

YOUR **COMMODORE**

# COMMODORE

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Techno Cop  
Robocop  
Batman

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Basic extension

Memory Mapping

Teletext on the C64

**SNAP SHOT!**  
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reviewed

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C128 80 columns

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- Full feature options, all functions covered the device clearly/fully.
- We feature 16Kbytes 16 to the most comprehensive, most likely it has used the lowest program available for the 8192 bit.
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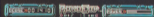
VOLUME 5  
NUMBER 7



Clear Cases



The Microtext adaptor



Kobayashi

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**ABC**  
1989-01-01

## Modem Moves

**M**odem Marketing is a  
 new company which  
 has been formed to sell  
 Dataphone communications  
 equipment to the UK's com-  
 puter dealers. Principally  
 this means that the Demon II  
 (£79.95 + VAT) and  
 Designer (£99.95 +VAT)  
 modems should soon be  
 given a higher profile.

The Demon II auto dial,  
 answer and hand search con-  
 trols all of the common  
 communications protocols  
 but lacks the over-ride but-  
 ton, telephone socket and  
 call progress monitoring  
 facilities possessed by the  
 Designer.

**Teachline:** Modem Marketing,  
 617 Lincoln Road,  
 Peterborough PE1 3PA.  
 Tel: (0753) 32660.

## Space Horror

**P**roject Finstar is the  
 computer equivalent of  
 a sci-fi horror and suspense  
 movie, according to its mak-  
 ers Electronic Arts. Equipped  
 with close-ups, fade-outs  
 and other movie gimmicks,  
 the game is available for the  
 C64 (disk only) for £34.95.

A parting of the ways  
 with EA has meant that  
 Accolade has been trying to  
 decide whether to go it alone  
 in Britain or sign up with  
 another American company  
 such as Microprose. At the  
 moment, no-one is talking,  
 so watch this space...

**Teachline:** Electronic Arts,  
 Langley Business Centre, 11-  
 19 Stenton Road, Langley,  
 Slough, Berkshire SL1 1YN.  
 Tel: (0753) 46442.

# Data Statements

## Tele Ported



The new Whittington development team (clockwise from top left): Peter Moorhead, Steve Perry, Tony Blakley and Paul Hibbard.

**T**hree members of Tele-  
 comsoft have defected  
 to the Microprose HQ in  
 Yelbury. The trio of Steve  
 Perry, Peter Moorhead and  
 Paul Hibbard have joined  
 the company as part of the  
 expansion drive (initiated by  
 company boss (Wibb) Bill  
 Staley.

This swells the Micro-  
 prose development team to  
 four, which means that sev-  
 eral British-made products  
 should be appearing later  
 this year.

A former magazine jour-  
 nalist, Martin Webb, has  
 also been attracted to the  
 company as its public rela-  
 tions manager and Martin  
 Bull, creditable sales manager  
 with Activision, is now  
 doing the same good work  
 for Microprose.

**Teachline:** Microprose, 2  
 Market Place, Yelbury,  
 Glos. GL8 8DA. Tel: (0866)  
 34037.

## Jacko Pops Up Gold

US Gold are claiming to have signed a deal for the rights to the computer version of Michael Jackson's *Moonwalker*.

US Gold tried to climb on the Jacko bandwagon by getting the maestro to add his magic touch to *Thunderblade*. The link with the pop star was their mutual dealings with Pepsi Cola but the plans came to nothing. The new deal is probably the biggest chance that US Gold have had for massive publicity and they're not ruling out the possibility of video licences and extensive marketing.

The game is planned for release in autumn, but will US Gold hold it back for the Christmas rush so that they can regain their crown from Ocean? One thing's for sure, US can't claim more than a monkey.

**Filename:** US Gold, Disk 2/3, McDonald Way, Birmingham B6 7AF Tel: 021-356 1348

## Kingstuters

A little bit of fun never hurt anyone, and our attention has been drawn to an amusing paperback of computer-based cartoons. Featuring the characters from the King Tut strip cartoon, *Down With Computers* is packed with variations around the theme of ancient Egyptians and their abacus computers.

It may seem like a limited joke, but cartoonist Geoff Waizen has managed to sustain the humour from comic to comic.

*King Tut - Down With Computers* is published by Rockett Books (ISBN 1 85361 094 0) and costs £1.95.

**Filename:** Rockett Books, 3 Glendale Lane, Star Road, Pershore Green, Worcester. Stock: RWJ/ARA.

## Footballz

Grandtium Entertainment's latest announcement - that Liverpool Football Club have endorsed the company's next football game - is surprising, to say the least. As yet the prospective game consists of a rather unimpressive title, *Liverpool: The Computer Game*, and the vague but obvious concept that it will be a football game.

Perhaps this is sufficient for an endorsement, but as Stephen Hall, Grandtium's managing director, says, "Now we're ready to take on the challenge of producing a game that will match the enormous status that Liverpool Football Club enjoys." I doubt if Liverpool would be pleased to endorse it if it

turns out like the Peter Shilton game.

In a further burst of exuberance, Hall continues, "The popularity of this type of product, plus what we consider the greatest sports license yet seen in this market, means we've got a real winner on our hands."

So it would appear that all you need to do is to produce a football game and you're half way to gaining a licence to print money.

**Filename:** Grandtium Entertainment, 15-19 Paul Street, London EC2A 4JX. Tel: 01-247 6434.

## Value Added Virus

When the Friday 13th virus struck last January most people threw up their hands in horror and panicked. Not so for S&S Enterprises. They quickly realised that there's money in them three ill and proceeded to produce a diagnostic disk for a 'nocturnal' £3 a throw.

The virus, known to its enemies as 1813 because of the number of bytes that it occupies, sneaks itself on a disk and waits for Friday 13th to come around. On the assigned date it happily wipes any file that comes near it and slows down the computer's processing speed, thereby causing great confusion.

Although there was an outcry last January and the news hit the daily newspapers, only three affected sites have been drawn to the attention of S&S, which poses the question of what was everyone shouting about?

**Filename:** S&S Enterprises, Weylands Court, Water Meadow, Gerrards Street, Chesham, Bucks HP8 1LP. Tel: (0494) 791908.

## Bye Bye Budget Buys?

After Code Masters' announcement that its product prices were to be increased by £1 to £2.99, there has been a rush by other budget houses to deny that they will soon be following suit.

Paula Byrne (Silverbird) has confirmed that the company will maintain a £1.99 range but that prices will be lower and further between. Other houses such as Alternative and Mastertronic are also trying to keep prices down but their launching of higher priced labels does leave the door open for them to abandon the lower price range whenever necessary.

**KING TUTT**

**DOWN WITH COMPUTERS!**

## Weird TV

One of the hits of the 1988 PC Show was the ST version of Rainbow's *Weird Dreams*, and now it's been taken up by ITV's *Motormouth*, who knows what will happen to it when it becomes available for the C64 and Amiga?

The TV game is a bit of a cheat really because the sound effects are created through a MIDI interface using an Atari sound-effects box and the game itself has been rewritten to run as an Atari ST Mega 1, not the sort of gear to be found in the average home.

Don't be put off too much by this information though, the game did look v-e-r-y good at the Show.

**Touristline:** *Rainbow Software, First Floor, 64-76 New Oxford Street, London WC1A 1PS. Tel: 01-631 5373.*

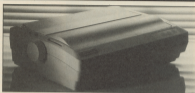
## Bingo, It's Bob

Domark are releasing the computer version of BBC TV's quiz show, *Bob's Fun House*. Although they can't offer Bob Monkhouse himself, don't start counting your blessings because they've included a stupid little 'silly house mouse' that breaks down in way through the game.

Up to four contestants can battle it out as they try to become the one who will go on to the Golden Bingo Game. If you want to run the risk of being 'walled' then this is the game for you.

**Touristline:** *Domark, Ferry House, 51-57 Lucy Road, Faversham, London SW77J (FR). Tel: 01-760 2323.*

## Cheap Mannesmann



Have you noticed how companies prefer to say 'very low price' rather than 'cheap' or 'cost affordable'? The latest candidate is the Mannesmann Tally MT81 at £149.

This nine-pin dot matrix machine breaks with tradition by employing square rather than round pins and Mannesmann claim that this

enables a better looking NLQ printout. Another feature not usually found in this price range is a paper parking facility which makes switching back and forth from sheet feed to tractor feed a lot less fiddly.

