lots of gears to choose from (luckily all with syncromesh), accelerator and brakes. Although entirely adequate, however, it never really delivers as a full blown simulation, and perhaps the playability is let down by the multitude of controls. *Realism 7/10, Fear Factor 6/10, Playability 7/10.*

Grid Position Two. *Pit Stop II* is, to date, the most playable two-player racing simulation game available – and I bet US Gold are converting it from Commodore 64 to Spectrum as fast as the little bytes can travel down the interfaces. Similar in concept to *Talledega* (and naturally *Pit Stop I*), like *Racing Destruction* it has a separate playing window for each player. Strategy plays an important part – as does speed and skill. Very, very playable indeed. *Realism 7/10, Fear Factor 7/10, Playability 9/10.*



***Grand Prix Rally II* from Amsoft**

Grid Position One. *Revs*, on the BBC B from Acornsoft, is really one in a field of one. Having driven a Formula Ford 1600, I can promise you that playing *Revs* is the nearest thing you can come to driving a racing car without risking your neck. The handling, the impression of speed. . . and some of the tension! This has the lot; even the opposition are smart and fast. The number of controls make it a little hard to get into, but once mastered cause no problem.

The bad news – conversions look to be unlikely. . . this is bordering on tragedy (if not commercial insanity!), so it's worth it for budding Formula Three drivers to beg/steal/borrow a BBC B in the close season. Go away and drive it into the sunset. *Realism 10/10, Fear Factor 9/10, Playability 8/10.*

Christina Erskine puts sports games through their paces

Sports simulations are a strange area of the games computing market. People talk quite readily of the realism of such programs, yet I can think of no sport at all where technique remotely relates to using a keyboard. Daley Thompson did not achieve his decathlon with a Quickshot joystick.

I have resigned myself to the fact that a ten minute work out a day with *International Football* is not going to give me muscles like Grace Jones.

Recently, the range of sports given the micro treatment has widened enormously – whitewater canoeing, ice hockey, round the world yachting, and, even, fishing.

Psion's *Match Point* (Spectrum, C64 and QL) is one favourite I return to. Although the first tennis simulation for home micros when it came out on the Spectrum over a year ago, I reckon it's still the best. The graphics are crisp, movement smooth, and after a fair bit of practice, you get to the stage where you really can select shots. Some of the service decisions – the faults and net cords – seem a little arbitary, but it's certainly playable.

Commodore's newly released *International Tennis* features all the authenticity of *Match Point* but a more sophisticated game. The graphics are chunkier, there are more skill levels, and choice of shot depends on exact positioning of the joystick, since it uses all the diagonals. This means you need a good quality joystick to play effectively. However, it is only available for the Commodore 64.

Amsoft's offering, *Centre Court*, is very amateur by comparison, and *Superbrat* (Spectrum) from Atlantis, while tremendous value at £1.99, is definitely a non-seed.

Cricket on the computer seems to have a fairly select following. *Tim Love's Cricket* (Peaksoft) and CRL's *Test Match* had the field pretty much to themselves until this summer when the big names moved in. Audiogenic signed up Graham Gooch and Tynesoft took on Ian Botham.

Graham Gooch's Test Cricket (Commodore) – the better of the two – uses a simplified graphic representation of the infield, and cuts occasionally, television style, to the boundary when a fine stroke has been played. It includes authentic looking scoreboards, and as few controls as possible to play the game.

You can play in one of two modes, arcade or simulation. Simulation mode is intended to let you watch a match, with a limited facility to control the play – making the batsman play more aggressively, for example. It is astonishingly passive.

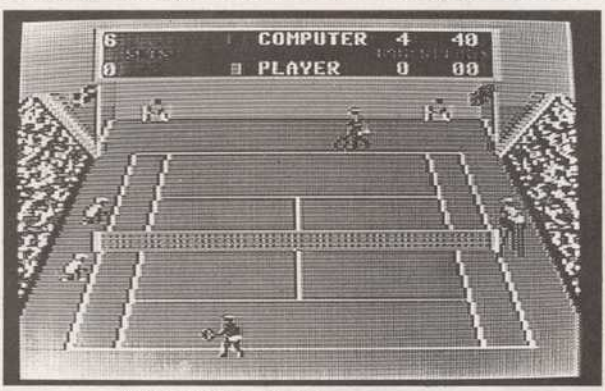
Things get a bit more lively in arcade mode, but you still only get to control the timing of you, batting stroke, not positioning. Get the timing right, and the ball soars off towards the boundary. Get it wrong and you will almost certainly be out before the end of the over. Then there will be a tearing noise, as if Ian Botham has just ripped his shirt, but it is only the crowd applauding.

So far, in my endeavours with *GGTC*, Graham Gooch himself has never scored more than six in an innings. He was abysmal too when the program put him on to bowl, *and I think he should be told.*

The recently released *Hypersports* (Spectrum and C64) from Imagine inevitably invites comparison with Epyx's *Summer Games* and now *Summer Games II.*

Summer Games won me over with the superb graphics and complex controls which gave a very realistic appearance on screen. *Hypersports* uses slightly fewer controls, and I'm not sure that this is a good thing.

The biggest drawback with *Hypersports* is that you cannot select which sport to play; you have to go through them in strict order – swimming, skeet shooting, pummel horse, archery, triple jump and weight lifting.



***Match Point* from Psion**

Summer Games II – now released – is if anything better than its state-of-the-art predecessor *Summer Games.* Eight new events are featured – triple jump, rowing, javelin, show jumping, high jump, fencing, cycling and kayaking. The animation is superb and, like the original, the attention to detail is excellent. The show jumping event is probably the cleverest bit of programming, by the kayaking is also incredibly difficult.

Now that the C64 Epyx titles are sold through US Gold, prices have come down. The program costs under £10 on cassette; under £15 on disc.

Other multisport games, such as the two Decathlons, from Activision and Ocean (Daley Thompson's) must have almost played themselves out by now, although I notice that *DT's Decathlon* is rapidly becoming software's answer to *Dark Side of the Moon.*

Football may be the national game, but there are surprisingly few football games on the market. Ocean's *Match Day*, Commodore's world best seller *International Football*, and now Anirog's *Five-a-Side* are the ones which spring to mind on the C64. *International Football* on the C64 still looks the best, although graphically they all use similar techniques, while Anirog's includes a truly menacing chant of 'Here we go, here we go'.

Slightly more esoterically, recent releases include *Tour de France* from Activision and *Nick Faldo Plays the Open* from Mind Games. Imagine also has *World Series Basketball* on Spectrum, C64 and Amstrad.

Tour de France as far as I know is the first cycling simulation available. With much attention to realism, you must complete each of 16 stages of the legendary race, from the streets of Paris to the Pyrenees. Your main controls are directional – no short cuts across the grass allowed – and acceleration and gear changes. I feel there may be a danger of it becoming monotonous after the first few stages; probably not a good idea to attempt to tackle the entire tour at one sitting.

Nick Faldo Plays the Open reminds me of a very, very old golfers joke about a gorilla who challenges Tony Jacklin. At every tee, the gorilla delivers a perfect drive plum on to the green, so that Jacklin, gentleman that he is, tells the gorilla he needn't bother to putt out. By the 18th green, Jacklin is so aggrieved he demands the gorilla should complete the hole, whereupon it performs another 500 yard drive and it dawns on Jacklin that is the only thing it can do.

Nick Faldo uses the fashionable disembodied pointing hand for pseudo-icon menu selection – parameters being direction, strength, choice of club, and taking the shot, This takes up the bottom third of the screen; the rest comprises an aerial view of the fairway and your ball.

So far, so good. Unfortunately, on the Spectrum, once you reach the green the picture of the pin and your ball has become so tiny that it is difficult to make out exactly where it is. After some playing, I can drive quite well, but I cannot putt at all.

Graham Taylor sorts out his flaps and takes to the air

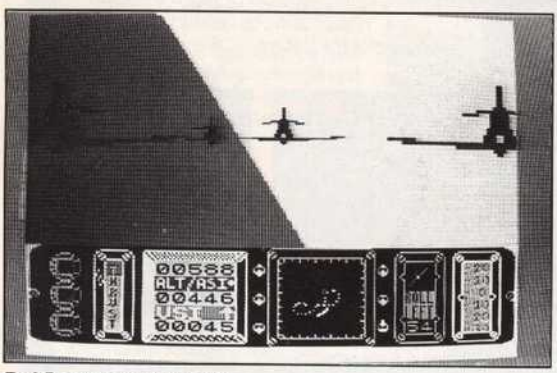
The thing about flight simulations is that there is a grave danger that what's accurate is also boring and unplayable. Giving somebody 24 different controls to operate may accurately reflect really flying a plane, but it may not be that much fun.

That said, there's something prestigious about flight simulations that gives the best ones a longevity way beyond other games. When a new machine is launched it's pretty important that (along with *Chess*) a flight simulation is available fairly quickly.

On the Spectrum for a good long time Psion's *Flight Simulator* held sway – it simulated a light aircraft and used the basic vector graphics found in all the other simulators, but the screen was slow to up-date; consequently it looked jerky and responded slowly to commands. Highly rated at the time, it now looks fairly primitive.

In contrast, Digital Integration's *Fighter Pilot*, which effectively replaced the Psion offering, remains a compelling and relatively undated program. The game runs much more quickly, so the 3D effect and the rate at which it responds to your commands is that much more impressive. It has one other major virtue – whilst like the Psion program it remained a fairly precise representation of flight, it lets you blow other aircraft to bits with air-to-air missiles.

Digital Integration converted the program very effectively to the Amstrad recently and also the Commodore – arguably less well, mainly because of the Commodore's slower processor. But in all its versions *Fighter Pilot* remains a first choice for those wanting a simulator with both technical accuracy and zap 'em up playability.



***Red Arrows* from Database**

Commodore 64 owners have a wider choice of simulations and indeed perhaps the best 'purist' flight simulation on any home micro: *Flight Simulator II*, by US company Sublogic. This recreates a Piper 181 Cherokee Archer and has an intimidating number of controls – so intimidating and accurate, in fact, that the program is sometimes used as a prelude to actual flight in training schools.

High spots in the game include a vector graphic of the statue of Liberty and a choice of day/night flying and weather conditions. The only problem with the game is the degree of skill required to master it – this is not for the idly interested, it requires a lot of practice.

Super Huey, by Audiogenic in this country, is a similarly complex simulation but features a combat helicopter. I counted 29 different indicators and gauges, the joystick uses a variety of modes and all the diagonals for a subtle series of variations in control. Helicopters are, if anything, harder to fly than aircraft and this program makes few concessions to the novice. It does feature combat and a host of other game options and is potentially very addictive, but, like *Flight Simulator II*, requires a lot of stamina.

For those whose interest in simulations is more death and destruction than the exact angle of flap, *Flyer Fox* is one of the most impressive, fast and action packed of the lot. Graphics, particularly of the enemy planes, are good enough to make the game really involving.

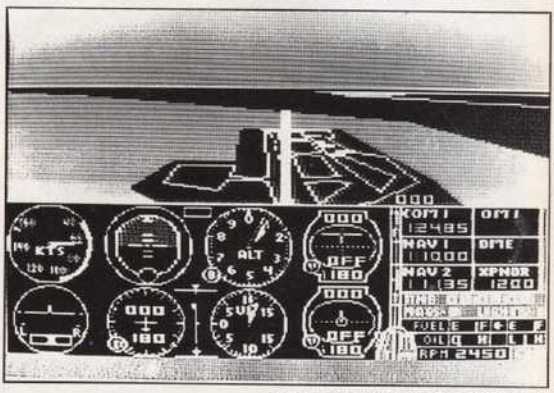
F15 Strike Eagle from Microprose is for those who want a little more than *Flyer Fox's* zap-zap-zap in terms of complexity but who still don't want to have to spend days mastering how to fly the plane.

Anirog has the first jump-jet simulator with *Jump Jet* on the C64.

Back to pure flight simulations and the recently released *Spitfire 40*. It lets you fly the classic warplane in both training flights and full combat. The game is marked by extraordinarily detailed graphics representing the control panel with dials and other controls accurately representing the current flying information.

The problem with *Spitfire 40* is that all the clever graphics mean that up-dating of the screen is very slow indeed. This not only means that it responds rather slowly to commands, it also makes the 3D vector graphics rather slow to be up-dated and some people find this aspect rather detracting; it certainly slows the game down.

Red Arrows from Database Software (Spectrum, Amstrad and Commodore 64) not only simulates the Hawk training jet, but lets you fly as a member of the Red Arrows team, joining them in a collection of fiendish rolls and spins and going berserk with the thrust, brake, spin and roll commands. It's horrendously difficult to do and only absolute addicts should try it. Graphically it's only fair – the other aircraft are built up from simple block graphics and are there more for visual reference (ie, to find out whether you've managed to remain in any sort of formation) than gosh-wow realism.



***Flight Simulator II* from Sublogic**

The BBC is less well served with flight simulators, perhaps because of the reduced memory available. Easily the best of what's around is *Aviator*, a Spitfire simulation that uses vector graphics *à la Fighter Pilot*. The aircraft handles very realistically and the ground below has occasional towns and bridges. The most bizarre aspect of the whole game, though, is that if you survive long enough you get to do battle not with the dreaded Hun, but a collection of alien triangles. It's only in black and white but nevertheless runs quickly – one of the best simulations visually.

Armchair pilots, at least on the Commodore and Spectrum, certainly have a wide choice and though there are some obvious first choices, it's worth considering exactly what you require before you take off to the shops. Do you really want something that is incredibly exact but has a manual with 20 pages, or do you basically only want to kill lots and lots of enemy planes without constantly checking your flaps and torque?

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Fasten your seat belt

Top simulations company Digital Integration are switching from F15 to Apache. ***Graham Taylor*** *flew south to find them*

Fighter Pilot from Digital Integration was not only the best flight simulator for the Spectrum, it was also the only simulator that let you do what everyone secretly wanted to do with their flight simulators anyway – blast enemy aircraft from the skies.

Digital Integration is Rod Swift and David Marshall, who met whilst working for the Ministry of Defence in Farnborough on military computers, and them put together a small team of programmers.

In a previous MoD job Dave had worked on 'real' simulators for the military and whilst there are some comparisons between that work and developing *Fighter Pilot*, there were also some unexpected differences.

"Whilst obviously there are major technical differences between what is possible on the home micro and what a military simulator is capable of there's another point.

"A military simulator is very precise in reproducing the precise quirks of an actual plane, the kind of unusual and sometimes unexpected handling characteristics that would be misplaced on something which is intended primarily to entertain."

That said, Digital Integration goes to a lot of trouble to make the handling characteristics as accurate as possible. This extended to getting hold of bundles and bundles of technical information issued by the manufacturers of the F15 fighter plane featured in the game, distilling the main details of acceleration, top speed, fire power, manoeuvrability, etc, into hard information to be incorporated into the program.

So accurate was it, in fact, that it is now used by a number of flying schools and is also being sold connected up to actual aircraft instrumentation and controls as a low cost (around £400) 'real' flight simulator.

A similar procedure has been followed in the development of *Tomahawk* – the helicopter 'follow up' to *Fighter Pilot* that has been over a year in development and is based on the A4-64A Apache helicopter. The game should be out well before Christmas. Said David, "When we began work on the program I sent to Hughes for technical reports.

"It's a strange situation, they will never answer my question directly but instead send batches of technical books and leaflets from which the information can be gleaned." David showed me a collection of articles with odd facts buried in the text picked out with a yellow marker pen. It's a painstaking business that takes a long time – before any actual coding begins.

"A helicopter works quite differently to an aircraft," explained David. "In an aircraft the variation of thrust on the fixed wing is used for lift; in a helicopter thrust tends to remain close to maximum. We also have to replicate things like the way the rotors are tilted."

Assumptions about what is possible on the Spectrum have also changed. *Fighter Pilot* had graphics for four runways and that was about it, so far as 3-D representation went. In *Tomahawk* there are around 5,000 including forests, buildings, landing pads which are represented in vector graphics and from potentially six different angles. You can, if you're clever enough, actually fly through the forest.

The game features, like *Fighter Pilot*, a whole selection of baddies that can be blasted from the sky using air-to-air missiles and other weapons of destruction. It's going to be a lot of fun. Were there, I wondered, reasons why Digital would not implement simulation features on a game other than technical ones "People want to shoot things and mustn't be over burdened with too many complex controls – we've simplified the controls tremendously on *Tomahawk* so that they can be represented on the keyboard, in the real machine so much is interlinked."

Digital Integration use development computers like the Cal PC, but most testing of program modules is done on the actual Spectrum.

"We have a vast library of routines which are held as *Wordstar* files, source code can be assembled and to a certain extent tested on the Cal, but unlike the Vax you can't totally simulate the Spectrum."

Much time recently has been spent on the algorithms for the 3-D routines for *Tomahawk* (and beyond – the routines are not machine specific).

"We set ourselves the basic parameter that screen up-dating of information mustn't take longer than a quarter of a second. Then we had to find ways – mainly better maths – to do more and more things in that time. We've been able to handle 30 objects in that time on *Tomahawk*, rather than one, the runway, in *Fighter Pilot*."

For that reason David and Rod are still reasonably optimistic about the future software on the Spectrum. "Certainly we are hitting some limits but in other areas there could still be tremendous scope for development."

Aside from *Tomahawk* there are other projects under development. Rod is working on *TT Racer*, a simulation based on a Suzuki 500 and featuring accurate representations of the European Motorcycle Grand Prix. "The outside view will be as though you are sitting on the back of the bike. The idea is to give it the kind of excitement and sense of speed you feel when a camera is mounted on the side of the bike."

TT Racer will be on the Spectrum, but before that comes out Digital will release *Speed King* on the Commodore 64, written by M Estcourt who came to the company after reading that David much admired his program *Death Chase*. It's a bike race game with some of the best use of multi-sized sprites to give the illusion of perspective ever seen – you hardly notice the sprite up-dating as other bikers on the track move towards you.

David and Rod offered dark hints about future Digital plans but would not be drawn. David would only say: "We have been considering the idea of using some of the 3-D techniques in what I could loosely call a role playing adventure. It could be quite spectacular but it's only at the earliest stages of development and is unlikely to be released this year."