Epson and IBM compatibility and a speed of 180 characters per second at 10 characters per inch (28 cps

in NLQ) should ensure that the MT 81 carves its own niche in the market or at least proves more than an empty threat.

**Touristline:** *Mannesmann Tally, Mally Millar's Law, Wokingham, Berkshire. Tel: 0734 780711.*

## Toy Fair



This year's British International Toy and Hobby Fair was a bit of a disappointment. Nothing seemed really new and there seems to be a move away from computerized toys towards the less expensive to make ones. The more adventurous show-gone could fight their way through *Perky Bunnies*, *Magix Shrinkies* and *Yan-rico* to find the star of the show - the Konix games machine.

What has horns, hooves and hooves and appears on

television? The Konix Multi-System, that's what. Man, it is weird stuff I've never seen anything like it before. The base is the handlebar and the horns are formed by an adjustable set of handle bars (or a steering wheel if you bend them another way).

The processor is a mere 16 bit affair, and the co-processor which controls the graphics and sound is 32 bits. All this makes the machine very fast indeed, but the demonstration program at the show didn't look too impressive graphically.

The program development houses are completing because they haven't been given the full information on the machine so that could be why the graphics looked like high speed 8 bit games.

I'm sure that the Konix is capable of better things but on the evidence so far I'm unimpressed.

**Touristline:** *Konix Products, 23 Kasson Industrial Estate, Esher Vale, Greater NP3 5SD. Tel: 0492 250301.*





# Techno Cop

Equipped with the most powerful handgun known to mankind, and the latest high-speed piston vehicle, you are one of the new breed of law enforcement agents. Your mission is to seek out and destroy members of the DDA (Death as Aerial) gang.

The game has two parts, the first of which is a car chase, during which you get the chance to blow every other vehicle off the road with an ever-increasing array of weaponry. Should high-powered cannons and tactical nuclear weapons prove inefficient for your needs, you can always try ramming them instead, although this increases the damage to your car (apparently exploding buses don't even scratch the pavement).

Once the subsonic computer has informed you of your mission (rather small, difficult to read print here) you start the second part of the game, exploring deserted buildings and blowing away sandy off-rail who come at you with whips, knives and guns. A criminal detector radar on your wrist points the way to your target, although your actual route may be more indirect as you try to find a path through the rubble and debris. As a slight variation, some of the criminals have to be brought in alive by capturing them in your net, and there are bonuses awarded for recovering stolen property. Both the car chase and this part of the game are against the clock. Succeed in your mission and you'll be promoted, but there is no real penalty for failure, only the occasional minus score for killing an innocent bystander.

I suppose it would have been too simple to use your criminal detector radar and then make the building blow apart, but that wouldn't be cricket, would it. There have been better race games, and better seek-and-destroy games - this hybrid falls between those two stools.

*Title: Techno Cop. Supplier: Creative Graphics, 70 Carter St, Sheffield S1 4PB. Tel: 0743-751423. Price: £9.99 (incp).*



# Mini-Golf



# Return of the Jedi



**R**eturn of the Jedi is the third in the Star Wars saga to be released by Danmark, and the plot (as if you didn't know) follows that of the film.

You play Luke Skywalker, trapped on the planet Tatooine, home of the Ewoks and cranking Imperial laser scouts. You steal one of their bikes and head for the Ewoks' village. The scouts are not at all happy about this, and set off in hot pursuit.

Carrying through a forest at breakneck speed is no easy task - you must dodge the trees and Ewok Scouts until you reach the safety of the Ewoks' village. Once at the Village, you control Han Solo and Chewbacca, his hairy sidekick. You must guide Chewy, and his stolen scout walker, through the forest.

Your destination is the bunker, where Han Solo is waiting to shut down the shield of the evil Deathstar. While you're playing on this level, the action switches to the Millennium Falcon speeding towards the Deathstar, and then back to the forest.

Once the bunker is reached and blown to bits by Han, you then move on to the final level, the Deathstar. Here, your task is to guide the Falcon to the centre of the Deathstar and blast the reactor, destroying the Deathstar and saving the universe.

Although Danmark would have made the effort to produce a fairly decent version of the arcade game, but this is way off the mark. The sound is average, the graphics crude and blocky.

Gameplay is ruined by the control - for example you must wrestle with the joystick to control the Speederbike, as it whizzes all over the screen. I'm afraid I cannot wholeheartedly recommend this game.

#### Touchline:

*Title: Return of the Jedi* Supplier: Danmark, Ferry House, Lucy Road, London SW95. Tel: 01-780 2224. Price: £14.99

**T**his could have been a most enjoyable simulation, but as it is, *Mini-Golf* from Magic Bytes is let down by some dreadful presentation both in the game itself and, more especially, the instructions.

The course includes the usual mix of mini-golf features: raised platforms, holes and curves to negotiate and tunnels to slip through. Par is indicated for each hole, although there are an alarming number of par ones, meaning that you have to be inch-perfect on the shot.

Control of the shot comes in three parts. The ball must be placed on a tee area, although why the program doesn't do that for you is beyond me. A line radiating from the ball's position then determines both the angle of the shot and, depending on how long you make the line, the power behind it. It's tempting to try and be clever and do everything with just one clever shot, but prudence soon dictates that it's better on occasion to tap the ball a few inches first, and then gain better position for the next shot.

Up to four people can play, although there is no indication on the screen as to whose turn it is. There are supposed to be two courses, beginners, and experts although so far, I've only managed to access one of them. Perhaps this is because I've not yet recorded a good enough score to qualify, or perhaps the second course only appears on the Amiga version. The instructions, which are quite dreadful, give no help whatsoever here.

Initially fun, this game offers little in the way of any lasting challenge. You soon get to know all the best angles for any given shot, and can then repeat it more or less at will. A wasted opportunity.

#### Touchline:

*Title: Mini Golf*  
Supplier: Magic Bytes

# Zak McKracken

and the Alien Mindbenders

Imagine the most ridiculous plot that you've ever encountered in an adventure game and double it. I guarantee that it won't come closer to the storyline in Zak McKracken and the Alien Mindbenders. But then this game has got a lead start.

Written in a spoof on *The National Enquirer* (which roughly equates with our very *Sunday Sport*), reality is to be seen only in the eyes of the gullible. For anyone who has not yet encountered one of these journalistic, typical stories inform you about World War II bomb-bom as the moon, and the fact that Hitler was really a woman. These headlines alternate on a brightly lit basis with any other bit of riveting investigation journalism on any subject whatsoever, as long as the word 'ALIEN' features prominently in the headline.

Anyway, back to the real plot. The year is 1991, and

you pick up art not those normally associated with adventures. A random assortment from the first few locations include: a phone bill, laser, fish bowl and Graciosa Marx (son and glasses set).

As you select different commands, Zak acts them out as games, moving to pick things up, open cupboards and reach things on. This is a genre that works well and adds quite a degree of realism (some would say the only degree) to the game. There is also a certain amount of artificial intelligence used in the program here. If, for example, you try to get object A with object B, Zak will go and pick up object B first, if he does not already own it.

One of the problems with games of this type is that it's often difficult to identify the objects from the illustrations provided, either through poor drawing or over-precise positioning of a cursor. Here, a 'what is' command lets



the world is getting progressively more and more stupid. Not because they insist on reading newspapers such as those listed above, but because ALIENS have taken over the telephone company, and are jamming mysterious nuclear rays down the phone lines. Now all you need is a couple of people who travelled to Mars in a converted van, a few two-headed squirrels, the Bermuda Triangle, visits to Atlantis and you will have destroyed the stupidly machine in no time at all.

The game involves no typing whatsoever - all the commands that you need are listed in a menu at the bottom of the screen. Although this severely limits the number of things that you can do, it does mean that you don't have to keep searching for exactly the right combination of words all the time. In fact, most of the puzzles reduce themselves to using the right object in the right place. Logical thinking is definitely the order of the day here, as the sort of objects

programmed as a location thoroughly, telling you which objects are part of the game, and which merely decoration.

Because of the apparent randomness of some of the puzzles, the game comes complete with a copy of 'The National Enquirer', which provides many a subtle, and not-so-subtle hint.

Zak McKracken is a quirky sort of game that some players will love, and others thoroughly detest. If what you have read in this review strikes you as being childish in the extreme, then I would suggest that you give it a wide berth. Personally, I thought it was like a breath of fresh air, but then again, I am writing this review with a crayon from somewhere inside my pocket coil.

Title: Zak McKracken and the Alien Mindbenders.  
 Publisher: LucasArts Games, c/o Dept 2, A & B Midford Way,  
 Midford, Northampton, NN16 9JX. Price: £19.95 (S&P).

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PaperClip Publisher is a powerful layout tool, more important, it is also easy to use. Two kinds are displayed right on your screen - simply point and click your joystick or mouse. Different powerful commands are available in pull-down menus so you don't have to go searching through your manual to find a command. Whether you are creating a single-page advertisement or a multiple-page newsletter, PaperClip Publisher will help you get the job done quickly and professionally. **Only £34.95.**

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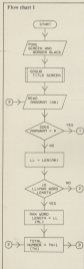
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# A Flow of Ideas

*How can you write an anagram game without getting mixed up?*

*By Norman Doyle*



**B**efore setting about the task of writing an anagram program two things are obvious: the program has to know what the word is and then the letters have to be mixed up. Since this is the most difficult part of the whole task it must be the first one tackled.

Storing the words is the easiest task because they can be stored as DATA statements but the program has to jumble them up. In the flowchart this process begins at entry point 1 which sets a counter to unity and nullifies a string, AAS.

The first step is to store the individual letters of the word in separate string variables, A(X). By generating a random number, R(X), a letter can be selected by using A(R(X)) to arrange the letters in an arbitrary order. The problem is that the letters are chosen up randomly, as might be expected. For a three letter word the number sequence could be:

3 1 1 3 3 3 3 2

To let the program know which letters have already been selected, the first value selected would cause the program to remove the letter from A(X) and store it in a string, AAS. Then A(R(X)) would be nullified so that the letter will not be reselected. A counter, X, is also increased to indicate that one letter has been removed from the array. The next number adds A(X) to AAS but the next five numbers generated have been selected before so they are ignored. When 2 occurs, the final letter is taken and this is indicated by the counter exceeding the original word's length, L.

The obvious disadvantage is that the program may take a while before AAS is complete. The second problem is that the number sequence may result

in the anagram string being identical to the original word and repeating the process would further increase the time taken for the anagramming process. Nature is a wonderful thing and the probability of an unjumbled word is higher with short words but the time taken to generate a full sequence is faster. This means that the problems more or less balance themselves out and the anagramming takes approximately the same time whatever the word length.

## Long and Short

Having created the engine, the size of the petrol tank has to be determined. By this I mean that the program has been devised to allow any size of word to be used but words having more than ten letters would result in an error being generated for an undimensional array. The first part of the flowchart caters for this eventuality by measuring each word in turn and substituting the value of the longest word in the AS array.

A secondary advantage of this module is that the program can take any number of words because the maximum length finding process also counts the total number of words as it goes through them.

The end of this module shows the importance of arrows in a flowchart. When the final block is reached the only outward flow line is the one which leads back to connection point 1.

The design of a flowchart depends on the designer. I prefer to keep the diagram linear but the flowchart of the module could connect directly to the main part of the program at point 1 if the outflow lines of the decision diamond are swapped and the following blocks on Flowchart 1 moved to the side as in Flowchart 2. This also shows the need for arrows.





## Main Line

Before the main program can be executed the data pointer is restored to the start of the data block. Next a loop is initiated which runs from the first data item to the last.

In the section which follows this the anagram is read and measured before it is decoded. Although I won't go into detail yet, this is a way of preventing prying eyes from reading the data by listing the program.

After the anagram has been created, the program gives the user three guesses. Depending on how many guesses taken to decipher the anagram, points are awarded with a penalty for each guess required. At this point a Mastermind type of subroutine could be added to indicate which letters of an incorrect guess are in the correct position.

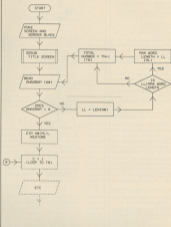
If, after the three guesses, the player has not worked out the anagram, a hard hint message is printed which reveals the original word. Otherwise, a well done message is printed on the VDU screen and, in both cases, the next anagram is presented or, if there are no more anagrams, the program prints the results of the test and ends.

## Using The Encoder

Try to write your own program from the flowchart and then compare it with the one presented here. This listing includes the rather simple title page and the data decoder subroutines. There is also an encoder at the end which can be used to create your own anagram program. Just to keep you on your toes, there is a redundant expression in the program. By studying the flowchart and comparing it to the listing, you should be able to find it. The answer is written on the Back Page for quitters and cheats.

Before running the encoder, write your words in the data block starting at line 280 and going as far as you like (as long as you don't go beyond line 600). Each data line should end with an asterisk.

Flow chart 3



Type **RUN 6000** and press the return key and the first line of encoded data will be printed on the screen. Use the **END** key to make enough space at the end of the line for retyping a line number and **DATA** (make this line number higher than the last data line in the program). Before pressing the return key, remove the asterisk at the end of the line. The original line with the associated word can now be deleted so that the next time the

encoder is run it will read the next line of data.

Before pressing **RETURN** after the first line of data has been encoded, add an asterisk after the final comma. Enter the line and remove the original word data and the program is complete.

Whether you're interested in flowcharting or not, the program should offer food for thought for players and programmers alike.



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# Circus Games



**S**ummer Games, World games, Winter games, Light-jumper, Cosmic Games - and now Circus Games! This is not any old circus, as both Ringling Bros and Barnum and Bailey combine to create the greatest show on earth, in which you'll have to train tigers, walk the tightrope, perform on the trapeze and show off your trick horse riding.

You can practice the events individually, or compete in an international competition, in which a team of judges award you marks for your performances. Walking the tightrope demands a combination of balance and courage, as you have to perform acrobatics as well. Moving across the tightrope is difficult enough as it is without having to perform acrobatics - you push the joystick up to move forward, and then left and right to keep your balance.

Pressing the fire button and pushing the joystick in the appropriate direction will perform a somersault, handstand, cartwheel or spin, but you must remember to press the fire button at the right moment when you've completed the move, otherwise you'll plummet to the ground. When you think

you've mastered that, you then have to repeat the performance while riding a unicycle.

In the next event, you're a woman riding a horse around the ring, and you must perform as many acrobatic flips, handstands and spins as you can without falling off. If you're successful then you have to repeat the exercise, this time with a tougher horse.



Next, you climb up high above the ring and prepare to amaze the crowd on the trapeze, without the aid of a safety net, of course. When the event begins, you must catch hold of one trapeze and swing left and right to gain height, before judging your leap from one trapeze to the other. To really rack up the points, you may want to try a double or triple somersault while in mid-air.

The final event is only for the strong-willed, as a cage is lowered around you in the centre of the ring. You're armed with a whip and a chair, and three Bengal tigers are allowed enter the cage. To your right is a tunnel, to your left a flaming ring, and you've got two minutes to get the tigers to perform as many tricks as possible.

By aiming the whip at the right place and cracking it at the right time, you can steer the tigers into the obstacles, but you should avoid actually hitting the noble beasts, as this tends to annoy them. At first they just get unpleasant, but they're dangerous, and if you don't manage to calm them down by waddling the chair, they'll attack and you'll lose points as well as an arm or a leg.

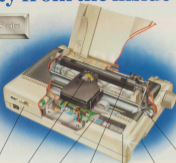
All the Circus Games events feature some quite impressive graphics and animation, which is accompanied by appropriate circus-style music. The game is quite difficult to learn, but provides a pleasant change from the usual collection of 100 metres, high jump and ski slalom events.

#### Finalities

**Title:** Circus Games. **Supplier:** Tomyco. **Address:** Industrial Estate, Blaydon, Tyne and Wear, NE21 4PE. **Tel:** 800 474 4517. **Machine:** C64 Disk. **Price:** £9.95 (retail), £14.95 (wholesale).

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# Jordan VS Bird



**I**n basketball, the greatest thrill is when a forward and defender go one-on-one. To replicate this, Electronic Arts has created a series of one-on-one tournaments designed to test who is the greatest. Will it be Larry 'the shooter' Bird or Michael 'the slammer' Jordan?