Digital Integration take their simulations seriously. Surprisingly so, as was revealed when I asked them why they had never attempted something like a Space Shuttle simulation.

"We were going to, but as we were about to get underway we realised that when the shuttle lands it just glides in on automatic control – it would have been incredibly boring."

How many other companies can you think of who would be daunted from producing a game because it didn't reflect the real world?

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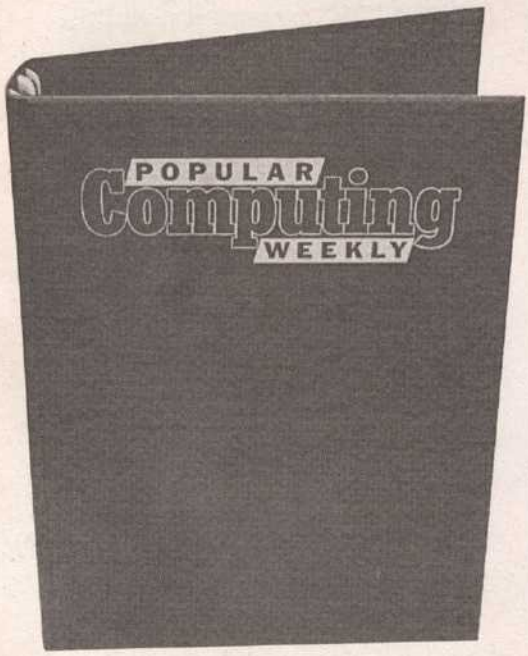

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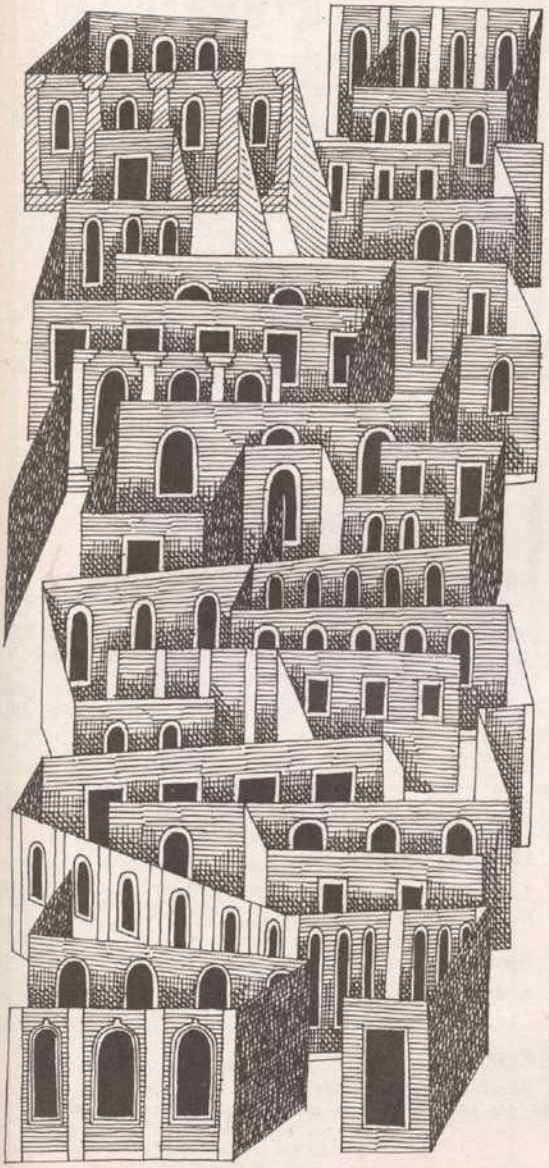
3-D Maze

A 3-D Maze game for the Sinclair QL written by Halvor Heuch

Ever felt that your were just going round and round in circles, achieving nothing? Well, now you can simulate that feeling on your QL with this program!

This will generate a maze, showing your place within it in glorious 3-D. You now have the task of trying to find the way out – which, as you will find, is not all that easy.

Using the compass function might help, but the diehards will try wandering around unaided. Instructions are included within the program – happy wandering!



```
100 REMark ** 3d maze by Halvor Heuch **
110 RESTORE
120 WINDOW #2,512,256,0,0
130 WINDOW 448,226,32,20
140 WINDOW #0,444,10,32,246
150 CLS #2:PAPER #2,0
160 MODE 8
170 PAPER 0
180 CLS
190 INPUT" Enter level (1 - 90) >";lev
200 IF lev<1 OR lev>90THEN GO TO 180
210 PRINT#0" Compass ?"
220 comp$=INKEY$(-1)
230 IF comp$<>"y"AND comp$<>"n"THEN GO TO 220
240 lev=lev+9:sc=lev*15
250 IF comp$="y"THEN sc=sc-100
260 p$=""
270 CLS
280 PRINT"          Please wait"
290 CLS #0:PAPER #0,0
300 DIM maze(lev,lev)
310 ju=1
320 rando=RND(1TO 4)
330 IF rando=1 THEN am=1:an=0
340 IF rando=2 THEN am=-1:an=0
350 IF rando=3 THEN am=0:an=-1
360 IF rando=4 THEN am=0:an=1
370 aw$=DATE$:ar=aw$(16 TO 17):as=aw$(19 TO 2
0):ag=(ar*60)+as
380 FOR iq=0 TO lev:FOR qi=0 TO lev:maze(qi,i
q)=1:NEXT qi:NEXT iq
390 FOR ok=0 TO lev*(lev-(.2*lev))
400 lz=RND(1 TO lev-1)
410 ly=RND(1 TO lev-1)
420 IF maze(lz,ly)=0THEN GO TO 400
430 IF (maze(lz-1,ly-1)=1OR maze(lz,ly-1)=1 O
R maze(lz-1,ly)=1) AND (maze(lz+1,ly-1)=1OR m
aze(lz,ly-1)=1OR maze(lz+1,ly)=1)AND (maze(lz
-1,ly+1)=1OR maze(lz-1,ly)=1OR maze(lz,ly+1)=
1)AND (maze(lz+1,ly+1)=1OR maze(lz+1,ly)=1OR
maze(lz,ly+1)=1)THEN maze(lz,ly)=0
440 NEXT ok
450 i=RND(1 TO lev-1):j=RND(1 TO lev-1):IF ma
ze(j,i)=1THEN GO TO 450
460 dd=RND(0 TO lev):cc=0:hh=-1:ii=0
470 IF maze(cc+1,dd)=1THEN GO TO 460
480 CLS:FILL 1
490 INK 5
500 LINE 0,0TO 10,14TO 136,14TO 146,0TO 0,0
510 IF j+an=cc AND i-am=dd THEN INK 0:ag:GO T
O 540
520 IF i+an>lev OR i+an<0 OR i-am>lev OR i-am
<0 THEN INK ju:ag:GO TO 540
530 IF maze(i+an,i-am)=1THEN INK ju:ag:ELSE a
f
540 IF j-an=cc AND i+am=dd THEN INK 0:ai:GO T
O 570
550 IF j-an<0OR j-an>lev OR i+am>lev OR i+am<
0THEN INK ju:ai:GO TO 570
560 IF maze(j-an,i+am)=1THEN INK ju:ai:ELSE a
h
570 FOR q=0 TO 5
580 tim
590 u=1/2^q:w=q+1
600 IF j+(w*an)=cc AND i+(w*am)=dd AND am=hh
AND an=ii THEN INK 0:a(u):g=4:GO TO 730
610 IF i+(am*w)>lev OR i+(an*w)>lev OR i+(am*
w)<0OR i+(an*w)<0THEN INK 3-ju:a(u):g=4:GO TO
 730
620 IF maze(j+(am*w),i+(an*w))=1THEN INK 3-ju
:a(u):g=4:GO TO 730
630 b(u)
640 IF i+((an+am)*((w*am*am)+(an*an)))=cc AND
 i+((an-am)*((w*an*an)+(am*am)))=dd THEN INK
0:c(u):GO TO 670
650 IF i+((an+am)*((w*am*am)+(an*an)))>lev OR
```

```
 i+((an-am)*((w*an*an)+(am*am)))>lev OR j+((a
n+am)*((w*am*am)+(an*an)))<0 OR i+((an-am)*((
w*an*an)+(am*am)))<0THEN INK ju:c(u):GO TO 67
0
660 IF maze(j+((an+am)*((w*am*am)+(an*an))),i
+((an-am)*((w*an*an)+(am*am))))=1THEN INK ju:
c(u):ELSE d(u)
670 IF j+((am-an)*((w*am*am)+(an*an)))=cc AND
 i+((an+am)*((w*an*an)+(am*am)))=dd THEN INK
0:e(u):GO TO 720
680 IF j+((am-an)*((w*am*am)+(an*an)))>lev OR
 i+((an+am)*((w*an*an)+(am*am)))>lev OR j+((a
m-an)*((w*am*am)+(an*an)))<0 OR i+((an+am)*((
w*an*an)+(am*am)))<0 THEN INK ju:e(u):GO TO 7
00
690 IF maze(j+((am-an)*((w*am*am)+(an*an))),i
+((an+am)*((w*an*an)+(am*am))))=1THEN INK ju:
e(u):ELSE f(u)
700 IF i+((am+an)*5)<0 OR i+((am+an)*5)>lev T
HEN GO TO 720
710 IF q=5 AND maze(i,i+((am+an)*5))=0THEN cr
oss
720 NEXT q
730 a$=INKEY$(50)
740 tim
750 IF a$<>"f"AND a$<>"l"AND a$<>"r"AND a$<>"
a"AND a$<>"m"THEN GO TO 730
760 IF a$="m"THEN displaymaze:GO TO 480
770 IF a$="l"THEN ee=am:ff=an:am=(ee*ff)+ff:a
n=(ee*ff)-ee:iu=3-iu:GO TO 480
780 IF a$="r"THEN ee=am:ff=an:am=(ee*ff)-ff:a
n=(ee*ff)+ee:iu=3-iu:GO TO 480
790 IF a$="a"THEN am=-am:an=-an:GO TO 480
800 IF a$<>"f"THEN GO TO 730
810 IF i+am=cc AND i+an=dd THEN finish
820 IF i+am>lev OR i+am<0 OR i+an>lev OR i+an
<0 THEN GO TO 730
830 IF maze(i+am,i+an)=1THEN GO TO 730
840 j=j+am:i=i+an:GO TO 480
850 DEFine PROCedure af
860 FILL 1
870 INK 3-iu
880 LINE 0,14 TO 0,100 TO 10,100 TO 10,14 TO
0,14
890 FILL 1
900 INK 5
910 LINE 0,14 TO 11,14 TO 0,0 TO 0,14
920 END DEFine
930 DEFine PROCedure eq
940 FILL 1
950 LINE 0,0 TO 10,14 TO 10,100 TO 0,100 TO 0
,0
960 END DEFine
970 DEFine PROCedure ah
980 FILL 1
990 INK 3-iu
1000 LINE 136,14 TO 136,100 TO 146,100 TO 146
,14 TO 136,14
1010 FILL 1
1020 INK 5
1030 LINE 136,14 TO 146,14 TO 146,0 TO 136,14
1040 END DEFine
1050 DEFine PROCedure ai
1060 FILL 1
1070 LINE 136,14 TO 136,100 TO 146,100 TO 146
,0 TO 136,14
1080 END DEFine
1090 DEFine PROCedure a(size)
1100 FILL 1
1110 LINE 73-(size*63),100-(size*86)TO 73+(si
ze*63),100-(size*86)TO 73+(size*63),100 TO 73
-(size*63),100 TO 73-(size*63),100-(size*86)
1120 END DEFine
1130 DEFine PROCedure b(size)
1140 INK 5
1150 FILL 1
1160 LINE 73-(size*63),100-(size*86)TO 73-(si
ze*31.5),100-(size*43)TO 73+(size*31.5),100-(
size*43)TO 73+(size*63),100-(size*86)
1170 END DEFine
1180 DEFine PROCedure c(size)
1190 FILL 1
1200 LINE 73-(size*63),100-(size*86)TO 73-(si
ze*63),100TO 73-(size*31.5),100 TO 73-(size*3
1.5),100-(size*43)TO 73-(size*63),100-(size*8
6)
1210 END DEFine
1220 DEFine PROCedure d(size)
1230 FILL 1
1240 INK 5
1250 LINE 73-(size*63),100-(size*86)TO 73-(si
ze*63),100-(size*43)TO 73-(size*31.5),100-(si
ze*43)TO 73-(size*63),100-(size*86)
1260 FILL 1
1270 INK 3-iu
1280 LINE 73-(size*63),100-(size*43)TO 73-(si
ze*31.5),100-(size*43) TO 73-(size*31.5),100T
O 73-(size*63),100TO 73-(size*63),100-(size*4
3)
1290 END DEFine
1300 DEFine PROCedure e(size)
1310 FILL 1
1320 LINE 73+(size*63),100-(size*86)TO 73+(si
ze*63),100TO 73+(size*31.5),100 TO 73+(size*3
1.5),100-(size*43)TO 73+(size*63),100-(size*8
6)
1330 END DEFine
1340 DEFine PROCedure f(size)
1350 FILL 1
1360 INK 5
1370 LINE 73+(size*63),100-(size*86)TO 73+(si
ze*63),100-(size*43)TO 73+(size*31.5),100-(si
ze*43)TO 73+(size*63),100-(size*86)
1380 INK 3-iu
1390 LINE 73+(size*63),100-(size*43)TO 73+(si
ze*31.5),100-(size*43)TO 73+(size*31.5),100TO
 73+(size*63),100TO 73+(size*63),100-(size*43
)
1400 END DEFine
1410 DEFine PROCedure cross
1420 FILL 1:INK 5:LINE 71,97 TO 73,100 TO 75,
97 TO 71,97:FILL 1:INK 3-iu:LINE 71,97 TO 71,10
0 TO 73,100 TO 71,97:FILL 1:LINE 75,97 TO 75,
100 TO 73,100 TO 75,97
1430 END DEFine
1440 DEFine PROCedure tim
1450 r$=DATE$:rt=rt$(16 TO 17)
1460 ry=rt$(19 TO 20)
1470 eq=(rt*60)+ry
1480 IF comp$="y"THEN com
1490 AT #0,0,0:PRINT #0;"Time:";((lev*25)-eq+
oq) DIV 60;":";((lev*25)-eq+oq) MOD 60;"     "
& p$ &" "
1500 IF eq-(oq+(lev*25))>=0 THEN kaputt
1510 END DEFine
1520 DEFine PROCedure finish
1530 CLS
1540 CSIZE 3,1
1550 INK 2
1560 CLS #0
1570 PRINT#0"          W E L L";#0
1580 PRINT"          D O N E"
1590 BEEP 10000,10
1600 CSIZE 2,0
1610 PRINT#0,#0,#0"  It took you ";(eq-oq)DIV 6
0;" minutes ";(eq-oq)MOD 60;" seconds."
1620 sc=sc+(lev*25-(eq-oq))
1630 PRINT#0"  You score ";sc
1640 CSIZE 3,1:PRINT#0"  Press a key to play a
gain.":PAUSE:CSIZE 2,0:RUN
1650 DEFine PROCedure kaputt
1660 CLS
1670 CSIZE 3,1
1680 PRINT#0"          H A R D";#0
1690 PRINT"          L U C K"
1700 BEEP 15000,255
1710 PRINT#0,#0,#0"  Press a key to play again.
":PAUSE:CSIZE 2,0:RUN
1720 DEFine PROCedure displaymaze
1730 sc=sc-50
1740 INK 4
1750 CLS:CLS#0
1760 IF lev<17 THEN fp=0:pe=lev:up=0:ux=lev:G
O TO 1810
1770 IF lev<37 THEN pe=lev:ELSE IF j>18 THEN
fp=j-19:pe=j+17:ELSE fp=0:pe=36
1780 IF lev<22 THEN ux=lev:ELSE IF i>10THEN u
p=i-11:ux=i+10:ELSE up=0:ux=21
1790 IF lev<i+18THEN pe=lev:fp=pe-36
1800 IF lev<i+10THEN ux=lev:up=ux-21
1810 FOR ps=up TO ux
1820 FOR cm=fp TO pe
1830 IF cm=cc AND ps=dd THEN PRINT;"E";:GO TO
 1860
1840 IF cm=i AND ps=i THEN po:GO TO 1860
1850 IF maze(cm,ps)=0 THEN PRINT;" ";:ELSE PR
INT;"U";
1860 NEXT cm
1870 PRINT
1880 NEXT ps
1890 PAUSE 100
1900 END DEFine
1910 DEFine PROCedure po
1920 INK 2
1930 IF am=-1THEN PRINT;"<";
1940 IF am=1THEN PRINT;">";
1950 IF an=-1THEN PRINT;"^";
1960 IF an=1THEN PRINT;"v";
1970 INK 1
1980 END DEFine
1990 DEFine PROCedure com
2000 p$=""
2010 IF i=dd AND am=-1THEN p$=">":GO TO 2070
2020 IF i=dd AND am=1THEN p$="<":GO TO 2070
2030 IF i=dd AND an=1THEN p$="^":GO TO 2070
2040 IF i=dd AND an=-1THEN p$="v":GO TO 2070
2050 IF (i>cc AND am=1) OR (i<cc AND am=-1)OR
 (i)dd AND an=1)OR (i<dd AND an=-1)THEN p$="?
":ELSE p$=">"
2060 IF (i<cc AND an=1) OR (i>cc AND an=-1) O
R(i>dd AND am=1) OR (i<dd AND am=-1)THEN p$=p
$ &"(":ELSE p$=p$ &"-"
2070 END DEFine
```

Invisible colours

An interesting interrupt driven m/c program for the CBM 64 by ***Mark Gornall***

This program is best described as a transparent colour changer, because once the program has been run you would not know that it's there unless you press *F1, F3* or *F5*. It is transparent so that it can be used in conjunction with nearly all Basic programs and many machine code programs.

Once you have run the Basic program you can *New* it and load in another program. Once another program has loaded you will find that Colour Changer will continue to work, unless *Run/Stop* and *Restore* are pressed, in which case you will have to type *Sys49152* to start it again. Of course you don't have to load a program once Colour Changer is running, you could start programming from scratch.