The first tournament is a straight one-on-one basketball contest in which you play either Jordan or Bird in four quarters of basketball. The game centres around a single basket, as each player takes it in turn to attack and defend, while you try and outscore your opponent. This is just the first option on the game list, along with a fast to 11 and 15 points options, you can also opt to tackle Bird and Jordan in their specialist competitions.

Larry Bird's speciality is getting those long three point shots from outside the shooting zone, and has devised a shooting contest in which you have 50 seconds to score as many points as possible by collecting balls from five containers spread around the basket. In a test of speed and accuracy, it's the number of points that count, so you have to either shoot quickly or accurately, but to mimic Bird you have to do both.

By far the best part of the game is 'Michael 'Air' Jordan's slam dunk tournament, in which you take on the computer or up to three human opponents in a test of skill and style. You get a choice of ten different slam dunks to try in a warm-up session, before taking on the main. These include

the magnetic two-hand hammer and Kin-the-ten, the aerobic twister and windmill, and even the patriotic Statue of Liberty.

Each move starts with a leap in the air from a marked line of the court, and hopefully ends with the ball being decisively slammed into the net. In slam dunking, getting the ball into the net isn't enough - you need style as well, so you can make things difficult for yourself by adding in extra twists and turns. If you make the shot as well, three points is Jordan's class, if not you should keep to the basics.

There's even a panel of five judges to reward your efforts, with the aim being to reach the perfect 50. In the contest itself, it's the best accumulated score after three dunks, so you have to make every one count, and it's up to you whether you go for certain safe jumps or risk going on the style.

Then it's back to the one-on-one contest with your newfound skills, and another attempt to prove whether Jordan or Bird is the player of the decade. Obviously, this will have more appeal on the video side of the pond, but there are a growing number of basketball fans in Britain who will find this amusing as well.

#### Touchline

*Title: Jordan VS Bird. Supplier: Electronic Arts, 114th Marlow Road, Lehigh, NY 12049, Ards, 021 899. Tel: 0753 49442. Machine: C64 disk. Price: £14.95 (disk).*

# Super Snapshot

*Just what is so super about this latest cartridge from the good old US of A?*

*By S Gorton*

When the C64 computer was first launched, everyone thought the fact that it had a cartridge port was a great idea. It meant that you could plug in a wordprocessor, game or whatever and have it instantly available. Unfortunately, no one seemed interested in using the cartridge port, and only a few ever appeared, including a number of poor quality games under the Commodore label. Just as everyone thought that the C64 was starting to run its last race and slowly sink into oblivion, the utility manufacturers included users with a variety of "utility" cartridges.

Now, a couple of years on, we've had the Finals, the Experts, the Prozac Frames and the Action Replays. All have gone through various changes and updates, some simply through software available on disk. Others have taken on a whole new identity, and have had their own custom chips designed. After all of this, Financed Systems Software still think there is room for yet another cartridge - Super Snapshot.

If you've ever read any of the American computer magazines, then the name Snapshot will not be new to you. As with the UK cartridges, it

has been through various design/software changes and has proved very popular. A number of American magazines even credit the cartridge on their contents pages, because they use it to feature pictures for inclusion in the magazine.

So what does the cartridge do? Does it offer any new features? Is it any better than the cartridges on sale at the moment?

## What's on offer

The Super Snapshot cartridge has some software on the cartridge, and some supplied on disk. Super Snapshot is unlike the Expert cartridge from Trilogic, as you aren't required to load in software before you can use it - many functions are available as soon as it is plugged in.

Facilities offered by the cartridge are:

- Disk Copiers (partly disk-based)**
- File Copier**
- Program Freeze**
- Disk Support**
- Programmable Function Keys**
- Turbo Disk**
- Boot Sector Support**
- Screen Copy**
- Extended Life**

- Sprite Enable/Disable**
- Machine Code Monitor**
- Disk Editor**
- Disk Memory Editor**
- Sprite Examiner**

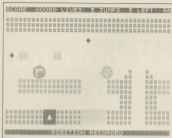
As you can see, the list is extremely exhaustive and has just about everything that you'd require when using your C64. The system disk that comes with the cartridge contains:

- Boot Sector Maker**
- TURBO\*DIS converter**
- TURBO\*DIS utilities**
- Sprite Editor**
- Extended Basic**
- Disk copier/program parameters**

## To Copy or Not to Copy

It seems almost every cartridge that appears on the market at the moment is designed to help you copy programs. Well, Super Snapshot is no exception. It's important to remember that all of these cartridges are designed so that users can make back-up copies of THEIR OWN software.

Equally important, you should be able to make back-up copies of your programs, just in case something goes



wrong with the original. In fact most "professional" software tells you to make a back-up copy of the program before starting to use it.

But, and it's a big but, you shouldn't use tapes or cartridges to make copies of software that you don't own. If you pirate software in this way, then you're only harming the software industry and pushing prices up. If you do copy a friend's software and you're caught, then you deserve everything that's coming your way!

I won't dwell on the freeze/copy side of this cartridge for too long. What I will say is that it does freeze some programs (make a copy), but not all, and the disk nibbler and parameter copier are among the best that I have come across - but again will not copy everything. As yet I've never found a cartridge or copier that would work with everything that I tried.

The file copier facility is a welcome one, as it certainly speeds up transfer of programs from one disk to another. I already own many disk-based file copiers, but having one on cartridge saves a lot of time having to the correct disk and then loading the program.

## Now For The Rest

Most of the other facilities of the Super Snapshot system are command-driven based.

The monitor, as you can see from the table, offers all of the commands

that you would usually expect, plus a few extras. The monitor is not memory resident, which means that you can examine any part of the computer's memory with ease. The hex/decimal conversions and the assemble options are very welcome. Most programmers will tell you that these are essential requirements, and it's surprising just how many monitors don't have them.

Should you ever require a copy of your computer screen, then you'll find the screen copy mode a welcome addition. Many cartridges offer the facility of saving out screens as a Kool's Pad file - Snapshot not only offers this option but also, depending on the mode the screen is in, allows you to save files that can be loaded into Doodle. Once you've loaded your screen into either of these graphics packages, you can alter them, print them out, etc.

Not only does Snapshot allow you to save out screen contents but it also provides you with the facility of dumping the screen to a printer. Both text and graphics dumps are supported. If you produce a graphics dump, this can be in any one of three sizes, plus you have the unusual facility of being able to dump any sprites on the screen.

Should you own a C128, then you have the extra facility of switching the computer into the 2MHz mode and using this to print out a hi loader. But remember the cartridge does NOT work in C128 mode.

One of three printers can be used to produce your dumps: 1325, 1326 and Epson. The 801 and 802 printers are more common in the UK than the 13 series. The dump does work with these printers, as they are compatible with the 1325 and 1326. Owners of non-Commodore printers should note that the printer should be connected to the serial port - not the user port.

So that you can examine the results of the screen dump option, some samples have been included with this article.

## Monitor Commands

A	Assemble
BR	Set break vector
C	Compare
D	Disassemble
F	Fill memory
G	Go
H	Halt
I	Inspect memory
IO	Display IO registers
L	Load a file
M	Memory display
O	Output to a device
R	Display registers
S	Save file
SP	Disable sprite collisions
SPB	Disable sprite/background collisions
SPS	Disable sprite/sprite collisions
SFR	Re-enable all sprites
T	Transfer memory
X	Exit to the way monitor entered
XB	Exit to Basic
XCM	Exit to sub-system menu
-	Modify memory
-	Modify register
-	Disassemble modify
#	Convert hex to Decimal
#d	Convert decimal to Hex
+	Used to enter decimal
E	Display disk directory
*	Modify MD registers
@	Read disk error channel
@#n	Set disk device number to n

It's important to note that not all game program screens can be dumped to a printer, especially if the program has a split screen. Many games use split screens to give the impression of moving backgrounds, or to change screen modes at different positions of the screen. Should you enter the screen dump section of the cartridge while using a program that does this you'll only see a small part of the program. There is no way to successfully dump a program of this type.

## Disk Editing

The disk and drive memory editors mentioned earlier are really just extensions of the cartridge's powerful monitor. Commands exist that allow you to read an area of the disk into a specified area of the computer's memory where you can then examine it, alter it, and then save it back out again. This is not the most elegant form of disk editor that I have come across, but it does work and is good for making quick alterations.

The drive monitor allows you to access the memory in the disk rather than the one in the computer. A \*E command in the monitor tells the computer that you are now working on drive memory rather than in the computer. All display/modify commands that can be used in the monitor can now be used to examine/modify the drive memory.

## Playing with sprites

If, like me, you're completely hopeless at art, then no doubt your sprites always look like something that crashed out of a coffee cup after it has been left on the windowsill for one month too many. The sprite monitor will allow you to examine your favourite games for sprites and save them out to disk, where you can modify them and then include them in your own program - don't forget that you can't patch sprites from other people and use them commercially!

Once you've saved your sprites to disk you can use the sprite editor to alter them to your heart's content - you could even use it to design new sprites for games and then use the monitor section of the cartridge to place the new sprites into your game.

## Also on Disk

The so-called Basic extension provided on the disk is really quite laughable. The commands all work and are extremely handy to have around, but the list of commands available can hardly be called extensive. To be fair though, the commands that are available are the ones that you would probably use 85% of the time in any Basic extension, and the extras would only be used occasionally. If you are only interested in "cookit"-type commands, then everything that you'll need is there.

## Putting the boot in

If you've ever used a C128, then you'll probably know that it has an autoboot facility. This simply means that when the machine/disk drive are turned on then the computer looks to see if a boot track has been written. If a boot track is found, then the appropriate program is loaded and run.

With Snapshot, C64 owners can use this facility. A separate program supplied on the system disk is used to set up the program that you wish to autoboot, and the boot sector. The cartridge will check any disk in the drive at power up to see if the boot sector has been set-up and if it has, load in the relevant program.

My attempts at making a program autoboot showed that only a Basic program can be specified as the auto start program, there is no provision for entering a start address for a machine code file. This is no problem though, as the program that autoboots could be a simple two line Basic loader for the machine code program such as:

```
10 IF A=0 THEN A=1 : LOAD "*"M
  $*$,1
20 SYS start-address
```

When you power up the computer plugged in, you are offered a menu offering some of the cartridges facilities, some of these allowing you to exit to Basic with or without an autoboot occurring. Should you not choose anything, the computer will drop into Basic and perform an autoboot.

Another nice touch is the addition of the keyword BOOT to the Basic vocabulary. Now if you change disks in the drive you can type BOOT, and as long as you have the boot sector set-up, then the program will autoboot, you could set up a boot sector on all your disks to give you a menu of the programs available.

## Warp Factor 25!!

Even though the cartridge offers turbo-loading and saving facilities (loading up to 13 times faster, saving up to seven times faster), the Snapshot Systems disk has a couple of programs that allow you to speed up loading by up to 25 times faster. TURBO \* 25 converter allows you to change any Snapshot saved file into a special new format.

Unlike the TURBO load facilities of the cartridge TURBO\*25 files can only be loaded on a 1541 compatible drive, the turbo D08 of the cartridge works with all Commodore drives.

The second file gives you the facility of setting up a fast loader on to your disk that can be used with WARP\*25 files. Once installed on your disk, this loader will list all files on the screen, and you simply have to move the cursor to the file you require and press return to load it. The loader will work with normal files but the performance is nowhere near as good.

Since TURBO\*25 files are in a special format, normal D08 commands won't work on them. The same program that allows you to produce a loader therefore gives you the facility to delete and rename WARP\*25 files.

Once you've converted a couple of files to WARP\*25, you'll wonder how you ever managed without it - the increase in speed is amazing. Some programs even load faster than with my Dolphin D08!

## Is it worth having?

To be honest, I wasn't looking forward to looking at yet another cartridge. I've seen them all and I thought that there could be nothing new. Well I was right and I was wrong.

Super Snapshot does not offer anything that is not available on other cartridges - what it does do is offer a slightly different collection of routines from the others. I personally liked the facilities Super Snapshot gave me, and will no doubt use it regularly.

If you're thinking of purchasing a cartridge I suggest that you look carefully at what each one offers and choose the one with facilities that best suits your needs.

I really only have one gripe about Super Snapshot, and that is that there isn't a switch to turn it off. I use a C128 and when the cartridge is in the cartridge port it automatically goes into C64 mode on power-up. If there was a switch that turned the cartridge off, then I may never need to remove Super Snapshot from my machine.

### Touchline:

Product: Super Snapshot Supplies  
Financial Systems Software, 2nd Floor, Avonlea House, St Mary's Street, Worcester, WAI 1WA. Tel: (0805) 661465 Price: £29.95

# Icon 64

*Improve the presentation  
and ease of use of your programs  
with this simple utility*

*By M Medhurst*



I don't know about you, but programs with a long list of menu options that require the pressing of a number to select the correct one drive me up the wall. It would be so much easier and more attractive if you were presented with a series of pictures for the relevant choices, and used the joystick to point at the option you wanted. Hence the birth of Icon 64.

The program is designed to be incorporated in programs that you write yourselves — as a stand-alone utility it doesn't do very much. It's totally up to you to produce the program that uses Icon 64.

What the program does is display a series of eight icons at the bottom of the C64 monitor screen. A joystick in port 2 is used to move an arrow to the icon you want to select. If you press the fire-button while the pointer is over an icon, the number of the icon is returned in a memory location.

You can check which icon has been clicked on, and cause your program to take the appropriate action. For example, clicking on an icon of a printer could print your current text in a wordprocessor. Clicking on a disk

could cause a new display with various icons representing various disk options — the choice is yours.

Icon64 is a machine code routine that resides at memory location 2949 (\$0891). The observant among you will realize that this is where your Basic programs normally live. For this reason, Icon64 and RUN will move the start of Basic to 3032 (\$0C08).

The icons used by this routine are quite simply sprites. Sprite data is, of course, totally up to you. The eight sprites that are used by Icon 64 should be stored from memory location 2432 (\$0880) to 2943 (\$087F). You could have a number of sprites in memory at different locations, and use either a small Basic or machine code routine to move the sprites that are to be displayed into the addresses mentioned above.

## Memory locations used

The following values should be poked to set up colours to suit:

POKE 2948, ICON colour  
POKE 2950, HD-LIGHT colour  
SYS 2889 will initialise Icon64

SYS 2120 turn on icons  
SYS 2151 turn off icons

The choice of icon is left in the following locations:

PEEK (211) = Fire button pressed  
0=not Press  
PEEK (251) = ICON under pointer 1-7  
0=noone  
PEEK (252) = last icon selected 1-7

As mentioned earlier the sprite data is stored from 2432 to 2943. Sprite 0 is the pointer.

Should you wish to see the program in action, I've provided a small demo. This places some icons on the screen, and tells you which one you have selected. Use a sprite editor to examine the sprites in the demo if you want to see how they have been designed.

## Important Note

Because Icon64 re-directs the C64 interrupts, you should disable the routine with SYS 2151 before any disk activity. You can, of course, re-enable Icon64 once disk activity has finished.



# 'MENACE'



Your mission, should you choose to accept it, is to destroy the planet Dyonisia. Apparently it's an unnatural planet that was formed over the centuries by bits of the nearest and toughest rulers that have ever existed. These leaders, having been exiled from their own planets, have managed and plundered space, and used the wealth they have developed, and the resources they have found, to build their planet of fear and death.

Your mission is to embark on what could be a suicide mission, as it has been calculated that a single craft may get past the planet's defences, where a fleet would be easily detectable and destroyed. Unlucky, you got chosen for the mission, which explains why you begin the game inside the mouth of a giant space ship, which now opens its mouth to let you out undetected at the start of the first level.

In a game that owes far too much to games like *Nemesis* and *Balamosky*, you roam three plus your craft through the party but repetitive scrolling landscapes, destroying all that comes before you. You'd imagine that a single fighter wouldn't stand a chance against six levels of killing machines that were designed and built by the six nastiest villains in the galaxy, but don't worry, the authors have included a *Nemesis*/Balamosky-style master conservator weapon that allows you to convert alien debris into new weapons. Naturally, you only get the chance to collect this debris

when you destroy an enemy base, but when you do, it offers you the chance to save it up and then cash it in for bonus points or new weapons.