The main use of the program, I would hope, would be for people to include the small Basic program at the beginning of their own programs, so that when their program is running the user will be able to change all the screen colours with the greatest of ease without affecting anything else that the computer may be doing.

Entirely interrupt driven, the assembly listing shows that the program is made up of two main parts. The first part, Lines 190-250, tell the computer where about in memory to jump to every 60th of a second, from Lines 200 and 220 we see that this address if *$COOD*. Once the computer knows where the beginning of the interrupt routine is, ie, *$COOD*, it starts the interrupts running and then returns to basic.

The second part of the program, ie, 310-710, is what the computer runs through every time an interrupt occurs. First of all the program ckecks to see it either *F1, F3* or *F5* have been pressed. If none of these keys has been pressed the computer continues with what it was doing before it was interrupted. If, however, one of these keys has been pressed the program will change the colour of the border, screen or text as appropriate to the key pressed. Once the colour has been changed the computer continues with what it was doing by means of a *JMP $EA31*.

If you wish to use this program in conjunction with a machine code program of your own, I suggest storing the values of the registers on the stack at the beginning of the interrupt routine and retrieving them at the end.

KEYS:

F1 – Change Border Colour, *F3* – Change Screen Colour, *F5* – Change Text

```
100 REM *** COLOUR CHANGE-MARK G,1985 ***
110 J=0:FORI=0TO77
120 READA:POKE49152+I,A
130 J=J+A
140 NEXTI
150 IFJ<>10409THENPRINT"SUM ERROR":END
160 SYS49152
170 DATA 120,169,13,141,20,3,169,192,141
180 DATA 21,3,88,96,165,197,201
190 DATA 4,240,11,201,5,240,17,201,6,240
200 DATA 23,76,49,234,174,32
210 DATA 208,232,142,32,208,76,49,234
220 DATA 174,33,208,232,142,33,208,76
230 DATA 49,234,174,134,2,232,142,134,2
240 DATA 138,160,0,153,0,216,153
250 DATA 255,216,153,254,217,153,233
260 DATA 218,200,208,241,76,49,234
```

```
100 ! ****************************
110 ! ***** COLOUR   CHANGE *****
120 ! ***** BY MARK GORNALL *****
130 ! ****************************
140 !
150 !
160 !
170 ! ----- START INTERRUPTS -----
175 !
180 *=$COOO
190             SEI
200             LDA £$OD                !LSB INTERRUPT START ADDRESS
210             STA $0314
220             LDA £$CO                !MSB INTERRUPT START ADDRESS
230             STA $0315
240             CLI
250             RTS                     !RETURN TO BASIC
260 !
270 !
280 !
290 ! ----- INTERRUPT ROUTINE -----
300 !
310             LDA $C5                 !WHAT KEY WAS PRESSED?
320             CMP £$04                !WAS IT F1?
330             BEQ BORDER
340             CMP £$05                !WAS IT F3?
350             BEQ SCREEN
360             CMP £$06                !WAS IT F5?
370             BEQ TEXT
380             JMP $EA31               ! INTERRUPT COMPLETE
390 :
```

```
400 !
410 ! ---- CHANGE BORDER -----
420 !
430 BORDER      LDX $D020          !GET PRESENT BORDER COLOUR
450             INX                !INCREASE IT BY ONE
460             STX $D020          !CHANGE BORDER TO NEW COLOUR
470             JMP $EA31          !INTERRUPT COMPLETE
480 !
490 !
500 ! ----- CHANGE SCREEN -----
510 !
520 SCREEN      LDX $D021          !GET PRESENT SCREEN COLOUR
530             INX                !INCREASE IT BY ONE
540             STX $D021          !CHANGE SCREEN TO NEW COLOUR
550             JMP $EA31          !INTERRUPT COMPLETE
560 !
570 !
580 ! ---- CHANGE TEXT -----
590 !
600 TEXT        LDX $0286          !GET PRESENT TEXT COLOUR
610             INX                !INCREASE IT BY ONE
620             STX $0286          !STORE NEW TEXT COLOUR
630             TXA                !TRANSFER X TO A
640             LDY £$00
650 LOOP        STA $D800,Y        !CHANGE
660             STA $D8FF,Y        !TEXT
670             STA $D9FE,Y        !ALREADY
680             STA $DAE9,Y        !ON SCREEN
690             INY
700             BNE LOOP
710             JMP $EA31          !INTERRUPT COMPLETE
```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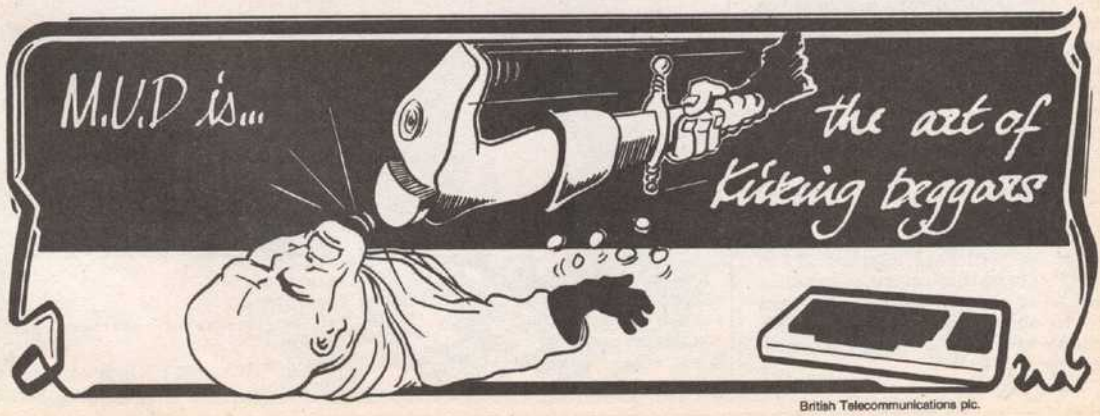

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Expand and compress

Now you've compressed that text – expand it! ***Jeff Tullin*** *shows how*

If you have followed the series over the last few weeks, you now have a program which squashes text and stores it away in memory, creating a database for use by this week's program.

The basic format of the database so created is this:

1) One byte *(Chr$13)* denoting start of dictionary list.
2) Up to 119 keywords, terminated each time by one byte *(Chr$13)*.
3) One byte *(Chr$13)* to signify beginning of text area.
4) Up to 255 text items, terminated by a *(Chr$13)* each time.
5) An end of list marker *(Chr$255)*.

More sections of text can be added after this, so long as they obey the rules from numbers three to five above.

Last week's flowcharts explain, (I hope) better than words can, how the expander routine works. Certainly the routine is easy to use. run the program, and this creates the machine code from *&7B00* onwards (line 250). Line 220 holds the address of the dictionary as given at the end of *Compactor*.

To use the routine, **load* the database into *&5200*, or run *Compacter* and type *New*. Then, what *Expander* expects is the address of your text list entered into *Y%*, and the number of the text item you want printed entered into *X%*, followed by *Call &7B00*.

With the squashed text resident in memory, and the machine code assembled at *&7B00*, type:

Y% = &524C= X% = 2:Call&7B00.

(Where *&524C* is the address of the text as given at the end of the *Compactor* program.) The second *Data* item should be printed out in full. If not, check the assembly language program carefully. If all goes well, then try *X% = 10= Call&7B00* to check the error trapping out. You should find this method of text retrieval very simple to use from Basic or machine code program.

Conversion Hints

1) The address of the text, passed in *Y%* on the BBC, is picked up from locations *&464* and *&465*, which is the BBC's internal memory allocation for *Y%*.

2) The *X* register is automatically set to the low byte of *X%* by the BBC operating system, when the command *Call* is issued. This is not so of other micros to my knowledge.

3) The ten zero page locations *ZP1* to *ZP11* should be consecutive, as some are used as 16-bit numbers. If ten locations are not normally free, try saving their values on the stack, then restoring them afterwards.

4) The BBC will print the string terminated by a zero byte, which follows a *Brk* instruction. Replace Line 1280 by *Rts*.

Finally, if the prospect of typing in the programs seems a little too much effort, you may send a cheque/P.O. for £3.00, together with a blank tape or disc and an sae to me at: 22 Kings Close, Gateshead, NE8 3PU, and I will return a working copy to you. Please state Basic1 or Basic2.

```
10 REM EXPANDER PROGRAM
20 REM (C) 1985 Jeff Tullin
30 REM BBC MICRO any OS
40 :
50 REM Will work on quite a few
   other 6502 machines too,as long
   as machine specific addresses
   are allowed for.
60 REM MACHINE SPECIFIC CALLS:
   &FFE7 causes newline and CR.
   &FFEE prints character in
   accumulator, leaves registers
   intact.
70 REM zp1- zp11 are zero page
   locs. available to the user.
80 zp1=&70
90 zp2=&71
100 stringno=&72
110 zp4=&73
120 zp5=&74
130 zp6=&75
140 capitalflag=&76
150 zp8=&77
160 zp9=&78
170 zp10=&79
180 zp11=&7A
190
200 newline=&FFE7
210 HIMEM=&5200
220 dictionary=&5200
230 :
240 FOR OP = 0 TO 2 STEP 2
250 P%=&7B00
260 [OPT OP
270 .expand
280 \
290 \   ON ENTRY, Y% HOLDS ADDRESS
300 \   OF LIST & X% HOLDS NUMBER
310 \   OF REQUIRED STRING
320 \
330 STX stringno
340 LDA #1
350 STA capitalflag
360 LDA &465:PHA
370 LDA &464:PHA
    \ Pick up addresses from Y%
380 JSR locate_string
    \ and find address of string
390 :
400 PLA :STA zp8
410 PLA :STA zp9
420 :
430 LDY #0
440 .mainloop
450 LDA (zp8),Y
 \ examine one character of string
460 CMP #13
470 BEQ exit
    \ Branch if string finished
480 CMP #ASC"#"
490 BNE fullstop
500 JSR newline
    \ Print newline instead of "#"
510 INY
520 CLC:BCC mainloop
530 :
540 .fullstop
550 CMP #46
560 BNE token_handler
570 JSR outputchar
    \ Print full stop
580 JSR newline
    \ Followed by newline
590 LDA #1
600 STA capitalflag
 \ Ensure next letter is capital.
610 INY
620 CLC:BCC mainloop
630 :
640 .token_handler
650 CLC
660 CMP #136
670 BCS tokenfound
 \ Branch if CHR$) 136 (IE token)
680 JSR outputchar
    \ Otherwise print as normal
690 INY
700 CLC:BCC mainloop
710 :
720 .tokenfound
730 SEC
740 SBC #136
 \ Reduces A by 136  =TOKEN NUMBER
750 STA stringno
760 LDA #dictionary DIV 256:PHA
770 LDA #dictionary MOD 256:PHA
780 STY zp6
790 JSR locate_string
 \ Find address of token required
800 PLA:STA zp10
810 PLA:STA zp11
820 JSR printstring
    \ Print it out
830 LDY zp6
840 INY
850 CLC:BCC mainloop
860
 870
 880 .exit:RTS
 890
 900
 910 .locate_string
 920 \
 930 \ FINDS THE ADDRESS OF THE
 940 \ REQUIRED STRING AND LEAVES
 950 \ IT ON THE STACK
 960 \
 970
 980
 990 PLA
1000 STA zp1
1010 PLA
1020 STA zp2
     \ Store return address
1030 PLA
1040 STA zp4
```

```
1050 PLA
1060 STA zp5
     \ Store working address
1070 LDA #0:TAX
1080 LDY #0
1090 .loop
1100 LDA (zp4),Y
1110 CMP #&0D
1120 BEQ endofstring
1130 CMP #&FF
1140 BEQ out_of_range
     \ End of list reached.
1150 .keep_looking
1160 JSR incrementbase
1170 JMP loop
1180 .endofstring
1190 INX
1200 CPX stringno
1210 BNE keep_looking
1220 JSR incrementbase
1230 LDA zp5:PHA:LDA zp4:PHA
1240 LDA zp2:PHA:LDA zp1:PHA
     \ Restore return address.
1250 RTS
1260 :
1270 .out_of_range
1280 BRK:BRK:EQUS"Parameter
     error":BRK
1290
1300 .incrementbase
1310 \
1320 \ ADDS 1 TO WORKING ADDRESSES
1330 \ USED BY locate_string
1340 \
1350 INC zp4
1360 LDA zp4
1370 CMP #0
1380 BNE carryclear
1390 INC zp5
1400 .carryclear
1410 CLC
1420 RTS
1430
1440 .printstring
1450 \
1460 \ PRINTS OUT STRING AT ADDRESS
1470 \ HELD AT LOCATION zp10/ zp11
1480 \
1490 LDY #0
1500 .lupe
1510 LDA (zp10),Y
1520 CMP #13
1530 BEQ endofline
1540 JSR outputchar
1550 INY
1560 JMP lupe
1570 .endofline
1580 RTS
1590
1600
1610 \ DEALS WITH THE ACTUAL
     PRINTING
1620 \ TO THE SCREEN AS REGARDS
1630 \ MAKING 1st LETTER OF PHRASE
1640 \ INTO A CAPITAL LETTER
1650 \
1660
1670 .outputchar
1680 PHA
1690 CLC
1700 LDA capitalflag
1710 BEQ print
\ Branch if capitals not required.
1720 PLA
1730 PHA
1740 CMP #123
1750 BCS print
1760 CMP #96
1770 BMI print
1780 PLA
1790 SEC
1800 SBC #32
\ Forces capital on valid character
1810 PHA
1820 LDA #0
1830 STA capitalflag
     \ Clear flag to prevent all
     capitals
1840 .print
1850 PLA
1860 JSR &FFEE
1870 RTS
1880
1890 ]
1900 NEXT
1910 PRINT"INSTRUCTIONS FOR USE.
     *LOAD dictionary + squashed
text          THEN CALL THE ROUTINE.
              Format:
     Yx=<address>:Xx=<message no.
>:CALL &7B00"
```


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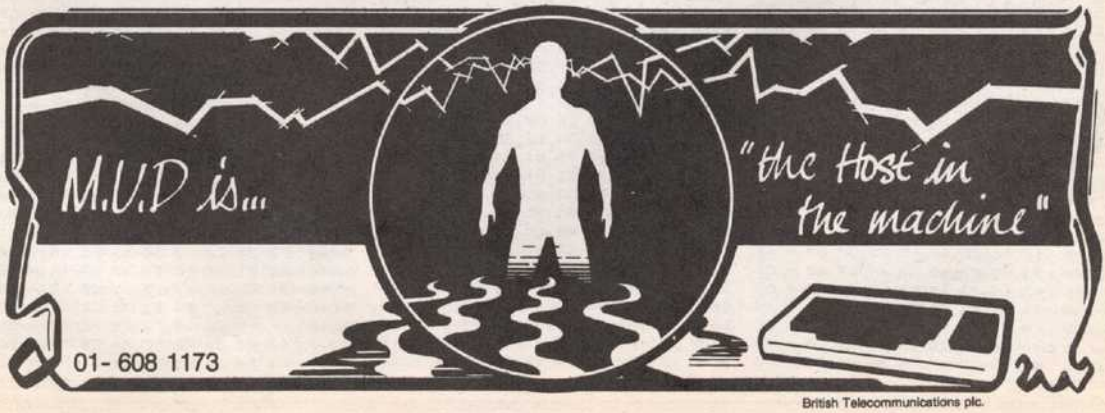

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Building a Basic extension

Part Three of the ZX!Basic code this week – by
Stuart Nichols

Lots of code to type in this week – most of Part Two in fact. Use the Hexloader printed in Vol 4 No 31 and you won't go far wrong.

Should you get spots before the eyes, I can supply copies of ZX!Basic on tape for £3.00.

Write to me at 82 Lays Drive, Keynsham, Bristol, BS18 2LE.