These weapons begin with short-range cannons that can be upgraded by laser enhancements, lasers for long-range combat, speed-up items to get you in and out of trouble up to seven times faster than you could before, a high energy but temporary force field, a force field top up, and up to two outaders that are attached to your ship. Extra your every mass and fire cannons that can get you out of a tight squeeze in an emergency.

At the end of each level is a super alien or guardian that will pummel you with firepower until you hit its vulnerable spot and progress to the next level.

*Menace* was a smash hit when it appeared on the Amiga, probably because it looked stunning and the gameplay may still be novel, but when it's constrained to the C64 not only do the graphics suffer, but so does the gameplay, as we have seen time and time again. Isn't it time for a new original arcade game, or is that too much to ask?

#### Finalizer:

**Title:** *Menace*. **Supplier:** Pygmalion Ltd., *Port of Liverpool Building, Pier Head, Liverpool L3 1JY*. **Fax:** 051-767 0825. **Machine:** C64 **Price:** £12.99 (disk), 29.99 (cart).

# Batman - The Caped Crusader



This is in fact the second Batman game that Ocean has released, the first being a 3D isometric game released four years ago when 3D isometric games were all the rage, and Ocean was following trends. These days though, Ocean is flushed with success, and has a wealth of game-creating talent. *Batman* is just the latest in a series of hits from the crystallized software house that includes *Archon* and *Operation Wolf*. It's hard to believe that the same company produced the dreadful *Knight Rider* and *Street Hawk*.

This time, Ocean has opted for a comic-strip-style approach, and a game that contains not one but two Bat-adventures, in which our hero must first foil the finalish plans of the Penguin before tackling the Joker - two arch villains for the price of one! The game begins as Batman slides down the Batpole into the Batcave. Unfortunately, the Batcave is in a bit of a Batstate as the Batcomputer is out of operation, so he must find the Batrods to fix it.

Objects such as the Batrods appear on the screen in Batboxes that can be collected by pressing the fire button.

This produces one of the game's best graphics effects, because instead of just telling you that you've found the batrods, a batyribbed title the screen and includes the icons representing the object, as well as a description of it. These objects are then stored in your utility belt, which can hold 17 objects that are selected and used in a separate screen that also displays Batman's energy status and the percentage of the game you've completed. Love lang enough to reach 100%, and the world will be a safer place.

The rooms and corridors of buildings including the Batcave are displayed on the screen in comic-style frames that are overlaid when you move into the next frame. The old frame turns black so as not to create a messy screen, and the effect is remarkable. Comic-style text also appears,

but this is more than just the 'Meanwhile, back at the Batcave' you would expect. In fact, they're close to the problems that you have to solve next. However, most people will find these clues so obvious that they'll probably concentrate on the action, as most of the thinking is done for you. For example, when you approach a door the message 'Take your pick' appears, leaving you in no doubt that your lockpick is the way in.

Your first task is to foil the Penguin, who has just been released from jail and has set up an umbrella factory near his Gotham City mansion. Of course, this is just a front for his latest evil plan to take over the world using an army of robotic penguins. Before you can tackle the Penguin, you have to find his hideout, while avoiding the almost constant attack from gun-toting thugs and other curious creatures. These can be dispatched with punches and kicks, or with weapons you can collect on the way, such as a grenade or Batarang.

Eventually, you will discover the Penguin's lair by climbing up the side of buildings (remember not to try this at home, children), and fighting on rooftops, where you will have to slug it out with mechanized Penguins before tackling down the villain himself. Before you can start the celebrations, you discover that while you were out debating the Penguin, Robin was kidnapped! The only clue is a playing card, which of course is the Joker, and the start of a second adventure.

*Batman - The Caped Crusader* is the game that Barfens have been waiting for, and the good news is that Ocean is planning *Batman - the movie* for later this year. So see you then Barfens, same time, same channel!

**Techline**

*Batman - The Caped Crusader*, Supplier: Ocean, 8 Central Street, Manchester. Tel: 061 423 8611. Atlantic (194, Price: £8.95/£9.95)

# Robocop



The race for the Christmas number one spot didn't go according to plan. While everyone was expecting a three-cornered fight between *Operation Wolf* (the eventual winner), *Airbros* (the favourite) and *ThunderBlast*, *Robocop* upset the odds, giving Ocean an unprecedented 1st and 2nd, and is now poised to take the top slot itself.

Based on the recent film, *Robocop* is set in Detroit, and begins just after Patrolman Murphy has become the 28th cop to be gunned down in Detroit since Security Concepts Inc. took over the police department. Although this is bad news for Murphy, it's just what OCP have been waiting for, as they take what's left of him, erase his memory, add a programmed mind and a titanium body, and turn him into Robocop - the future of law enforcement (naturally, this doesn't go entirely to plan, and part of Murphy's memory remains). So you take the controls of this killing machine, and set out to track down your killers and arrest them, which means "blow them away" in this game.

*Robocop* is controlled through joystick moves that allow him to walk left and right across the sideways-scrolling screen, climb up and down stairs, crouch to avoid flying bullets, jump and fire in five directions. The screen display shows the outer side of Detroit, packed full of alleys, windows and doorways that could hide an assassin waiting to make you the 28th cop to be killed.

The game consists of nine levels as patrols in which you maul the bad guys it out with murderers and thugs. Level one involves a straight shooting match in which you'll have to learn how to turn and shoot accurately to take out targets that appear at windows before they get you.

You're armed with a standard issue police pistol, but this can become far from standard by collecting bonus

objects that appear as a reward for gunning down villains and increase your gun's firepower. It can eventually fire in three directions at once, so you can take out three bad guys with a single shot in true western style. Above the main screen display, there is the time left in the patrol clock, the all-important score and a power rating that is shaped everytime you're hit, but can be recharged by collecting tons of baby food!

*Robocop* is more than just another shoot-'em-up; by level four you're beginning to match up parts of a photocop picture which, if successful, will lead to the name of the man responsible for your death. This leads you to a drug factory and the rest of the gang, who'll stop all but the best in their robotic tracks.

Success here reveals that the gang leader is none other than OCP director Dick Jones. Unfortunately, director four of your programming forbids you to set against an OCP director, which results in you being disarmed and sent out to face the robot H1308 armed only with your bare steel fist.

By level nine you're back at OCP headquarters and you confront the board of directors with the evidence against Jones, who reacts by trying to escape by taking the president hostage, who in turn immediately sacks Jones, cancelling director four and leaving you to do the rest.

*Robocop* manages to recreate the atmosphere of the film in pixels and animation that will have you reaching for the fire button at the slightest sign of trouble. This was a surprise hit of 1988 that will definitely set the pace for 1989.

**Touchline:**

**Title:** *Robocop* **Supplier:** Ocean & Central Street, Manchester, Tel: 061-832-6513. **Wackline:** C64, Price: 29.95 (incl.).

# Legend of Blacksilver

The source of all magic on the planet of Bantrea lies in an unapproaching mineral called Blacksilver. Nothing special to look at, it is nevertheless many times more precious than gold. It can lead to untold power, especially when it falls into the hands of powerful mages.

Such a perilous state of affairs currently exists on the island of Thalos. Apsal lives cataclysmic earthquakes, the king has been kidnapped and is being held in ransom. Desperate for help, the King's daughter, Princess Aylia, appears in one of your dreams appealing to you to come forward and attempt to save the world. Why she chose you - a mere peasant - rather than one of her trusted knights is not known, but you feel obliged to take on the quest even though you have previously never left your own valley.

The Legend of Blacksilver is a fantasy role-playing game using the same game system as the Legacy of the Ancients, although the scenario has been expanded considerably. Control of the game is simple, commands being highlighted from a menu on the left of the screen, and anyone wanting a game that they can start almost immediately without having to wade through a plethora of manuals and keynotes should be well pleased.

That's not to say that the game itself is simple. Your quest is long and arduous. There are towns and temples to visit, puzzles and of course dungeons - all in all some 40 levels packed with traps, treasure and some excellent graphic representations of monsters. You'll need to find gems that



allow you to access different exhibits in the archives - the source of most of your knowledge. Although an estimated playing time is given, it would reckon on somewhere in the region of 100-150 hours involvement before you save the world.