The remainder of the listing will be printed in the last part of the series next week.

```
ZX Spectrum 48K HEXDUMP
Part 2 : CODE 59904,5464
EA00  FC 00 F0 03 E0 0F C0 1D = BB
EA08  00 3B 00 3B 00 73 00 73 = 5C
EA10  3F 00 0F C0 07 F0 03 F8 = 00
EA18  01 FC 01 FC 00 FE 00 FE = F6
EA20  00 73 00 73 00 3B C0 3B = 9C
EA28  C0 1D E0 0F F0 03 FC 00 = BB
EA30  00 FE 00 FE 01 FC 01 FC = F6
EA38  03 F8 07 F0 0F C0 3F 00 = 00
EA40  FE 00 80 01 00 7E 80 0F = 8C
EA48  F0 01 FC 01 F0 01 E0 0E = CD
EA50  7F 00 01 80 00 7E 01 F0 = 6F
EA58  0F 00 3F 80 0F 80 07 70 = 54
EA60  C0 15 80 2A 00 55 00 40 = 14
EA68  00 7F 80 24 C3 18 E7 00 = E5
EA70  03 A8 01 54 00 AA 00 02 = AC
EA78  00 FE 01 24 C3 18 E7 00 = E5
EA80  F0 00 E0 0F E0 08 80 08 = 4F
EA88  00 7F 80 20 00 7F 00 52 = F0
EA90  0F 00 07 F0 07 10 01 10 = 2E
EA98  00 FE 01 04 00 FE 00 4A = 4B
EAA0  80 2C 00 4D 00 42 80 28 = E3
EAA8  80 27 80 20 C0 1F E0 00 = 06
EAB0  01 34 00 B2 00 42 01 14 = 3E
EAB8  01 E4 01 04 03 F8 07 00 = EC
EAC0  FF 00 FF 00 FF 00 FC 00 = F9
EAC8  F8 03 F0 04 F1 04 91 04 = 79
EAD0  FF 00 FF 00 FF 00 1F 00 = 1C
EAD8  0F E0 07 10 C7 10 C7 10 = B4
EAE0  00 64 00 7F 00 42 00 5A = 7F
EAE8  00 67 80 24 C3 18 E7 00 = CD
EAF0  03 38 01 FC 00 42 00 5A = D4
EAF8  00 E6 01 24 C3 18 E7 00 = CD
EB00  FF 00 FF 00 FE 00 FC 01 = F9
EB08  F8 01 E0 07 C0 1F 80 38 = 77
EB10  FB 00 01 04 00 FA 01 F8 = F3
EB18  03 F0 03 F8 07 F0 07 F0 = E4
EB20  00 73 00 67 00 6F 00 67 = B0
EB28  00 7F 80 3F C0 1F E0 00 = FD
EB30  07 F0 07 F0 07 F0 07 F0 = DC
EB38  07 F0 0F E0 1F C0 3F 00 = 04
EB40  F0 00 E0 0F C0 18 C0 1F = 96
EB48  00 3F 00 6A 00 55 80 20 = 1E
EB50  3B 00 01 C4 00 FE 01 80 = 7F
EB58  0F E0 01 B0 00 4E 01 08 = F7
EB60  C0 1F 80 22 00 55 00 49 = 1F
EB68  00 55 00 23 C0 1F E0 00 = B7
EB70  03 F8 01 44 00 AA 00 92 = 7C
EB78  00 AA 01 C4 03 F8 07 00 = 71
EB80  FE 00 FC 01 FC 01 F8 03 = F3
EB88  F8 02 F0 07 F0 06 E0 0D = D4
EB90  7F 00 3F 80 3F 80 1F 40 = 5C
EB98  1F 40 0F 20 0F A0 07 10 = 54
EBA0  E0 0E C0 1D C0 1A 80 3D = 62
EBA8  80 3A C0 1D E0 07 F8 00 = 76
EBB0  07 50 03 08 03 48 01 04 = B2
EBB8  01 44 03 10 07 E0 1F 00 = 66
EBC0  FE 00 E0 01 C0 1F C0 10 = 8E
EBC8  C0 16 C0 16 C0 16 C0 16 = 58
EBD0  7F 00 07 80 03 F8 03 08 = 0C
EBD8  03 68 03 68 03 69 03 68 = AC
EBE0  C0 10 C0 16 C0 16 C0 10 = 4C
EBE8  C0 16 C0 16 C0 1F E0 00 = 6B
EBF0  03 08 03 68 03 68 03 08 = EC
EBF8  03 68 03 68 03 F8 07 00 = D8
EC00  FB 00 F0 04 F0 06 E0 0F = D4
EC08  C0 0B C0 12 80 3A 04 41 = 9C
EC10  4F 00 07 B0 0F C0 0F C0 = A4
EC18  07 B0 0F 80 05 80 00 6A = 35
EC20  00 5A 00 4A 00 7A 80 25 = C3
EC28  80 24 80 3D 80 25 80 25 = AB
EC30  00 AA 00 AE 00 6A 05 50 = 17
EC38  07 50 07 50 07 50 07 50 = 5C
EC40  F8 00 F0 07 E0 08 C0 10 = A7
EC48  80 20 00 50 00 48 00 27 = DF
EC50  1F 00 0F E0 07 10 03 08 = 30
EC58  01 04 00 0A 00 12 01 E4 = 06
EC60  80 2C C0 12 C0 12 E0 09 = 39
EC68  E0 09 F0 05 F0 07 F8 00 = CD
EC70  01 34 03 48 03 48 07 90 = 62
EC78  07 90 0F A0 0F E0 1F 00 = 54
EC80  FC 00 E0 03 C0 1F 80 3C = 7A
EC88  00 7E 00 76 00 7E 00 7C = EE
EC90  7F 00 07 80 03 F8 01 FC = FE
EC98  00 FA 00 FA 00 FA 00 FA = E8
ECA0  00 6F 00 CF 00 4B 00 4B = D4
ECA8  00 6B 80 0B E0 0B F4 00 = D5
ECB0  01 FC 01 FC 01 EC 01 2C = 14
ECB8  01 2C 01 2C 01 2C D3 00 = 5A
ECC0  FE 00 F8 01 E0 06 80 18 = 75
ECC8  00 60 00 78 00 7E 00 7F = D5
ECD0  7F 00 1F 80 07 60 01 18 = 9E
ECD8  00 06 00 1A 00 76 00 AA = 40
ECE0  00 7F 00 7F 00 7F 00 7F = FC
ECE8  80 1F E0 07 F8 01 FE 00 = 7D
ECF0  00 56 00 AA 00 56 00 AE = 04
ECF8  01 58 07 E0 1F 80 7F 00 = 5E
ED00  80 00 00 7F 00 60 00 4E = AD
ED08  00 42 00 44 00 4E 00 60 = 34
ED10  01 00 00 FE 00 06 00 92 = 97
ED18  00 62 00 62 00 92 00 06 = 5C
ED20  00 7F 00 6B 00 7F 80 10 = F9
ED28  C7 10 8F 20 07 70 8F 00 = 8C
ED30  00 FE 00 B6 00 FE 01 08 = BB
ED38  E3 08 F1 04 E0 0E F1 00 = BF
ED40  FB 00 C0 04 80 32 00 0D = FE
ED48  00 67 80 1F 00 6F 80 19 = 0E
ED50  6F 00 05 90 00 A2 01 CC = 73
ED58  00 B2 01 EC 03 F0 01 3C = CF
ED60  00 4E 80 1B C0 28 80 0C = 5D
ED68  00 5F 80 22 D1 04 FB 00 = D1
ED70  01 E4 00 AA 01 30 01 64 = 25
ED78  00 EA 01 48 87 20 DF 00 = B9
ED80  F8 00 F0 07 E0 0F E0 0F = CD
ED88  C0 1F C0 19 C0 15 80 31 = 3E
ED90  3F 00 1F C0 0F E0 07 F0 = 04
ED98  07 F0 03 38 03 58 01 1C = AA
EDA0  80 3F 80 3F 00 7F 00 7F = 7C
EDA8  00 7F 00 7F 00 63 9C 00 = FD
EDB0  01 FC 01 FC 00 FE 00 FE = F6
EDB8  00 FE 00 CE 31 80 7F 00 = FC
EDC0  F0 00 E0 0F C0 1F 80 3F = 7D
EDC8  00 72 80 1D C0 0F 80 2F = 8D
EDD0  7F 00 1F 80 09 E0 10 C6 = DD
EDD8  11 44 31 84 11 C4 00 8A = 69
EDE0  C0 17 80 2F 80 2F C0 15 = 0A
EDE8  C0 0C 80 3D 80 35 CA 00 = 08
EDF0  01 DC 00 EA 01 E4 11 C4 = 81
EDF8  01 CC 01 EC 01 6C 93 00 = BA
EE00  01 00 00 00 0C 01 00 01 = 0F
EE08  01 00 00 00 0C 05 00 02 = 14
EE10  01 00 00 00 0C 09 00 03 = 19
EE18  01 00 00 00 0C 0D 00 04 = 1E
EE20  01 00 00 00 0C 11 00 05 = 23
EE28  01 00 00 00 0C 15 00 06 = 28
EE30  01 00 00 00 0C 19 00 07 = 2D
EE38  01 00 00 00 0C 1D 00 08 = 32
EE40  01 00 00 00 12 01 00 09 = 1D
EE48  01 00 00 00 12 05 00 0A = 22
EE50  01 00 00 00 12 09 00 0B = 27
EE58  01 00 00 00 12 0D 00 0C = 2C
EE60  01 00 00 00 12 11 00 0D = 31
EE68  01 00 00 00 12 15 00 0E = 36
EE70  01 00 00 00 12 19 00 0F = 3B
EE78  01 00 00 00 12 1D 00 10 = 40
EE80  00 00 00 00 0C 00 00 00 = 0C
EE88  00 00 00 00 0C 00 00 00 = 0C
EE90  00 00 00 00 0C 00 00 00 = 0C
EE98  00 00 00 00 0C 00 00 00 = 0C
EEA0  00 00 00 00 00 00 00 00 = 00
EEA8  00 00 00 00 00 00 00 00 = 00
EEB0  00 00 00 00 00 00 00 00 = 00
EEB8  00 00 00 00 00 00 00 00 = 00
EEC0  00 00 00 00 00 00 00 00 = 00
EEC8  00 00 00 00 00 00 00 00 = 00
EED0  00 00 00 00 00 00 00 00 = 00
EED8  00 00 00 00 00 00 00 00 = 00
EEE0  00 00 00 00 00 00 00 00 = 00
EEE8  00 00 00 00 00 00 00 00 = 00
EEF0  00 00 00 00 00 00 00 00 = 00
EEF8  00 00 00 00 00 00 00 00 = 00
EF00  F3 F5 E5 D5 C5 3A 2E EF = BE
EF08  3C C2 5A EF 32 2E EF 06 = 9C
EF10  10 11 BB F1 21 00 EE 7E = 5A
EF18  12 3E 08 85 6F 13 10 F7 = 66
EF20  21 00 40 11 00 D2 01 00 = 45
EF28  18 ED B0 C3 5A EF 00 79 = 3A
EF30  0F 0F 0F E6 E0 A8 5F 79 = 73
EF38  E6 18 F6 40 57 C9 7B 3C = 0B
EF40  E6 1F 28 02 1C C9 7B E6 = 75
EF48  E0 5F C9 7B C6 20 5F D0 = 98
EF50  7A C6 00 57 FE 58 C0 16 = CB
EF58  40 C9 CD 11 F1 CD 5D F0 = F2
EF60  CD 70 EF CD D0 EF CD 3A = BF
EF68  F1 C1 D1 E1 F1 C3 39 00 = 50
EF70  21 00 EE 11 BB F1 D5 E5 = 86
EF78  CD B7 EF E1 D1 13 3E 08 = 4E
EF80  85 6F FE 80 20 F0 C9 1A = 65
EF88  B6 C8 7E 12 23 A7 28 05 = 05
EF90  3A 78 5C A6 C0 23 7E 23 = 38
EF98  B6 28 03 1A A7 C0 23 4E = CB
EFA0  23 46 CD 2F EF 21 00 92 = 07
EFA8  19 0E 05 D5 06 08 D5 7E = 62
EFB0  12 14 24 10 FA D1 CB 39 = 29
EFB8  30 09 CD 3E EF 21 00 92 = E6
EFC0  19 10 E9 D1 79 A7 C8 CD = A0
EFC8  4B EF 21 00 92 19 10 DB = F9
EFD0  21 00 EE E5 CD E1 EF E1 = 72
EFD8  3E 08 85 6F FE 80 20 F3 = CB
EFE0  C9 7E A7 C8 23 3A 78 5C = E7
EFE8  A6 28 08 23 23 23 4E 23 = B0
EFF0  46 18 08 CD 41 F0 77 CD = A8
EFF8  55 F0 77 CD 2F EF 23 23 = ED
F000  7E 3D E6 0F 3C 01 40 00 = 2D
F008  21 C0 E9 09 3D 20 FC 0E = 3A
F010  05 D5 06 08 D5 1A A6 23 = A0
F018  B6 12 23 14 10 F7 D1 CB = A2
F020  39 30 05 CD 3E EF 18 EA = 6A
F028  D1 79 A7 C8 CD 4B EF 18 = DB
F030  E0 79 0F 0F 0F 4F E6 E0 = 9B
F038  A8 5F 79 E6 03 EE 58 57 = 06
F040  C9 23 54 5D 23 23 1A 86 = 83
F048  FE FF 20 02 3E 17 FE 18 = 8A
F050  20 01 AF 4F C9 23 13 1A = 38
F058  86 E6 1F 47 C9 21 00 EE = AA
F060  E5 CD 6E F0 E1 3E 08 85 = BC
F068  6F FE 80 20 F3 C9 7E A7 = EE
F070  C8 23 3A 78 5C A6 C0 CD = 2C
F078  41 F0 CD 55 F0 CD 31 F0 = 31
```

```
F080  23 06 00 D5 1A BE 20 01 = F7
F088  04 CD 3E EF 1A BE 20 04 = FA
F090  70 C6 03 47 D1 7B C6 20 = BA
F098  5F 30 00 14 7A FE 5B 20 = 9E
F0A0  02 16 58 1A BE 20 04 78 = E4
F0A8  C6 05 47 CD 3E EF 1A BE = E4
F0B0  20 04 78 C6 07 47 78 A7 = CF
F0B8  C8 2B 2B 2B CB 46 28 47 = C9
F0C0  2B CB 46 28 49 23 FE 06 = D4
F0C8  28 3E FE 0A 28 3A FE 08 = D6
F0D0  28 30 FE 04 28 31 FE 0C = BD
F0D8  28 2D CB 5F 20 24 FE 01 = C2
F0E0  28 1A FE 03 28 10 FE 05 = 7E
F0E8  28 06 36 FF 2B 36 FF C9 = 8C
F0F0  36 01 2B 36 FF C9 36 FF = 95
F0F8  2B 36 01 C9 36 01 2B 36 = C3
F100  01 C9 7E EE FF 3C 77 2B = 13
F108  7E EE FF 3C 77 C9 23 10 = 22
F110  F7 21 7A EE 16 00 01 FE = 95
F118  EF ED 78 CB 5F 20 01 15 = B4
F120  CB 67 20 01 14 72 23 16 = 12
F128  00 CB 57 20 01 14 01 FE = 56
F130  F7 ED 78 CB 67 20 01 15 = C4
F138  72 C9 3A 78 EE A7 C0 ED = 37
F140  4B 7C EE 79 3D FE FF 20 = 88
F148  02 3E 17 5F 78 3D E6 1F = 70
F150  57 21 00 EE E5 D5 CD 75 = 62
F158  F1 D1 E1 30 0E 7D C6 08 = 34
F160  6F FE 78 20 EF 21 AC EE = AF
F168  36 00 C9 7D A7 1F 1F 1F = 80
F170  21 AC EE 77 C9 7E A7 C8 = E8
F178  23 23 23 23 0E 03 D5 06 = 78
F180  03 7E 23 BB 20 04 7E BA = BB
F188  28 15 2B 14 7A E6 1F 57 = 52
F190  10 EF D1 0D C8 1C 7B FE = 3A
F198  18 20 E3 1E 00 18 DF D1 = 01
F1A0  37 C9 21 2E EF 36 FF 21 = 94
F1A8  00 EF 22 FF FE 3E FE ED = 37
F1B0  47 ED 5E C9 3E 3F ED 47 = 0C
F1B8  ED 56 C9 01 01 01 01 01 = 11
F1C0  01 01 01 01 01 01 01 01 = 08
F1C8  01 01 01 00 00 00 00 00 = 03
F1D0  00 00 00 00 00 00 00 00 = 00
F1D8  00 00 00 00 00 00 00 00 = 00
F1E0  00 00 00 00 00 00 00 00 = 00
F1E8  00 00 00 00 00 00 00 00 = 00
F1F0  00 00 00 00 00 00 00 00 = 00
F1F8  00 00 00 00 00 00 00 00 = 00
F200  CD F5 F6 78 CD 2C F2 79 = 94
F208  CD 2C F2 ED 43 37 F2 CD = 11
F210  F5 F6 ED 43 35 F2 ED 43 = 72
F218  39 F2 CD F1 2B 78 B1 0B = 48
F220  C8 1A 13 C5 D5 CD 3B F2 = 89
F228  D1 C1 18 F1 A7 28 03 FE = 6B
F230  21 D8 C3 F9 24 B8 18 02 = AB
F238  01 B8 18 26 00 6F 29 29 = B8
F240  29 ED 5B 36 5C 19 06 08 = 2A
F248  C5 ED 4B 36 F2 7E E5 C5 = 4D
F250  06 08 C5 17 F5 38 1B ED = 1F
F258  4B 37 F2 C5 ED 4B 39 F2 = 9C
F260  C5 CD ED F6 CD DB 0B C1 = E9
F268  0C ED 43 39 F2 C1 10 EB = 23
F270  18 16 ED 4B 37 F2 C5 ED = 41
F278  4B 39 F2 C5 CD E2 F6 C1 = A1
F280  0C ED 43 39 F2 C1 10 EE = 26
F288  F1 C1 10 C6 3A 35 F2 21 = 0A
F290  39 F2 77 23 35 C1 E1 10 = AC
F298  B4 23 C1 10 AB 3A 38 F2 = B7
F2A0  87 87 87 6F 3A 39 F2 85 = EE
F2A8  32 35 F2 32 39 F2 3A 36 = 26
F2B0  F2 32 3A F2 C9 00 00 C3 = DC
F2B8  61 F5 FD CB 01 BE CD FB = A5
F2C0  19 AF 32 47 5C 3D 32 3A = 46
F2C8  5C 18 01 E7 CD BF 16 FD = FB
F2D0  34 0D FA 0A 1C DF 06 00 = C6
F2D8  FE 0D CA 92 F3 FE 3A 28 = BA
F2E0  EA 21 49 F3 E5 4F E7 79 = DB
F2E8  FE 21 28 18 FE F4 28 09 = 82
F2F0  FE FA 28 05 FE EA C2 44 = 13
F2F8  1B D6 CE 4F 21 48 F4 09 = 74
F300  4E 09 18 13 DF 4F E7 79 = 10
F308  FE 5B D2 0A 1C D6 41 DA = C2
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F3A8  5C 23 5E 23 56 EB 19 23 = 7D
F3B0  22 55 5C EB 22 5D 5C 57 = F0
F3B8  1E 00 FD 36 0A FF 15 FD = 6C
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F3E8  2A 84 5C E5 2A 00 5C E5 = E2
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F3F8  3E 15 D7 AF D7 3E 5B D7 = 20
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F410  CD 1B 1A 3E 5D D7 06 05 = 7F
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F420  5C E1 22 84 5C F1 32 6A = CC
F428  5C E1 22 51 5C ED 4B B0 = F4
F430  5C CD 3D 1F C9 C1 CD 30 = 0C
F438  25 28 0A EF 02 38 EB CD = 38
F440  E9 34 DA 92 F3 C3 CC F2 = FD
F448  48 41 9D 87 C4 59 46 49 = 59
F450  90 64 4D 89 B7 70 63 6A = BE
F458  7E 80 B9 41 62 29 A5 9D = C5
F460  A0 1C 56 3F 3F 2B 17 1F = F1
F468  37 77 44 0F 59 2B 43 2D = F5
F470  51 3A 6D 42 0D 49 5C 44 = 30
F478  15 5D 00 8A 1C 06 00 43 = 61
F480  FE 06 CB 05 35 F4 08 00 = 05
F488  2E FE 08 2C 08 00 00 FE = 66
F490  06 00 5C FE 08 00 7D FE = E3
F498  08 00 9B FE 05 18 F8 08 = AE
F4A0  00 AB FE 05 91 F3 08 2C = 66
F4A8  08 2C 08 2C 08 00 D9 FE = 27
F4B0  00 08 00 7C F7 08 00 99 = 1C
F4B8  FE 06 00 06 FF 00 00 F6 = FF
F4C0  F8 09 00 D2 F6 0A 2C 08 = 07
F4C8  2C 08 00 00 F2 27 1E 03 = 6E
F4D0  42 1E 09 00 6D F7 05 90 = 62
F4D8  CE 05 72 CE 08 00 2C FF = 46
F4E0  08 2C 06 00 C2 C9 03 09 = D1
F4E8  05 9C F9 07 07 07 07 07 = BD
F4F0  07 08 00 7A 1E 06 00 94 = 41
F4F8  22 05 60 1F 06 00 BB F6 = 5D
F500  00 CB F6 08 2C 08 2C 08 = 31
F508  00 7E FB 09 00 0E F7 00 = 87
F510  00 75 F9 08 2C 08 00 93 = 3D
F518  F7 16 06 0C 5A 58 21 42 = 34
F520  41 53 49 43 16 08 07 7F = C4
F528  20 31 39 38 35 20 20 53 = 8A
F530  2E 4E 69 63 68 6F 6C 6C = F7
F538  73 FD 36 53 38 3E 02 CD = 3E
F540  01 16 CD 6B 0D 3E 02 CD = 69
F548  01 16 11 19 F5 01 20 00 = 57
F550  CD 3C 20 21 61 F5 E5 01 = 86
F558  D4 98 C5 01 28 70 C3 0D = 9A
F560  FE 2A B2 5C 36 3E 2B F9 = CE
F568  2B 2B 22 3D 5C 18 07 FD = 2D
F570  36 31 02 CD 95 17 CD B0 = 5F
F578  16 3E 00 CD 01 16 CD 2C = 31
F580  0F CD BA F2 FD CB 00 7E = CE
F588  20 12 FD CB 30 66 28 40 = F8
F590  2A 59 5C CD A7 11 FD 36 = 97
F598  00 FF 18 DD 2A 59 5C 22 = F5
F5A0  5D 5C CD FB 19 78 B1 C2 = 85
F5A8  61 F6 DF FE 0D 28 C0 FD = 26
F5B0  CB 30 46 C4 AF 0D CD 6E = FC
F5B8  0D 3E 19 FD 96 4F 32 8C = 04
F5C0  5C FD CB 01 FE FD 36 00 = 56
F5C8  FF FD 36 0A 01 CD 69 F3 = 66
F5D0  76 FD CB 01 AE FD CB 30 = E5
F5D8  4E C4 CD 0E 3A 3A 5C 3C = F9
F5E0  F5 21 00 00 FD 74 37 FD = BB
F5E8  74 26 22 65 5C 21 01 00 = 9F
F5F0  22 16 5C CD B0 16 FD CB = EF
F5F8  37 AE CD 6E 0D FD CB 02 = F7
F600  EE F1 47 FE 0A 38 02 C6 = 2E
F608  07 CD EF 15 3E 20 D7 78 = 85
F610  11 91 13 CD 0A 0C AF 11 = 58
F618  36 15 CD 0A 0C ED 4B 45 = AB
F620  5C CD 1B 1A 3E 3A D7 ED = 9A
F628  4B 47 5C 06 00 CD 1B 1A = F6
F630  CD 97 10 3A 3A 5C 3C 28 = A8
F638  1D FE 09 20 04 FE 15 20 = 83
F640  03 FD 34 0D 01 03 00 11 = 56
F648  70 5C 21 44 5C FD CB 0A = 5F
F650  7E 20 01 09 ED B8 FD 36 = 80
F658  0A FF FD CB 01 9E C3 79 = AC
F660  F5 ED 43 49 5C 2A 5D 5C = AD
F668  EB 21 B3 F6 E5 2A 61 5C = 81
F670  37 ED 52 E5 60 69 CD 6E = 5F
F678  19 20 06 CD B8 19 CD E8 = 92
F680  19 C1 79 3D B0 20 28 C5 = 55
F688  03 03 03 03 2B ED 5B 53 = D2
F690  5C D5 CD 55 16 E1 22 53 = BF
F698  5C C1 C5 13 2A 61 5C 2B = 07
F6A0  2B ED B8 2A 49 5C EB C1 = 4B
F6A8  78 2B 71 2B 73 2B 72 F1 = 38
F6B0  C3 6F F5 3E 10 01 00 00 = 76
F6B8  C3 E0 F5 CD A2 2D DA F9 = 07
F6C0  24 21 D1 F6 36 01 ED 43 = 73
F6C8  B0 5C C9 21 D1 F6 36 00 = F3
F6D0  C9 00 CD F5 F6 CB 7A C0 = 86
F6D8  CB 7B C0 CD E2 F6 D8 C3 = 46
F6E0  4D 0D ED 43 7D 5C CD ED = 1D
F6E8  F6 D8 C3 EC 22 3E BF 90 = 2C
F6F0  D8 C3 B0 22 C9 CD 02 F7 = FC
F6F8  47 C5 CD 02 F7 59 C1 51 = 3D
F700  4F C9 CD D5 2D DA 0B F7 = C3
F708  0E 01 C8 0E FF C9 CD EE = 68
F710  1B CD F5 F6 CB 7A C0 CB = A3
F718  7B C0 2A 7D 5C 78 94 16 = 60
F720  01 30 04 16 FF 7C 90 47 = 9D
F728  79 95 1E 01 30 04 1E FF = 7E
F730  7D 91 4F B8 30 06 69 D5 = 89
F738  AF 5F 18 07 B1 C8 68 41 = 4F
F740  D5 16 00 60 78 1F 85 38 = 9F
F748  03 BC 38 07 94 4F D9 C1 = 7B
F750  C5 18 04 4F D5 D9 C1 2A = C9
F758  7D 5C 78 84 47 79 3C 85 = 56
F760  3D 4F CD E2 F6 D9 79 10 = 93
F768  DD D1 C3 4D 0D CD EE 1B = A1
F770  CD F5 F6 C3 32 F7 00 00 = A4
F778  00 00 00 00 CD 85 1E 21 = 91
F780  4F FF A7 ED 42 38 0A 21 = 87
F788  C1 C9 A7 ED 42 30 02 CF = 61
F790  19 02 C9 CD A2 2D DA F9 = 53
F798  24 ED 43 0B F8 CD A2 2D = F3
F7A0  DA F9 24 ED 43 09 F8 CD = F5
F7A8  A2 2D DA F9 24 ED 43 07 = FD
F7B0  F8 CD A2 2D DA F9 24 ED = 78
F7B8  43 05 F8 2A 05 F8 ED 5B = AF
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F7E0  F7 C8 18 D7 38 02 13 13 = 0E
F7E8  1B ED 53 07 F8 18 CC ED = 2B
F7F0  5B 05 F8 2A 09 F8 A7 ED = 17
F7F8  52 C9 ED 5B 07 F8 2A 0B = 97
F800  F0 A7 ED 52 C9 00 00 00 = A7
F808  00 00 00 00 00 CB 7A 20 = 65
F810  05 CB 7B 20 01 C9 CF 19 = 1D
F818  2A 4F 5C 23 23 23 23 23 = 84
F820  11 29 F8 73 23 72 C3 CD = CA
F828  1F CD 03 0B FE 20 30 5C = A4
F830  FE 16 28 1E FE 06 28 4A = D0
F838  FE 0D CA 3E F9 FE 08 CA = DC
F840  47 F9 FE 09 CA 5B F9 C3 = 28
F848  F4 09 11 5F F8 32 0F 5C = 02
F850  18 06 11 4A F8 32 0E 5C = 0D
F858  2A 51 5C 73 23 72 C9 11 = B9
```

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Dumped in code

A machine code screen dump routine for the 464 and Brother 1009 printer by ***John Durst***

When you have a dot-matrix printer connected to the Centronics port of your Amstrad, one of the things you almost certainly will want to do, is to print out the contents of the monitor screen; to do a "Screen Dump". In the ordinary way this is not directly possible – as can be done with the old ZX printer *"Copy"* command on the Spectrum. But almost any combination of printer and computer can be persuaded to execute a Screen Dump with the help of a short machine code routine.

The problem in every case is that of scanning the display file, so as to read the pixels that make it up, and then present these pixels to the printer in a form which it can deal with and transfer to paper.

Most dot-matrix printers have a *"Graphic"* option, sometimes called *"Dot Image"*. In this mode, instead of printing out a complete character (which is usually a matrix of 8 columns by 8 vertical lines) it prints just a single vertical line for each byte input. The dot arrangement corresponds to the binary value of the byte, so that a byte containing "0001 1000" Binary will print out as a vertical line consisting of three blank spaces with two dots below them, followed by another three blanks.

The software problem is to arrange to scan the screen (of the display file) in groups of eight vertical bits at a time and feed them in succession to the printer.

The thing that makes this not altogether straightforward, is the fact that display files store the information about the screen in horizontal lines of pixels; we have to arrange to sample the corresponding pixels in eight successive lines of the display file, and combine them into a byte to be output to the printer.

So far all this applies in general terms to all screen dump routines. But the Amstrad 464 has a further complication: bytes output to the printer ignore bit No 7, so instead of being able to send the complete depth of a character on every pass, you can only send a maximum of $\frac{7}{8}$ of a character. In fact, because $\frac{7}{8}$ is an awkward fraction, it is easier to implement the routine if it deals with just six lines of pixels on each pass – $\frac{3}{4}$ of a character.

The Display File of the 464 – in common with most display files – is set out in an horrific address system; things don't follow one another at all as you might expect. Next door pixels are not necessarily in next door bytes and pixels above, or below, are not always in bytes the same distance from one another. The coward's way out is to make use of a Rom routine called *"Scr Dot Position"*, which delivers the correct display file address in return for the *X* and *Y* co-ordinates of the screen pixel. This is fairly slow, as it means re-calculating the address for each pixel from scratch, but it is very convenient, as it also returns the "pixel mask", which extracts the bits which code for the *Ink* in the pixel – something else which dodges about confusingly – as well as altering with the Mode in use.

So the technique is to get the co-ordinates of the first screen pixel (starting at top left), call the routine *"Dot Position,* find whether the pixel is set for *Pen*, or *Paper* and store the answer in the form of a set bit for a *Pen* Ink, or a reset bit for *Paper*. Then move the co-ordinates down one pixel – and store it too. Do this for six vertical pixels and output the composite result to the printer. After this, the routine moves on to the next horizontal pixel and does the same for that set of six vertical pixels ... and so on through the whole display file.

The program shown generates the code for the routine. If you wanted to use an Epson printer, you would have to change Line 120 to "12,10,27,75,64,1,0,0". Also, the counter byte on Line 20, six position from the end – at present "7", should be changed to "6".

Once you have *Run* the program successfully, you can forget the Basic and *Save* the routine for use on its own.

To use the program, *Call #9000*. You could set up an RSX command, *"Copy"*, but I don't see much point. It involves extra coding – and you are much more likely to want to use the routine in the course of a program, to print out some piece of graphics. In that case you would have some line like; **1000** a$ = *Inkey$:IF* a$ = "C" *Then Call* &9000.

One last word of caution: always reset the printer, by switching it off and on, after you have used the routine. The print-out is likely to end with the printer still in Graphics mode when it will garble the next bytes it receives including a "Reset" command!

SCREEN DUMP – Decimal Loading program

```
10 DATA 33,153,144,6,8,126,205,43,189,35
,16,249,33,160,0,205,17,188,56,4
20 DATA 41,40,1,41,34,161,144,33,199,0,1
7,145,144,6,7,26,205,46,189,56
30 DATA 251,205,49,189,19,16,244,17,0,0,
6,6,197,213,229,205,29,188,126,161
40 DATA 203,121,32,5,7,203,17,24,247,205
,47,188,79,205,153,187,169,33,163,144
50 DATA 40,2,203,198,203,38,225,209,193,
43,124,181,200,16,213,58,163,144,79,205
60 DATA 46,189,56,251,205,49,189,205,17,
188,121,48,5,205,43,189,24,3,40,1
70 DATA 19,19,205,9,187,254,252,200,14,6
,9,229,42,161,144,167,237,82,225,32
80 DATA 165,237,66,24,141
90 REM
100 REM          PRINTER CODES
110 REM
120 DATA 13,10,27,42,4,64,1,0
130 DATA 27,64,27,108,20,27,51,16
140 REM
150 REM          CHECK DATA LIST
160 REM
170 DATA 1870,1535,2350,2432,2737,2074,2
493,1118
180 RESTORE:FOR i=0 TO 7
190 x=0:FOR j=1 TO 20:READ n:x=x+n:NEXT
200 PRINT x;:NEXT
210 PRINT
220 RESTORE 170:FOR j=0 TO 7:READ m:PRIN
T m;:NEXT
230 STOP
240 REM
250 REM        POKE VALUES TO MEMORY
260 REM
270 RESTORE:MEMORY 36863
280 FOR j= 36864 TO 37020:READ n:POKE j,
n:NEXT
```

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Deprotection

After a long period of silence, BBC owners have been doing quite well for tips in the column over the last few weeks. Here are some more to add to the list from John Fitzgerald of London.

"*Q*BERT* (Superior Software) – let the whole game load, then press *CTRL+Break*. Type *Page = &1700* (ret), *Old* (ret), *List 2900* (ret). Change men% from 2 to the number of lives you want.

"*Ghouls* (Micro Power) – let the game load and then press *Break*. Then type *Page = &2200* (ret). List the first 10-20 lines. LI(ves) and LEV(els) can be found. Level can be 1 to 4, lives any number. Then *run* (ret).

"*Escape from Moonbase Alpha* (Micro Power). When the game has loaded press *Break* then *Old* (ret) *List* 700 (ret). P% = Hulk Pills, S% = Strength, G% = Gold Held. Change these to make the game easy.

"*Planetoid* (Acornsoft) – Type *Page = &3000* (ret), *Load ""*. Then type 150 ?&276B=&x = number of lives. This has to be done after the title page has loaded. Don't forget to press Escape to remove the SEARCHING message."

Now then, there are a couple of important messages. First of all, I get many letters each week from people asking for personal replies. I'm sorry but I really can't get round to answering you all individually, much as I would like to. However, a lot of these letters are to do with pokes, etc, that you can't get to work.

You'll no doubt be pleased to hear that we are planning a special project along the lines of the complete arcade guide that will hopefully give guidelines for beginners as well as allowing me the chance to clear up some old problem pokes in greater detail.

One of the machines that gives greatest difficulty is the Amstrad because the machine has a built-in protection device that stops you from merging, loading or listing Basic headers without them auto-running. Many of the pokes that we receive for this machine can easily be entered into the headers of the games, before the Call statement that starts the machine code as long as you can deprotect the Basic. To do this is easy if you purchase one of the Amstrad tape back-up utilities that are advertised in the back of most computer magazines (including *Amstrad User*) – these all offer a deprotection option.

The alternative is to write your own routine that replaces the existing header and loads the machine code, pokes it, and runs it. Where we can, we try to print these replacement headers rather than the simple poke, but we may not always have the game in question to work it out if the person who found the poke hasn't sent it in.

The problem is that you usually have to know the Call number from which the machine code starts and this may not be the same as the first location of the code. Anyway, can I encourage all Amstrad hackers to send in a full replacement header if possible.

To prove my point here, courtesy of our old friend Murray Pope, is an infinite lives poke for Microbyte's *Er*burt* – Poke 18971,0. Here it is again surrounded by loads of boring sound set-up routines.

```
10 Memory 16383
20 Load "", 16384
30 Ink 0,0
40 Env 1,3,1,33,6,-1,50
50 Ent 5,100,5,4
60 For F=1 to 7
70 Read A,B,C,D,E,F,G,H,I,J,K,
80 Ent A,B,C,D,E,F,G,H,I,J,K,
90 Next
100 Data 1,10, -10,1,8,30,1,2, -75,1, -2,2, -50,2,5,50,2,12, -5,2,3,12, -10,1,2,110,1,6, -15,1, -4,12, -10,1,6,20,1,2, -125,1,3,12, -10,1,2,110,1,6, -15,1,6,6, -20,4,2,100,4,2, -40,4,7,4,5,3,2,25,3,4,6,3
110 Poke 18971,0 : Call 26547
```

Whilst on the subject of Murray's letters – although he has already admitted that Decapiture is possible in the Amstrad *JSW*, he caused a real furore by suggesting that it wasn't. Several people wrote in with suggestions on how to get past it.

Duncan Ellis of Ilkley says, "I suggest the problem is with the blue block – this should be jumped when it is on the way down about two or three characters off the ground. The timing is difficult as it moves so fast." Andrew Dunbar of Buckley says, "As the first guillotine is halfway through its descent, jump from the furthest edge of the top step and walk to safety between the two blades. As the second blade rises just above your head, walk forward so that you drop into the curved recess. Jump to the right out of the ditch in such a way that you follow the blade closely as it rises. You should make it!"

Andrew wants to know if you can take a ride on the yacht after pressing the trip switch, and what's the screen on the right of "Incredible –". Well, the answers come from Stuart Wray who is an old *JSW* expert and who has kindly sent a map of the 132 locations. Stuart says that the trip switch is there to allow you to collect the object in The Cartography Room. The yacht business looks to be a myth.

Another old friend is PF, The Tetrach, who gives the same tip as Andrew and also follows it on with a request for help with Incredible Big Hole In the Ground. "I've only managed to reach it once with my last life which fell straight to the floor and died. Are there any alternative routes to this screen?" Stuart's map shows that Incredible Big Hole In The Ground covers three screens, to the right of which is Loony Jet Set – does that help, Andrew? The screen seems only accessible via the left platform of Beam Me Down Scotty and Teleport.