Your character has five different attributes - strength, endurance, dexterity, intelligence and charisma. Rather than automatically improving these statistics as you progress through the game, you can visit different training centres where, for a small fee, you can take part in an arcade game. Success or failure here is reflected in the relevant attribute score.

The games are not particularly taxing, but they do show a sort of warped originality - clay pigeons shooting with a bow and arrow for example. Completing certain tasks within the game will also affect your characteristics, so you don't have to rely entirely on arcade skills.

Money is vital to your continued survival. Weapons, armour, food, spells, boats and so on all have to be paid for. Apsal lives robbing treasure chests, the easiest way of increasing your wealth is to gamble, and there are several games of chance in which you can lose your shirt or make your fortune.

Killing monsters is another way of acquiring gold, although there's obviously a considerable amount of personal risk involved. Perhaps talking your way out of trouble or doing a quick bunk might prove to be a wise decision. 'He who runs and runs away, lives to fight another day' may not be the stuff of legends, but then people only usually sing about dead heroes!

There are nine different spells that you use on your travels, although you'll have to prove your worth as an adventurer before the shopkeepers will let you loose with the likes of 'ambitiate' and 'psychic projection'. The successful casting of a spell depends on your intelligence, magical skill level, and where you are when you try to cast it.

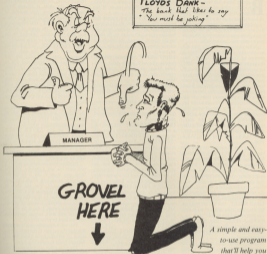
Legend of Blacksilver is a well produced, simple to play RPG. Although lacking the complexity of some of its rivals, you can't help but get carried along by the story. Another one for the collection.

Developer:

Titus The Legend of Blacksilver. Supplies: Epic (U.S. Gold), 212 Midland Way, Walsford, Birmingham B5 7AL. Tel: 011 256 2448.



**FLOYD'S BANK -**  
*The bank that likes to say  
 "You must be joking!"*



*A simple and easy-  
 to-use program  
 that'll help you  
 keep track  
 of your  
 bank account!*

# Balance Sheet



**B**alance Sheet has been designed to keep track of your current bank status, and provide you with a statement at any time. Even if you don't have a bank account, Balance Sheet can still be of use to you to help you manage your finances more easily and economically.

When the program is run, you will see the title screen first and then a prompt to 'Enter Year'. Ideally, this should be a four figure number - 1988 for example - but it can be text, if you choose. The purpose of this is to provide each file you save with its own 'code'. As you will use Balance Sheet for more than a year, this means you will want to have more than one file of the same name (files are saved for each month, being named using the first three letters of the month - e.g. SEP for SEPTEMBER) on the disk, therefore each file is given a suffix (by year) to distinguish between, say, JANUARY 1987 and JANUARY 1988.

When you've entered the date (you need to press RETURN), the Main Menu will appear. This lists the main functions of 'Balance Sheet'. To the right of the first option (load sheet), is a pointer. You can move this up and down by using the cursor up/down key. To make a selection from the menu, simply position the pointer next to the function, and press return. **LOAD SHEET** - this will prompt you for the three letter name of a file that has previously been saved.

**SAVE SHEET** - this will again prompt you for the three letter name under which the current file in memory will be saved.

**ENTER DATA** - this is how you go about setting up and entering transaction details into 'Balance Sheet'. More about this later.

**WIPE SHEET** - this will prompt you for the name of the file you wish to erase from the disk; you will be asked

if you're sure, just in case you make a mistake. Enter 'Y' for yes, or 'N' for no.

**VIEW SHEET** - this will display the current file in memory on the screen. Any details are not shown, basically because there isn't room to fit them on the screen! Instead, the details are shown when you print the file - see next entry.

**PRINT SHEET** - selecting this will prompt you with a sub-menu - the **Print Menu**. Selection is made here exactly the same as for the Main Menu.

**ABORT** - will return you to the main menu without taking any further action.

**PRINT WHOLE SHEET** - will print out the current file in memory (provided your printer is connected and on-line).

**PRINT PART SHEET** - will print out a section of the sheet only. You will be prompted "FROM RECORD" and "TO RECORD". Your input must be in two digits; for example, if you entered for "FROM RECORD" 08, and "TO RECORD" 11, then only these entries and those between will be printed. Both entries cannot, of course, be less than one, and the second entry must be larger than the first.

**CHANGE PRINT FORMAT** - this will produce yet another sub-menu, which is againised like the main and print menus. The first option is **PRINT MENU**, and will return you to the print menu. The other options consist of **PRINT SLASH ZERO**, **PRINT BOLDFACE**, **PRINT EMPHASISED**, **PRINT N/A** and **PRINT ITALICS**. These options should work on any Epson compatible printer. To select a function, simply place the pointer next to it, and press return to turn it on. Press return again to turn it off. A white square will appear next to it to indicate that the function is on. The

function stays on until it is turned off, or until the sheet is cleared from memory (see later). Any number of functions can be on at the same time.

**RE-NAME SHEET** - this will prompt for two inputs - the name of the file you wish to re-name, followed by the new name (you need to press return).

**VIEW CONTENTS** - this will list all the current files on the disk for a particular year, note only the files on disk for the current year will be displayed - i.e. if the year is, say, 1988, and you have on disk four files saved from 1987, and three from 1988, then only the ones that were prefixed with 1988 will be displayed. To display the files from 1987, you will have to change the year - see later.

Finally, **EXIT** will return you to the Power - Up Screen. You will be prompted 'ARE YOU SURE?' first, in case you accidentally select it.

Now to the **ENTER DATA** option. Selecting this option will open a specially formatted window in the top position of the screen. The best way to show you how to create a sheet is with an example:

Suppose you are starting afresh a new sheet for, say, February. The first thing you want to do is to let the computer know how much you have in your account. For the sake of argument, let's suppose it's £150. First you are required to enter the date. As you've not actually making an official transaction, what I do is to fill out the date with stars, so you can do this too (no need to press return).

You will notice once you have done this that the pointer to the right moves down to indicate from which section Balance Sheet is expecting input.

The next input is for details of the transaction. As it is the first entry, enter "BALANCE CARRIED", or something similar. The maximum entry allowed is 38 characters. Press return once you have done that, and you'll see the pointer move down again.

Now you must enter the amount to be paid in. In this case it's £150, so type ONE space, then the 150, then enter a decimal point (this should be typed over the one already shown on the screen), then the 00. This display may "-----" and should now look like "150.00". Don't worry if you have got it wrong, as you can re-enter the information again.

When you've entered this, the pointer will move down to "WITHDRAWN -----", you are not



making a withdrawal, so just press return. The computer will enter "0.00" for you. The message "CORRECT" (Y/N) will appear across on the right-hand side.

If you've done any of the above wrong, then press N, and you can do it again. Pressing Y will display your balance. Press another key to return to the main menu.

Now let's suppose that on the 4th of February, you withdraw £20.45, for whatever reason. Select Enter Data as before, and enter the following for the date: "04/02/88". Then you can enter anything you like for the details. You are not paying in anything, so press minus, and the computer will fill out the space with "0.00". For WITHDRAWN, enter two spaces, then 20.45. (Remember to enter the decimal point as well).

If you've done that correctly, press Y, and your new balance will be calculated, and displayed. Press any other key to go to the main menu. You can select from the menu VIEW SHEET, to see what you have just typed in (except for the details), or you can select PRINT SHEET to obtain a hard copy (statement).

The file can be saved using the SAVE SHEET option. Any three-letter name can be used, but it's best to call each file the month it is related to, i.e. "FEB". As long as you entered the year as 1988, then it will appear under VIEW CONTENTS as "FEBFILE-1988".

## Other Functions

Holding down the CEM key (bottom left of keyboard), and the F1 key (top left of keyboard) when on the main menu, will clear any sheet in memory and present the title screen. You will then be required to re-enter the year.

Holding down any key during printing will terminate printing, and return you to the main menu. Pressing the escape key (left arrow), again from the main menu, will allow you to re-enter the year without clearing the memory.

Should you need to, pressing D from the main menu will delete the last entry from the sheet. Please note that this function must not be used directly from loading a new sheet (as the previous balance will not exist).

Finally, if you've used the DISK-BOOT program to load BALANCE SHEET, then using the LOAD, SAVE or PRINT options without the appropriate device connected will

cause the computer to crash, and any sheet in memory will be lost.