Dennis Goodwin of Wallingford has had trouble with the room Star Drive. "I could get in, but not out as all the platforms keep moving left. Software Projects helpfully supplied this answer – on the right of the screen are three blocks. Jump on the middle one and, as soon as you land, jump off again. Beware of the well, I think this is a trap."

I'm sorry, but we have no plans to print the map as yet since we really do feel that *JSW* is an ageing game, despite the boost of the extra rooms; it also has had infinitely more coverage in the column than some other releases. However, I will consider sending photocopies out to those who send in a stamped addressed envelope clearly marked *JSW*.

We are searching for the top UK computer games player – the best there is!

The very best of Britain's game players will get to fight it out on a number of top secret new games – scheduled for release in the autumn.

Here's how it works

Study the table below and look at the column for the machine you have – these are the games you'll need to master. Send your high scores in on the form below, making sure that your scores are authenticated by a responsible individual signing the form. Any score achieved using technical short-cuts – such as infinite lives Pokes – will not be accepted.

Between now and September Tony Kendle will be keeping you up to date on the *Arcade Avenue* page with just who has the scores to beat. Then, in September, the top three scorers on each machine will battle it out for a place in the final and the chance to be the first to play our 'top secret' games.

	Commodore	BBC	Spectrum	Amstrad
Game 1	Suicide Express	Elite	Technician Ted	Sorcery
Game 2	Beach Head	Jet Pac	3D Star Strike	Splat!
Game 3	Shoot the Rapids	Chuckie Egg	Cyclone	Manic Miner

Game Wizard Entry Form

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Game 3 score: .....

Name .....

Address .....

.....

.....

Your signature .....

Witness's signature .....

.....

Tony Bridge's Adventure Corner

On the warpath

Adventure Corner takes a bit of a departure this week from the usual tack. Adventuring on microcomputers can trace its origins back to wargaming and many adventurers are also keen wargamers. The Corner will not become Wargame Corner, but we'll occasionally be looking at the more interesting programs.

Two very interesting wargames have been recently released. The first is *The Bulge*, from Lothlorien, running on the Commodore and Spectrum. Lothlorien were among the first software houses to produce wargames for the more popular machines, and I remember them fondly for their early popular programs like *Johnny Reb*, which hardly left my computer for several weeks.

Before the Spectrum, however, was the Atari range of computers, and the classic wargame for those machines was the legendary *Eastern Front*, written by the equally legendary Chris Crawford. If you have an Atari and haven't yet seen this wonderful program, then beg, borrow, etc , as soon as you can.

The atmospheric scenario, the assault on Russia by the German forces in the Second World War, is matched by the very easy-to-use command input (joysticks all the way) and the smooth-scrolling map.

The reason I mention *Eastern Front*, apart from the fact that I'd like more people to know about it, is that Lothlorien's package is very much a descendant, and a worthy one at that. The map, as in *Eastern Front*, covers a larger area than the screen, which scrolls as you move your cursor to the edge. Unlike *EF*, there is a second, so-called *Global* map, available, which gives an overview of the whole map. This facilitates moving across large distances, after which you can toggle back to the *Battle* map, upon which commands can be given to the various units.

Information on enemy and friendly units can be called up at any time simply by placing the cursor over that unit. Your movement commands are input in the same way, with the cursor being moved to the destination. Movement is undertaken by your units as soon as your orders are received, and you can leave them to get on with it – they will eventually arrive in their own time.

Thus, it's not simply a case of shoving all your units up against the enemy and watching them slog it out. Plans must be laid early in order for your units to arrive at the same location that the enemy will occupy *in the future* (I've lost count of the number of times that I have sent my armies to build an impenetrable wall a couple of miles *behind* the enemies advance!). As in all well-designed wargames, the forces are well-balanced and historically accurate, of course.

Most of the time, the game is easy to play (by one or two players) by virtue of both the command input, the scrolling and the excellent manual which also contains historical background and victory hints. I sometimes found the graphics a little confusing (there is an option to re-design the colours and so on) and the command input was occasionally frustrating, but all in all, I spent many a happy hour with *The Bulge*.

CCS have also been around for most of the life of the Sinclair machines, and some of their programs (such as *Dallas)* kept me awake to the small hours. The latest release, *Arnhem, The Market Garden Operation* is equally addictive. This program, too, finds a parallel with an Atari program. As *Eastern Front* is the classic large-scale strategic and historically accurate computer wargame, so *Operation Whirlwind* is, for me, the classic small-scale tactical game. It has no historical scenario, involving the player in a bid to move his forces from one side of the map to the other in order to capture the enemy's city.

Arnhem is very similar, except that the overall scenario concerns the Allied forces bid to secure bridgeheads over the rivers near Arnhem in Holland, again in the Second World War.

Much of the action in *Operation Whirlwind* is centred around the *'traffic jams'* that occur around the bridges as all your forces attempt to cross against heavy enemy opposition. This was exactly the trouble that the Allies found at Arnhem, and the problems are very well recreated by CCS in this program. There are several mini-scenarios contained within the program, each one posing a different problem for the player or players.

As in *Operation Whirlwind*, the order of play is fairly uncluttered, which makes a change from most wargames, though there is a rather complex Reporting routine. Input is by cursor keys or joystick throughout.

Although I've drawn parallels between the two new games and other, older, games, none suffer from the comparisons. If you're an adventurer casting around for something in a different vein, yet retaining the necessary atmosphere and strategy problems, then these two programs should certainly be looked at.

Regular readers will know Hugh Walker's name, and will be interested to know that he recommends another CCS game, *Nato Alert*. Although I haven't seen it, it appears to be a resource/management game, rather than a wargame of the sort of I have been looking at so far this week. The scenario, of course, is Europe threatened by nuclear war, and your task is to prepare for such a war in the best way possible by husbanding your resources as boss of the NATO alliance. Although it's rather slow, says Hugh, as it is written in Basic, it makes a nice rest from adventures.

That's it for wargames for a while. I hope regular adventurers won't think it a betrayal – let me know if you want me to carry on this very occasional look at games outside our immediate area of interest.

A couple of pleas for help now: Doreen Bardon is stuck in *Odyssey of Hope* from Martech, in particular the Bees and the Harpies. Can you help her? Write to Doreen at Lendal Cottage, High Street, Slingsby, Yorks YO6 7AE.

Paul Setterford is stuck in *Velnor's Lair*, Derek Brewster's first (as far as I know) attempt at an adventure, and one that still crops up in my mail. You haven't given me much information, Paul, but try feeding the rats with the apples, then search the rags. You'll find a telescope – take this to the crack and then use it to find a magic word. This will help you through the crack, and thus progress further into the caves. The crocodiles that you'll come across later have always been a source of trouble – feed them with a monster, then type *Use Bath* (you'll need the oars). To get those oars, search the fungi. If you want to write to Paul with more help, his address is The White Cottage, Abbey Drive, Laleham, Middlesex TW18 1SR.

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48K SPECTRUM Printer, books and lots of original software worth over £300. Will sell for £120 Tel: Exeter 210315.

SPECTRUM 48K Shekiosha GP-50-A printer, joystick and interface, 30 games, all originals, tape recorder, or swap for CBM64 Plus C2N and wanted a foreign penpal ring John. Blackpool 0253 21992.

BUY "ARNHEM" For £70 and you can have a £48K Spectrum, recorder, and loads of software and mags absolutely free!! Ring Andy on 0532-657038.

48K SPECTRUM Various tapes and books £75. Softek 'IS' m/c compiler plus book on m/c £16. Phone Mike on 0793 39105 evenings.

WANTED Spectrum s/w originals. Hypersports, Buck Rogers, Super Pipeline II, Glass. Will pay £3 Each, also Daley's Super Test, Dynamite Dan. Will pay £.50 each. Phone Uttoxeter 5287 ask for Neil.

SPECTRUM 48K, Joystick interface, £120. Software inc. Knight Lore, White Lightning and Snooker, £120 ono or swap for CBM64. Tel: 031-660 1574.

48K SPECTRUM Lo-profile keyboard, power switch, tape recorder and 15 games including Knight Lore, Hobbit, Valhalla. Magazines included free if wanted. Local buyer preferred, but will consider offers of £150 ono.

48K SPECTRUM O.E.L. TTX 2000 teletext adaptor, (cost £144) £65. Software and 25 magazines all for £230 ono. May split. Contact D. Maynard, 112 Hartfield Road, Forest Row, Sussex RH18 5LY.

SPECTRUM PLUS With recorder interface, one Dk'tronics and Comcon programmable interfaces, joystick, 44 software titles including Tasword 2 Shadowfire Doomdark's Revenge, Eureka, Underworld, Tir-Na-Nog, Valhalla. Offers Around £200. Telephone Stafford 823400.

SPECTRUM, CBM64 original software for sale, £3.50 each tape. Send for list: Tony, 23 Egerton Rd Sth, Chorlton, M21 1YP, or phone 061 881 3651.

48K SPECTRUM PLUS One month old. Also including software and books £105. Phone: Ashford (Middx) 53468.

SPECTRUM PLUS (Under guarantee) with brand new cassette recorder, twin joystick interface and lots of software, £115. Also cheap games for CBM64 for sale. Tel: 470 0861 (East London).

48K SPECTRUM + Kempston interface, Interface II, ZX printer, 5 rolls of paper, joystick, over £100 worth of software, cassette recorder. Perfect condition £140 ono Tel: Sevenoaks 61844.

SPECTRUM PLUS (Guaranteed), Ram Turbo I/F and Quickshot II joystick plus over £120 software (originals) all for £160. Phone Malcolm (01) 553 0349 after 7pm or weekends.

QL Three months old. Unused version two Psion software, extra cartridges, games, £320 ono Tel: 01-228 7550 eves.

48K SPECTRUM dktronics keyboard + joystick with interface, microsoft, ZX printer, £150 or swap for BBC teletext adaptor + Rom board. Opus single sided disk drive for BBC £70. Tel: 0492 49722.

SPECTRUM software, Cauldron, J. B. Squash, Doomdarks, Alien 8, Softaid, B. J. Superstar Challenge, Nightlore, Bruce Lee, Jetset, Boulderdash, Avalon, Backpackers, swap for L. O. Midnight, D Day, Out Shadows or sell for £2 to £5. Tel: Mark 0623 84561.

SPECTRUM software, swap Lords of Time, Return to Eden, Test Match, Ground Zero, also computer mags PCW C&VG for anything for Spectrum, games etc. D. Harper, 16, Badgeney Road, March, Cambs PE15 9PA.

SPECTRUM software. Tipster £8, Chess, Lifeline, Manic Miner, Catwalk, Tutankhamun, Ad Astra, House Jack Built, Pogo, £3 each, Easyspeak £2, Gnasher, Bullseye £1 each. Tel: Lymington (0590) 73788, prices include postage.

48K SPECTRUM £210 of software inc Hypersports and Dynamite Dan, printer, one joystick, programmable and Kempston interfaces, tape recorder £250 ono. Tel: 01-552 6653.

SPECTRUM plus for sale with Dk'tronics speech, AGF, Protocol 4, Quickshot II, tape recorder £230 of software including Shadowfire, Knightlore etc, cost over £450 sell for £190 ono. Tel: (0252) 874212, ask for Richard.

SPECTRUM 48K, good condition with joystick and interface, microdrive and interface one, ZX printer and paper, cassette recorder, Fuller keyboard, software, books, worth over £400 bargain at £215 ono. Tel: 051-480 7677.

SPECTRUM accessories, lineprint III printer interface, RS232 or parallel £29, ZX printer £15, Orme electronics Eprom Readcard, gives toolkit, Sprites £19, Cambridge programmable interface £18, keyboard membrane, 56 way lead, OTO. Tel: 0481 23390.

48K SPECTRUM for sale with 40 original game worth £220, computer carry case, Kempston joystick interface, 30 magazines and 6 books all for £150. Tel: 01-834 8896.

MICRODRIVE, interface and blank cartridges for sale £70 ono. Tel: 01-680 4734 ask for Russell.

SINCLAIR QL hardly used for BBC model B or sell for £250. Tel: 01-946 4821.

SPECTRUM 48K with interface one, microdrive Dk'tronics keyboard, Currah speech with connector, Kempston joystick with interface, software and books, sell for £200 or swap for Commodore 64. Telephone 0524 734209.

SPECTRUM 48K, interface 2, data recorder, 65 original games including Hypersporte, Rocky. Only £115 or will swap for Commodore 64 computer. Tel: 0696 60038 after 5.30pm.

48K ZX SPECTRUM, Fox Electronics keyboard, joystick + interface 2, cassette recorder, original software worth £200, books, magazines, worth over £475 all offers considered. Tel: 0707 336308 after 4pm. Will deliver.

INTERFACE 1, 2 microdrives + 8 cartridges (with software) Cambridge programmable joystick, interface + joystick £155 ono. Also Oric-1 16K for £50 ono. Tel: 061-881 5663 after 6pm ask for Ahmad.

SINCLAIR QL (no dongle) absolutely as new £225. Will consider swapping for Amstrad CPC464 colour, Commodore 64 plus disc drive or BBC B. Tel: 0203 316599.

SWAP Sinclair microvision TV, 16K ZX81 with 30 Ht basic course, cordless telephone, Pioneer car stereo PLL autoreverse high power audio system for your SLR camera/equipment. Tel: 08864 588 (Worcs).

48K SPECTRUM interface 1, interface 2, microdrive Alphercom lineprinter, light pen and many games including Hobit and Ghostbusters £250 ono. Tel: Chris on 0908 512210 after 6pm.

48K SPECTRUM as new unwanted gift £70. Tel: 0296 612324 evenings (Aylesbury).

SPECTRUM Plus + tape recorder + prism VTX 5000 modem + ram turbo joystick interface + sound booseter + on/off load/save switches + over £170 worth of original software + magazines for sale only £230. Tel: 0342 27072 (East Grinstead).

48K SPECTRUM tape recorder, printer, joystick interface, magazines + games. Worth £1000 approx. Sell £370 ono. Tel: Alan 01-691 8448 evenings.

ZX SPECTRUM 48K including manuals, leads etc £45. VTX 5000 modem £35. Will sell both for £75. Tel: 01-657 0301 after 6pm.

SPECTRUM PLUS, 3 months old, 9 months guarantee, Ram, turbo interface, Sabre Wulf, Underwurlde, Knight Lore, Alien 8, Everyone's a Wally, Gyron. Everything boxed and in mint condition £150. Tel: Dorchester 65614.

SPECTRUM rotronics Wafadrive for sale, unused £60 ono. Tel: 01-691 3107.

48K SPECTRUM, Saga keyboard, interface 1, microdrive, 9 cartridges, interface 2, 2 Roms, Dragon Torc, Hobbit, Ant Attack, Knight Lore, Doomdarks, Revenge, Fighter Pilot, Jetpac, Hunchback II, magazines, books, all boxed £210 ono. Tel: Blackpool 51544.

SPECTRUM + and ZX printer with DKtronics interface, Quickshot II joystick + brand new data recorder £200 worth opt software, lots of top names want £200 ono. Tel: Chris 985 6279.

48K SPECTRUM £100 original software, interface II, Quickshot joystick, machine code book, case £99. Games include Alien 8, Sabre Wulf, Underwurlde, Monty Mole, Pyjamarama. Tel: 0302 842553. Over 200 magazines free.

48K SINCLAIR Spectrum. Excellent condition £50. Tel: 01-249 6665. Mr Freedman.

SPECTRUM PLUS for £350 incl tape recorder, Kempston interface II, joystick, light pen, Currah speech, 25 books £70 of s/w. Tel: 01- 937 0218 ask for Hashim.

SINCLAIR QL 3 months old, £299 no offers. CU3 monitor (metal) £210, 3

COMPUTER SWAP

Computer Swap entries are limited to 30 words. All entries cost £2.50 and can be accepted in writing only. Please enclose a cheque or postal order or give Access or Barclaycard No in the box provided. Only text appearing in the grid will be printed. Send the form to: Computer Swap, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2H 7PP.

All software offered through computer swap must be in original condition and for private sale only.

It cannot be swapped.
Warning: It is illegal to advertise pirated software.

COMPUTER SWAP

Please write your copy in capital letters on the lines below.

Name .....

Address .....

..... **Telephone** .....

☐ *Please charge my Visa/Access card no:*

DIARY

Event	Dates	Venue	Admission	Organisers
Computer Show	August 17 10.30am-5.00pm	Library Hall Homer Road Solihull West Midlands	80p	CJS/Northleach 04516 609
Computer Show	August 18 10.30am-5.00pm	YMCA Hall Severt Street Gloucester	50p	CJS/Northleach 04516 609
Small Business and Home Computer Exhibition	Aug 19-20 10.00am-9.00pm	"Golddiggers" Timber St Chippenham Wiltshire	£1.50 adults £1.00 children	Kevin Angell/ Simon Main 0249 656444
Personal Computer World Show	September 4-8	Olympia London	£2.00	Montbuild 01-486 1951

books and 10 extra cartridges in box and dust cover £20. Tel: Tadley 71475.

48K SPECTRUM ZX printer, Kempston joystick, £500 of s/w. Sell for £320 ono. Tel: 061- 698 6467. Simon Tonge.

SPECTRUM 48K. Fuller keyboard, ZX printer, 3 joysticks, interface, £500 of original s/w. Swap for CBM64 + disc drive. Chris MacDonald, Flat 10a, Cambridge Place, Great Cambridge Road, Enfield EN1 4JU.

SPECTRUM 48K as new, boxed, business s/w, games, programming books, mags, data recorder £130. Guaranteed. Tel: Colchester 240774 after 5pm.

48K SPECTRUM PLUS, one month old, also includes s/w and books £105. Tel: Ashford (Middx) 53468.

48K SPECTRUM, interface 1, 2 microdrives, 10 cartridges, ZX printer, tape recorder and fitted carrying case. Complete with all manuals. Cost over £400 will sell for £180 ono. Tel: Gerrards Cross 883263.

SPECTRUM PLUS, interface 1, microdrive, printer, 4 cartridges, over £130 of s/w (original only), books, mags, cassette recorder. Sell £310 ono. Tel: 0703 738432 after 6pm.

ZX SPECTRUM PLUS, ZX microdrive interface, cartridge, s/w. £170 p&p. Tel: Chelmsford 380731 after 6pm.

48K SPECTRUM PLUS, Kempston interface with cassette recorder, 7 games and mags. Only £150 ono. Tel: 078 130 3630.

SINCLAIR QL including QL magazines and chess £270 ono. Tel: 01-249 9895.

48K ZX SPECTRUM with Currah microspeech, Quickshot joystick, magazines, black and white TV plus 40 games. Tel: 01-452 8547.

48K SPECTRUM PLUS, Currah speech, joystick, interface plus good s/w. All originals. Sell £200 ono. Tel: 01-571 2870 (after 4pm).

SPECTRUM 48K, microdrive interface 1, joystick, Sekoshia printer, Dk'tronics keyboard, tape recorder, speech synthesiser, B&W TV and books £300 ono. Tel: Haywards Heath 457352.

48K SPECTRUM PLUS, interface 1, microdrive, interface with driving s/w for Epson, Oki etc. All boxed complete wioth leads, manuals etc, also over 25 items of s/w. The lot for £175. Tel: 01-898 7228.

SPECTRUM PLUS for sale, 3 weeks old with plenty of books, mags + s/w £100. Tel: 01-949 0225 ask for Paul.

SINCLAIR QO as new. Guaranteed. RS232 lead, £299. Tel: Worthing 0903 211439.

SPECTRUM Quickshot joystick with Protex switchable I/F £5 ono. Tel: 031 663 4934.

48K SPECTRUM, less than one month old, speech synthesiser, 11 games £60 ono. Tel: 01-986 6569, after 6pm.

SPECTRUM 48K plus Kempston Interface, Quickshot 2 Joystick, Stonechip keyboard, sound amplifier, S/W, £100 of mages, £200 ono. Tel: 0705 252231.

48K SPECTRUM joystick, and interface £289 ono. Tel: Boldon 37243, eves.

SPECTRUM 48K, Sigma I keyboard, Dual port interface, plus joystick, magazines, £150 ono. Tel: 0642 322704.

Wanted

POWERFUL, accurate air rifle, IJ-38, .177 with dipter sight, targets and 1500 pellets, mint condition with spare sprng and washers. Swap for Spectrum 48K. Must have parents' consent. Tel: 0325 312417.

SWAP CBs, Home base and mobile + accs for Commodore 64 or best computer or WHY. Can Split. Tel: W. Frisey. (0236) 26317.

WANTED 16K RAM pack for Vic 20. Will accept switchable. Phillip Rochester. 18 Lanvanor Road, Peckham, London SE15 2BW.

SWAP CASIO MT70, 20 cassettes, 10 ribbons for CBM 64 disc drive or 801 printer. Tel: 01-316 1037.

DRAGON 32 wanted. Tel: Great Missenden 6761, ask for Oliver.

48K SPECTRUM, last compiler by OCL, accounts, Letaset by Eclipse. Will swap for other Spectrum + programs. Tel: 01-882 2311 after 6pm.

WANTED CBM 64 with tape recorder. Up to £100 offered. Must be in good condition. Tel: 01-505 2423.

SAP SPECTRUM 48K + ZX printer + DK keyboard + tape recorder + Dragon 32 + black and white TV + joystick for Amstrad computer. Tel: 01-590 448.

SWAP SOUND MOVIE CAMERA with focus plus projector and screen worth £270 for Amstrad CPC 464 colour or green screen. Tel: 0733 78750.

WANTED non-working BBC micro, MZ80K in/output box. Sword (GL MS computer, MZ 700 data recorder. Offers on condition of equipment. Chris. Tel: 04427 2657.

SWAP CBM64 C2N and accessories for my new 48K Spectrum, cassette recorder, AGF Interface, joysticks, amplifier, books and mags. or sell £170 ono. Tel Teignmouth 78159.

WANTED SYSTEM 15000 Frankie Game. Any database program. Contact Lee McAllester, 76 Cann Hall Road, Leytonstone, London E11 3JF. Tel: 01-534 3563.

WANTED microdrive cartridges in good condition, must be reasonable. Tel: 0843 66522 after 6pm.

WANTED microdrive cartridges for Spectrum. Pay up to £1 each. Tel: 0274 67536.

HAVE SPECTRUM VTX 5000 modem. Unwanted prize. Will swap for Y2SEU FRG7 or any HF-Rig. Tel: Southport (0704) 42664.

WANTED Atari 800 (48K) and disc drive, can collect if necessary. Must be low priced. Tel: (Dover) 216000 ask for Steve.

AMSTRAD software pack, £35. TASWORD 464 £10 or swap for MASTERFILE or Dialog HOME ACCOUNTS. MICROSCRIPT, MICROPEN & MICROSPREAD discs, all £65 or £25 each, swaps considered. DMP1 £125. Tel: 0203 316599.

WANTED ZX printer for Currah Microspeech + demo tape. Tel: Harwich (0255) 553403.

WANTED Modem and disc drive for Oric Atmos 48K. All books and leads plus any other hard/software. Phone (0482) 857345 after 6pm. John.

SWAP Mattel console with ten games and scalectric with two cars for Spectrum plus. Write to C. Owen, 90 St John's Road, Dudley West Midlands DY2 7AE.

SWAP my Acorn Electron with cassette recorder and software (inc. Elite, Blagger etc) and Acorn User and Electron User mags for Atari 800XL plus 1010 recorder. Tel: (0734) 302639.

SWAP 48K Spectrum, software, magazines, data recorder and joystick interface for Atari 800XL and data recorder or sell for £140 ono. Tel: Ipswich 58013.

WANTED Commodore CBM 4008, 4016 or 4032. Will pay reasonable price. Phone Bhagani 01-903 7955 ext. 44.

WANTED 48K Spectrum. Will pay £60 plus p/p. Tel: 061 486 9969 anytime up until 4.30pm Mon to Fri. Must be good working order.

SWAP Atari VCS + 8 carts, + j/stick for good Alphacom printer + paper or sell for £70. Tel: Andrew Macdonald on 0631 63955.

SWAP Oric Atmos 48K with some software for absolutely anthing; will accept first interesting offer received. Apply: John Cunningham, 34 The Fennels, Harlow, Essex, or ring (0279) 33103 after 7pm.

SPECTRUM 48K swap for Dragon 64. Also swap software one for one. Many good titles. Phone (Newport, Gwent) 52599 after 6pm.

WANTED CBM64 colour monitor. £150 paid. David 01-853 0712.

SWAP portable colour television (Philips) for micro/wafer drive plus printer or above plus Amstrad 7090 twin tape portable hifi for disc drive and printer. Tel: York (0904) 29517 anytime.

SWAP 48k Spectrum + tape deck + joystick + Kempston interface + top software titles, for CBM64 + C2N data recorder or sell for £160 + 6 months guarantee, very good condition. Ask for Michael or Cliff 203 5356 evenings.

WANTED Seikosha GP100A printer for Dragon not more than £100. Tel: 0924 372924.

SWAP my Currah speech and Zaxxon (Sega) for a Spectrum + keyboard. Currah speech and Zaxxon in vgc. Will expect keyboard to be in vgc also. Tel: 0324 35180.

WANTED for C64. Does anyone have Daley Thompson's Decathlon or Hyper-Sports? Will swap Bruce Lee + Frak! for either one! Tel: Conn after 5pm, at 01-868 4124, urgent.

AMSTRAD pen pals wanted. Write to Edward Wilson, 7 Gawthorpe View, off Dukes Brow, Blackburn, Lancs.

SPECTRUM pen pal wanted. 19 years and upwards. Male or female. To swap programs, ideas, tips, etc. All letters answered. Write to Dave McManus, 36 Connaught Ave, Mutley, Plymouth, Devon PL4 7BY.

WANTED reliable inexpensive word processor, full size Qwerty keyboard, disc drive/tape, optional VDU, full size printer, cash. Local area preferred from where can collect. Tel: Devon 865407.

SWAP 48K Spectrum Kempston pro interface DK'tronics keyboard, Quickshot, Data recorder, over 50 games for CBM 64 + 2CN Data Recorder. Tel: Swansea (0792) 201268, after 4pm and ask for Stuart.

ADVENTURE HELPLINE

Espionage Island on Spectrum. How do I move the large rock? Paul Herd, 27 Brentford Road, South Reddish, Stockport, Cheshire SK5 7EA.

Eric the Viking on Amstrad. I can't manage to get the fire started to melt the icicles on the iceberg. I also can't find a light source when I'm in the cairn. Can anyone help? J M Hood, 12 Valleyside, Kingshill, Swindon, Wilts.

Mordon's Quest on Spectrum. How doi I pass the waterfall? Who is the king of the jungle? Matthew Musgrove, 84 Shepherds Lane, Bracknell, Berks RG12 2DE.

El Dorado on Spectrum. I'm new to adventures – can I go through the deep valley or through the valley with fissure? If not, where? M Ward, 41 Watling Street, Bury BL8 2JD.

Jewels of Babylon on Amstrad. I cannot pass the cannibals village. Can the vertical slab of rock be moved? Help! Kevin O'Connor, 126 Heronfield Close, Church Hill, Reddich, Worcs B98 8QW.

Fantasia Diamond on Enterprise. I am completely stuck! How do I cross the river and/or open the manhole? Andrew Irwin, 29 Claydon Rodd, Wall Heath, Kingswinford, W Midlands DY6 0HR.

Return to Eden on Amstrad. How do I get on the boat, and pass the boatman to get to the emerald isle? A Ware, 78 Brownfield Road, Cheltenham, Glos (Tel: 0242 31087).

Classic Adventure on BBC. How do I get out of the repository – what do you have to do? G Ramsey, 31 West Way, Neasdon, London, NW10 0LU.

Classic Adventure on C16. I'm an absolute beginner and can't get anywhere after picking up the food etc. David Ironside, 59 Melville Heath, South Woodham Ferrers, Chelmsford, Essex.

Twin Kingdon Valley on Spectrum. How do I get the master key from the dragon and what do I do with the wooden staff? David Wright, 10 Burrell House, Haggard Road, Twickenham, Middx TW1 3AG.

Sherlock on Spectrum. How do I go places in the cab and where do I want to go? Clovis Patten, 161/2 Chapel Street, Honningsham, Warminster, Wilts.

Kentilla on Spectrum. How do I enter (or cross) the waterfall? What must I jput in the crucible? How do I open the steel door? Vasco Novais de Oliveira, Rua João Luis de Moura No 52, 2750 Cascias, Portugal.

Charts

Amstrad

1	(-)	Way of the Exploding Fist	(Melbourne House)	£9.95
2	(3)	Red Moon	(Level 9)	£6.95
3	(1)	Dun Darach	(Gargoyle)	£9.95
4	(2)	Beach-head	(Access/US Gold)	£9.95
5	(-)	Nonterraneous	(Mastertronic)	£1.99
6	(4)	Alien 8	(Ultimate)	£9.95
7	(-)	Red Arrows	(Database)	£8.95
8	(5)	Knight Lore	(Ultimate)	£9.95
9	(7)	Rocky Horror Show	(CRL)	£8.95
10	(-)	Finders Keepers	(Mastertronic)	£1.95

Bubbling Under:

Mini Office	(Database)	£5.95
Sorcery	(Virgin)	£9.95

Atari

1	(1)	Bounty Bob Strikes Back	(US Gold)	£9.95
2	(2)	Airwolf	(Elite)	£6.95
3	(5)	Hard Hat Mack	(Ariolasoft)	£9.95
4	(3)	Drop Zone	(Microprose/US Gold)	£9.95
5	(-)	Mig-Alley Ace	(Microprose/US Gold)	£9.95
6	(4)	Archon	(Ariolasoft)	£11.99
7	(7)	Bruce Lee	(Datasoft/US Gold)	£7.95
8	(6)	Miner 2049'er	(Big 5)	£9.95
9	(-)	Kissin Cousins	(English Software)	£6.95
10	(9)	Ghostbusters	(Activision)	£14.99

Bubbling Under:

Colourspace	(Llamasoft)	£7.50
MULE	(Ariolasoft)	£14.95

BBC

1	(1)	Revs	(Acornsoft)	£14.95
2	(-)	Beach-head	(Access/US Gold)	£9.95
3	(2)	Alien 8	(Ultimate)	£9.95
4	(8)	Elite	(Acornsoft)	£12.95
5	(-)	Red Moon	(Level 9)	£6.99
6	(5)	Atic Atac	(Ultimate)	£7.95
7	(-)	Contraption	(Icon)	£8.95
8	(3)	Repton	(Superior)	£9.95
9	(4)	Magic Mushrooms	(Acornsoft)	£12.95
10	(-)	Bobby Charlton's Soccer	(Stack)	£11.95

Bubbling Under:

Combat Lynx	(Durrell)	£8.95
Knightlore	(Ultimate)	£9.95

Commodore 64

1	(1)	Way of the Exploding Fist	(Melbourne House)	£9.95
2	(2)	Hypersports	(Imagine)	£7.95
3	(3)	Elite	(Firebird/Acornsoft)	£14.95
4	(10)	Frankie goes to Hollywood	(Ocean)	£9.95
5	(7)	Rockford's Riot/Boulderdash	(Monolith)	£9.95
6	(8)	Fourth Protocol	(Hutchinson)	£12.95
7	(-)	Mr Do	(Datasoft/US Gold)	£9.95
8	(5)	Shadowfire	(Beyond)	£9.95
9	(6)	Soft Aid	(Various Artists)	£4.99
10	(-)	Pitstop II	(Epyx/US Gold)	£9.95

Bubbling Under:

Thing on a Spring	(Gremlin Graphics)	£7.95
Tour de France	(Activision)	£9.99

Spectrum

1	(1)	Frank Bruno's Boxing	(Elite)	£6.95
2	(2)	Hypersports	(Imagine)	£7.95
3	(-)	Highway Encounter	(Vortex)	£7.95
4	(-)	Dynamite Dan	(Mirrorsoft)	£6.95
5	(7)	Soft Aid	(Various Artists)	£4.99
6	(3)	Glass	(Quicksilva)	£7.99
7	(4)	Nick Faldo Plays the Open	(Mind Games)	£9.99
8	(10)	Rocco	(Gremlin Graphics)	£7.95
9	(6)	Shadowfire	(Beyond)	£9.95
10	(5)	Jet Set Willy 2	(Software Projects)	£7.95

Bubbling Under:

Fourth Protocol	(Hutchinson)	£12.95
Spy vs Spy	(Beyond)	£9.95

All figures compiled by Ram/C

Top Twenty

1	(1)	Hypersports *(Spectrum/C64)*	**Imagine**
2	(2)	Way of the Exploding Fist *(C64)*	**Melbourne House**
3	(3)	Frank Bruno's Boxing *(Spectrum)*	**Elite**
4	(20)	Frankie Goes to Hollywood *(Spectrum/C64)*	**Ocean**
5	(4)	Elite *(C64/BBC/Electron)*	**Firebird/Acornsoft**
6	(5)	Soft Aid *(Spectrum/C64)*	**Various Artists**
7	(6)	Nick Faldo Plays the Open *(Spectrum/C64)*	**Mind Games**
8	(11)	Fourth Protocol *(Spectrum/C64)*	**Hutchinson**
9	(-)	Red Moon *(Spectrum/C64/BBC/Electron/Amstrad)*	**Level 9**
10	(12)	Shadowfire *(Spectrum/C64)*	**Beyond**
11	(15)	Dun Darach *(Spectrum/Amstrad)*	**Gargoyle**
12	(7)	Jet Set Willy 2 *(Spectrum/C64)*	**Software Projects**
13	(18)	Rockford's Riot/Boulderdash *(C64)*	**Monolith**
14	(-)	Dynamite Dan *(Spectrum)*	**Mirrorsoft**
15	(8)	Glass *(Spectrum)*	**Quicksilva**
16	(13)	Rocco *(Spectrum)*	**Gremlin**
17	(-)	Mr Do *(Spectrum/Atari)*	**Datasoft/US Gold**
18	(-)	Highway Encounter *(Spectrum)*	**Vortex**
19	(9)	Spy vs Spy *(Spectrum/C64)*	**Beyond**
20	(17)	Nodes of Yesod *(Spectrum)*	**Odin**

Figures compiled by Ram/C

Readers' Chart No 37

1	(1)	Elite (C64/BBC/Electron)	**Firebird/Acornsoft**
2	(5)	Hypersports (Spectrum)	**Imagine**
3	(7)	Way of the Exploding Fist (C64)	**Melbourne House**
4	(3)	Soft Aid (Spectrum/C64)	**Various Artists**
5	(2)	Dun Darach (Spectrum/Amstrad)	**Gargoyle**
6	(4)	Shadowfire (Spectrum/C64)	**Beyond**
7	(6)	Revs (BBC)	**Acornsoft**
8	(9)	Knight Lore (Spectrum/BBC/Amstrad)	**Ultimate**
9	(10)	Spy vs Spy (Spectrum/C64)	**Beyond**
10	(8)	Confuzion (Spectrum/Amstrad/C64/BBC/Electron)	**Incentive**

Winning phrase No 37: "Had diced snail for tea" from Charles Morgan of Croydon, Surrey, who receives £25. Runner up: "Dracula dies of the tan" from Lee Russell of London E7.

Now voting on week 39 – £25 to win

Each week *Popular* is compiling its own special software top ten chart – compiled by YOU.

And each week we will send £25 to the person who sends in, with their chart votes, the most original (witty, neat or clever – but never rude) phrase or sentence made up from the letters (you don't have to use them all) in the titles of the top three programs in this week's chart, published above.

You can still vote in the chart without making up a slogan – but you won't be in with a chance of winning the prize.

All you have to do is fill in the form below (or copy it out if you don't want to damage your magazine) and send it off to: Top 10, *Popular Computing Weekly*, 12-13 Little Newport Street, London WC2H 7PP.

Voting for Week 39 closes at 2pm on Wednesday August 21 1985. Entries received after that time will not be eligible for inclusion in that week's voting. The judges decision is final. Only one entry per individual per week will be allowed.

Name .....

Address .....

.....

.....

My top 3: Voting Week 39

1.....

2.....

3.....

My phrase is: .....

New Releases

LOGICAL

Mount Challenge looks, on screen, like a terribly platformy game, but turns out

to be a rather entertaining mixture of strategy and timing. Nothing astounding, but an original and even addictive game nevertheless.

The task is to guide a rather naffly designed sprite up over 20 screens to reach the top of a mountain where redemption of all mankind awaits. There are, as ever, nasty sprites that bounce around and get in the way and stomp on you. So far so tedious.

However, the real point of the game is logical. Different platform blocks are either red or green. Depending on their colour they react differently when you move on them. Green blocks let you move up, down, left or right by one step if the energy button is pressed on, but won't let you move anywhere if it is off. Red blocks let you move one step if energy is off and three steps if it is on. Thus to make your way on the screen you need to make a complex mixture of left, right, up, down, power off, on moves – it can take a lot of thought to see how some of the screens can be done at all. Add the nasty sprites which sometimes mean you have to work things out very quickly and you have a surprisingly entertaining game.

£2.40 is certainly a close to budget price and I'd say if the duff graphics don't put you off utterly, then this is well worth tracking down.

Program *Mount Challenge*
Price *£2.40*
Micro *Spectrum*
Supplier *Asvoguelle*
Blakemoor
Marshbrook
Church Stretton
Shropshire
SY6 6QA

Pick of the week

INGENIOUS

Addictive Games is inextricably linked with the amazingly successful *Football Manager*, but from time to time the company does release other titles for people who don't want to play football. *Boffin* is an arcade game for the BBC and Electron – it happens to be one of the best I've seen on the machines.

Once you accept that Boffin is basically a dodge and collect game there is much to enjoy. For one thing the graphics are pretty good – your figure is big with eyes that roll whenever something goes wrong and backgrounds have more detail than you expect from BBC games.

It also works quite well as a game, to drop any distance you must have your umbrella up, whereas to jump you must have it folded down. Overcoming the various obstacles requires some ingenuity and thought, as well as a long and tedious experience of repeated failures.

There are a couple of dozen screens and much to entertain and amuse, even the sound effects are better than average. At £9.95 it's not cheap, but as BBC arcade games go this is one of the few released recently to make Commodore and Spectrum owners envious.

Program *Boffin*
Price *£9.95*
Micro *BBC*
Supplier *Addictive Games*
7a Richmond Hill
Bournemouth
BH2 6HE

ON CUE

Tournament Snooker is an excellent version of the TV favourite for the Einstein – a much maligned and ignored machine in my opinion!

Little to say about the game really. Most computer snooker games use the same systems, move a cursor around to determine the position of the cue and then fiddle with the power and spin to make the cue ball do what you want it to.

The Einstein version actually has a line to represent the cue attack and two bar lines to represent the kinds of spin and amount of force to be used. It's easy to use and the ball doesn't creep around like a snail.

Program *Tournament Snooker*
Price *£14.95*
Micro *Einstein*
Supplier *Hard Software*
6 Arum Way
Leicester
LE3 6NB

HOT AIR

If you thought £1.99 was pretty cheap take a look at the offerings from Central Solutions Ltd – its games retail for a mere 99p. And for that price *Valley of the Dead* has to be an excellent buy.

There's nothing astounding about it – it's really a version of *Cavern Fighter* and similar games – but the game is

This Week

Program	Type	Micro	Price	Supplier
Faerie	Ad	Amstrad	**£2.50**	Eight Day
Ice Station Zero	Ad	Amstrad	**£2.50**	Eight Day
Quann Tulla	Ad	Amstrad	**£2.50**	Eight Day
Macadam Bumper	Arc	Amstrad	**£7.95**	PSS
Master of the Lamps	Arc	Amstrad	**£9.99**	Activision
Rock Raid	Arc	Amstrad	**£6.95**	Kuma
Arnhem	S	Amstrad	**£9.95**	CCS
Red Arrows	S	Amstrad	**£8.95**	Database
War Zone	S	Amstrad	**£6.95**	CCS
Strip Poker	S	Atari	**£9.95**	US Gold
Faerie	Ad	Commodore 64	**£2.50**	Eight Day
Ice Station Zero	Ad	Commodore 64	**£2.50**	Eight Day
Quann Tulla	Ad	Commodore 64	**£2.50**	Eight Day
Secret of St Brides	Ad	Commodore 64	**£6.95**	St Brides
Cops 'n' Robbers	Arc	Commodore 64	**£2.99**	Atlantis
Pole Position II	Arc	Commodore 64	**£39.95**	Sinclair
Speed King	Arc	Commodore 64	**£9.95**	Digital Integ
Tour de France	Arc	Commodore 64	**£9.99**	Activision
Paintbox	Ut	Commodore 64	**£9.99**	Audiogenic
Castle Assault	Arc	Electron	**£2.50**	Blue Ribbon
Diamond Mine	Arc	Electron	**£2.50**	Blue Ribbon
Nightmare Maze	Arc	Electron	**£2.50**	Blue Ribbon
Decision Maker	Ut	QL	**£39.95**	Sinclair
QL Cavern	Arc	QL	**£12.95**	Sinclair
Cartridge Doctor	Ut	QL	**£14.95**	Talent
Decision Maker	Ut	QL	**£39.95**	Sinclair
Entrepreneur	Ut	QL	**£39.95**	Sinclair
Integrated Accounts	Ut	QL	**£39.95**	Sinclair
Project Planner	Ut	QL	**£39.95**	Sinclair

soundly programmed with adequate graphics and is surprisingly addictive.

The idea is that you pilot a hot air balloon through twisting caverns; controls are left, right and more air, the latter command gives your balloon a lift. By a mixture of letting the balloon fall and the occasional jet of air, it's possible to keep it at a fairly regular height and (theoretically) juggle your way past the crevasses of the cavern network. Here and there, you also find nasty (well, quite cute actually) aliens that bounce around and get in the way.

Good fun and, at 99p, there's not even any point in trying to copy a friend's, buy it.

Program *Valley of the Dead*
Price *£0.99*
Micro *Spectrum*
Supplier *Central Solutions*
500 Chesham House
150 Regent Street
London
W1R 5FA

SCORE DRAWS

From ancient times, when fingers slid silently over plastic membranes and all graphics consisted of black and white squares, one kind of computer program has lurked darkly in the classifieds. Not *Space Invaders*, nor *Chess* nor even *Manic Miner*, perhaps *Football Manager* but certainly *Pools Prediction* programs. Which only goes to prove that greed is common to all. Profound really.

Anyway, whizzing up to date now we have *Amstrad Draw 2*, a sophisticated version of the program that first drew breath on the ZX81. It's disc based which means it can hold a vast amount of information and comes with all kinds of neat bits and bobs.

Pool programs work by predicting the likely outcomes of matches by drawing statistical conclusions from a database of previous match results. The bigger the database, the (theoretically) more likely the program is to predict the correct results. Using the system carefully – weighting predictions according to things like pitch condition, injuries, home or away and so on – ought to give you predictions that, taking a long term view, are considerably better than informed guesswork and maybe even make you some money.

Amstrad Draw 2 comes with a database of over 12,000 matches (and the company will regularly update it for you for a small fee) and will actually generate your pools coupon on screen so that filling it in each week is a doddle. It'll even read the predictions out aloud if you have the DK Tronics speech synthesiser.

After all the years this basic package has been developed from one machine to another, it's not surprising that it's got very slick and professional indeed and very easy to use. If the football pools are something you occasionally enjoy then this is an entertaining and maybe even lucrative way of getting your Amstrad in on the act too.

Program *Amstrad Draw 2*
Price *£12.95*
Micro *Amstrad (with disc)*
Supplier *Amstra Draw*
1 Cowleaze
Chinnor
Oxford
OX9 4TD

AN APOLOGY

QL games are getting rather embarrassing; nobody expected much from the first few offerings but the machine has now been around for ages and there's still a need to 'apologise' for the fact that the games are so naff and treat them in the understanding way one might treat a budget game on the Spectrum.

The reason for this is, Psion's *Chess* excepted, nobody anywhere has produced a good game for the machine. Worse than that, no-one has produced anything that gets near top Spectrum or Commodore games.

So we come to *Quazimodo* – a game somewhat withered by age and staled by a lack of infinite variety on the QL! A 68008, 128K machine! What are we to make of it?

This version of the game by Shadowsoft is by no means a poor offering when compared with other QL games but in other comparisons it's dreadful.

The screen scrolls unevenly, the sprites are simple, the sound (of course) is limited and there is little by way of interesting detail or animation. It is simply a fairly basic version of *Quasimodo*.

At £12.95 it's cheap by QL standards, expensive by others.

Since there are so few QL products out there I'd say buy it – it's cheaper and better than most, but why are QL games so awful?

Program *Quazimodo*
Price *£12.95*
Micro *QL*
Supplier *Shadow Games*
70 Gooseacre
Cheddington
Leighton Buzzard
Beds

Mig Alley Ace	Arc	Atari	**£9.99**	US Gold
Secret of St Brides	Ad	Spectrum	**£5.95**	St Brides
Dam Busters	Arc	Spectrum	**£9.99**	US Gold
Macadam Bumper	Arc	Spectrum	**£7.95**	PSS
Pokes Galore	Arc	Spectrum	**£2**	Lee Griffiths
Red Arrows	S	Spectrum	**£8.95**	Database
Space Escort	Arc	Vic 20	**£1.99**	Atlantis

Key: Ad – adventure **S** – strategy-simulation
Arc – arcade **Ut** – Utility

Activision, 15 Harley House, Marylebone Road, London NW1. 01-486 7588. **Atlantis,** 19 Prebend Street, London N1 8PF. 01-226 6703. **Audiogenic**, 39 Sutton Industrial Park, London Road, Reading, Berks 1AZ. 0734 664646. **Blue Ribbon**, Silver House, Silver Street, Doncaster, South Yorkshire DN1 1HL. 0302 21 137. **CCS**, 14 Langton Way, London SE3 7TL. **Database**, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY. 061 456 8383. **Digital Integ.**, Watchmoor Trade Centre, Watchmoor Road, Camberley, Surrey GU15 3AJ. **Eight Day**, 18 Flaxhill, Moreton, Wirral L46 7UH. 051 667 1581. **Kuma, Kuma Computers**, 12 Horseshoe Park, Pangbourne RG8 7JW. 07357 4335. **Lee Griffiths**, 9 Heys Avenue, Rainford, Merseyside WA11 8AW. **PSS**, 452 Stoney Stanton Road, Coventry CV6 5DG. 0203 667556. **Sinclair**, Stanhope Road, Camberley, Surrey GU15 3PS. 0276 686100. **St Brides**, St Brides School, Burtonport, County Donegal, Ireland. **Talent**, Curran Building, 101 St James Road, Glasgow G4 0NS. 041 552 2128. **US Gold**, Unit 10 The Parkway Ind Centre, Heneage Street, Birmingham B7 4LY. 021 359 3020.

Unadventurous

I'm worried about computer games. I think that the titles on offer are becoming sectionalised, stereotyped and rather unoriginal.

I find that somewhat alarming considering the whole market is really only five years old.

I am thinking particularly about adventures. As a reviewer I get to see many examples of this genre and, without wishing to trespass into the territory of Tony Bridge or tread on the toes of too many orc-slayers, I would like to propose that there's something severely wrong with it.

What I find lacking is just that quality which its name professes. According to my dictionary, to adventure means to incur risk, to hazard oneself or to dare enter an undertaking. So why, all too often, do I find myself collecting a lamp and entering the cave? It's more like doing the weekly shopping than being a brave warrior!

The answer is, of course, partially historical. This is the form that those first main-frame adventures took. When it became possible to transfer all those locations to the home computer somebody did just that. There are still many versions of that original classic around today. It soon became the model for many initiators and so the term adventure came to have a specific meaning.

Now I happen to think that Gilsoft's *Quill* is a wonderful utility. I also believe that its users have a lot to answer for. Too many *Quill*-ed adventures fail to show any signs of imagination. They dump the player in a landscape full of elves, locked doors and yes... object after object to collect. The 'adventure' becomes an exercise in puzzle solving more suited to a book of lateral thinking problems or a cryptic crossword. We are made to think but we learn nothing and there is no real sense of risk or daring.

The main satisfaction in this kind of adventure comes when it is well written, so that the narrative and descriptions sweep the player along and that involvement overcomes an underlying sense of the program's mechanics. Similarly an original setting, such as the town of *Urban Upstart*, may help disguise the formula, and the satire of *Hampstead* could even tell us a little about the social levels of the country we live in. Eventually, though, I am forced to recognise that these are only exercises of the intellect.

A possible way of adding the physical aspects of timing and hand/eye co-ordination is through the arcade adventure, but how many conservative traditionalists refuse to accept these programs as part of their genre? Certainly early pretenders to the title had very limited similarities. Some more recent examples have been incredibly sophisticated. A recent preview of one important game out this autumn reveals a combination of mapping and problem solving with fighting and manipulating objects in a 'real' 3-D space.

An alternative is the approach of *The Fourth Protocol* which places you in the hot seat as spy-master, receiving messages, searching the files and allocating resources in an attempt to overcome a plot to destroy Britain. Not an elf in sight and no torches or flints, but as far as I'm concerned it has enough action to keep the player constantly on edge. Do you actually set a tail on that suspect? How do you respond to the unusual absence from work of a high-ranking official?

I call that an adventure but many people would disagree. The definitions of game type have fast become concrete and people look no further than *Go East* and *Take Torch* for their adventuring.

I believe such narrow-minded definitions will make the genre increasingly unadventurous and badly supported.

John Minson

Musical numbers

Puzzle No 170

The Musical Appreciation Society at Greyfriars School has a sextet of members whose names are curiously appropriate: Grieg, Offenbach, Rossini, Scarlatti, Schumann, and Sullivan.

The other day young Tommy Grieg (who is also a keen mathematician), noticed that the cube of 28 – this being the number of his sports locker – was 21952, and this corresponded with the letters in his surname. That is, of the five digits in the number, the first and last were alike, while the rest were different. Similarly, in his name, the first and last letters were identical, and the rest were different.

Can you say what locker keys the other five boys should request if they too wish to enjoy this unusual property?

Solution to Puzzle 165(ii)

Paula - Stanley 21ft Rachel - Stanley 72ft
Paula - Quentin 45ft Rachel - Quentin 60ft

```
10 LET H=P=75
20 FOR N=1 TO H=P-1
30 S=SQR(H=P*H=P-N*N)
40 LET S=VAL(STR$(S))
50 IF S=INT(S) THEN PRINT N;S
60 NEXT N
```

As the girls *P* and *R* were standing on a diameter of the pond, then the angles subtended at all points on the circumference will be 90 degrees. Consequently, the puzzle requires us to find two different right-angled triangles having a hypotenuse of 75 feet, and legs which measure an exact number of feet.

In the program, one of the legs is given an integral value from 1 to 74 in sequence, and the length of the other leg is evaluated by using Pythagoras' theorem. If the resulting value is integral then the two dimensions are printed. From the data so produced, and using the additional information in the puzzle, the relevant distances can be easily assessed.

Solution to Puzzle 165 (ii)

The winner is R A Matulko of Lymm, Cheshire, who receives £10.

Rules

The closing date for Puzzle No 170 is September 11.

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48K Spectrum

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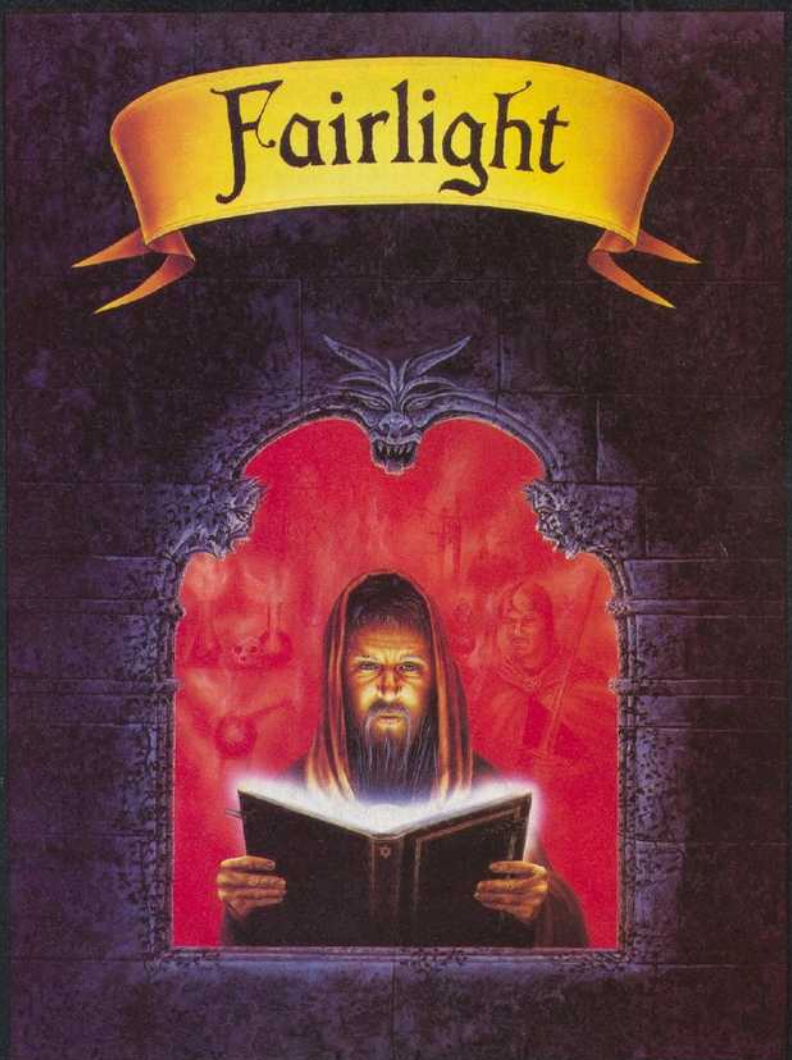

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