If you encounter a "file not found" error when trying to load a file that you know exists, then the most likely fault is that the year is not set right. For example, you will get an error if the year is currently set at 1987, and you are trying to load JAN 1988.

## Getting it all in

The following are the instructions for typing in and saving 'Balance Sheet' Remember - don't run any program and you've saved it first. Please read the following through thoroughly first, so you are sure of what to do.

1. Type in LISTING 1, and save it as "LIST1". Check and double-check that it is correct.
2. Type in LISTING 2, the U.D.G.s, and save it as "LIST2". The program has a built-in checksum, and will inform you of any error.
3. Type in LISTING 3, the window machine code program, and save it as "LIST3". Again, the checksum will inform you of any error in the data.
4. Now re-load "LIST2" and run it. Type "POKE 32171,31" (return). You should see the character set change. Type "NEW" (return), and then type in LISTING 4, the window creator program. Because this program uses mostly keyboard graphics, it's unlikely that you will hit an the right symbol every time. Typing in this program with the new character set selected will let you see more easily if you have got it right or wrong. Save the program as "LIST4".
5. Now type in LISTINGS 5, 6 and 7, and save them as "LIST5", "LIST6", "LIST7" respectively.

Now that you've typed in and saved all these BASIC programs, it's time to create the machine code versions of them, and save them in the correct way onto the program disk. Have a new, formatted disk ready to receive the programs. When you have the complete set of programs saved on this disk the directory should appear as:

```

1 "SHEET"
1 "A"
5 "B"
4 "C"
3 "D"
25 "E"

```

To obtain the program in its completed form as shown above, do the following:

1. Load "LIST6", and run it. Type "NEW" (return), and load "LIST7". Place the program disk in the drive

(the one you have just formatted). Type RUN (return). The drive should run for a few seconds. To test that the BOOT program has been saved correctly, turn your computer off, then on, and LOAD "SHEET", 8, 1.

As soon as the computer clears "LOADING", the screen should clear, and your drive error light should flash. If this doesn't happen then you've made a mistake in either LISTING 6 or LISTING 7. If you have made a mistake then correct it, and change the 50 in LISTING 7 to read: 30 57557817: SHEET, 8, 1 and have another go.

2. Turn the computer off then on, and load "LIST5". Run the program, then type the following in direct mode: POKE 443,250: POKE 44,31 (return): POKE 45,89: POKE 86, 31 (return). Insert the program disk and SAVE "A", 8, 1 (return).
3. Turn the computer off then on, and load "LIST2". Run the program, and type the following in direct mode: POKE 5272, 31 (return), to make sure the U.D.G.s are in memory, TYPE POKE 44, 250: POKE 44, 25 (return): POKE 45, 9: POKE 46, 80 (return). Insert the program disk and SAVE "B", 8, 1. You can check that the U.D.G.s have been correctly saved by turning the computer off then on, and loading "B", 8, 1. POKE 5272, 31 should reveal the U.D.G.s back in memory.
3. Turn the computer off then on, and load "LIST3". Run the program. Insert the program disk and type the following in direct mode: SYS 3224: "C", 1 (return). The drive should operate for a few seconds.
4. Turn the computer off then on, and load "C", 8, 1 from the program disk. Load "LIST1", and run it. You should see all the windows used by the program flash up on the screen. When the program has finished running, insert the program disk, and type SYS 3248, 1: "D", 8 (return). The drive should operate for a few seconds.
5. Turn the computer off then on, and load "LIST1" - the Basic program. Insert the program disk and SAVE "E", 8 (return).

All the separate programs to Balance Sheet are now on the program disk. LOAD "SHEET", 8, 1 now, should make the program LOAD, then RUN automatically. (The screen will blank during loading).

If you don't want the program to "BOOT", then you can LOAD "A", 1 and then type SYS 8202 (return).

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# Soccer Simulators



"**T**hese four games are absolutely brilliant! Everything you could possibly want in computer soccer! These games have it all! Amazing playability!"

That's how Code Masters, the company that first made its name as budget software but has now turned full price, modestly describes its latest four-pack football offering. Unfortunately, the games are far from brilliant, remarkably unfriendly to use and contain many inadequacies that will hardly satisfy a football fanatic.

Two cassette tapes with a program on each side are accompanied by a poster of football goals, and a sheet of brief instructions. It's up to you to decide which game you'll play and for how long. Having said that, all the games have the same user-unfriendly front end that offers you the choice to choose between a one and two-player game, select controls, read on-screen instructions and select other appropriate options.

As far as I know, most C64 owners possess a joystick and will think it a nuisance to have to use keyboard controls to select the joystick every time they load in the game; they'll think it's appalling to have to go through this procedure everytime they play a match, particularly five a side game that lasts only a few minutes.

The football games, 11-a-side, 5-a-side and street soccer are all played in pseudo 3D, which just doesn't seem to work. The worst offender is the street soccer, which is played in a road containing nice obstacles such as parked cars and open garages. Unfortunately, should a computer opponent stray into a garage, he'll get stuck between the car and the garage wall, bringing the action to an abrupt halt.

In the 5-a-side game, attacking players aren't allowed in the goalkeeper's circle, but this only seems to apply to human players — when I was playing, a computer player dribbled the ball up to the goal line to score!

You may consider these to be minor niggles or serious faults, depending largely on your idea of football, and you may consider that four games for the price of one is good value (the fourth being a skills and training program), but for my money four budget games do not a full priced game make, and shouldn't be sold as such. Perhaps the 11-a-side and 5-a-side game together would make a good £1.99 or £2.99 game, but at £9.99 it's just not in the same league.

#### Touchline:

Title: 4 Soccer Simulators. Supplier: Code Masters, P.O. Box 6, Leamington Spa, Warwick, CV35 9EM, machine: C64. Price: £9.99 (cass).





## Signal Strength

Having installed everything in my room, I came upon the first problem — no aerial. Rather than moving everything down into the living room, I decided that I would indulge in an experiment. Casting all caution to the wind and spurring no expense, I plunged into the wardrobe and emerged with an all-purpose, metal coat hanger. Leaving a trail of freshly mowed shags in my wake, the hanger was soon transformed and installed as a serviceable aerial. Now for the second test.

Loading the supplied software took seconds — it automatically detected that the Microsoft Tuner was being used rather than a video recorder and proceeded to scan the searchband for a suitable signal. I knew it wouldn't work because, apart from the improvised aerial, I live in a weak signal area and the presence of an automatic cathodic scrubber doesn't help. Surprisingly, after a few seconds I was presented with a line of text indicating that the Tyne Tens transmitter had been contacted. This amazed me because I live in the Forthshire Television area. Adopting this as a warning, I let the search continue and soon had all of the TTV and BBC stations pinned down. Amazing! Once a station is sensed it can be allocated its own key on the computer so that channel switching is merely a case of passing two keys.

New came the true test — picture quality. As I expected, the TTV screen was a total mess, but I could get a reasonable picture of the index if I left it on the screen for a few passes. The other four channels were excellent but BBC2 had a few glitches — perhaps I should buy a multi-element coat hanger for future use.

Once the software has done this initial search, it can be moved so that the channels are fixed for future use. This also makes it all easier to use than the video link up where the channel.

At this point I remembered that somewhere in my academic past I'd acquired an indoor aerial for an old set, which had long since gone to the great reception area in the sky. Bypassing my room, I swapped, grinning jocosely from a pile of memorabilia clanking the weighty after trophy in my hand.

With a better aerial the BBC2 picture improved but that's about all, hardly worth the effort. During a lull in household proceedings I managed to get up the equipment near to the aerial socket from our planned, roof-mounted, coat hanger. This further improved the image to that new Tyne Tens was almost acceptable.

## The Advantages

In short, the adapter works perfectly to give a picture which is actually better than the 'real' thing. All that appears on the screen is generated inside the Commodore, and this means that the pictures can not only be printed out or stored on disk for future use but the whole retrieval process can be programmed.

The manual is excellent because all of the key features are fully documented so that any user can write a very powerful Basic program. In this way it is possible to select individual pages on any or all channels and save them or print them out for both. The time saved is phenomenal because the program can run while you get on with something more important, the days of sitting waiting for the correct screen to come round a thing of the past.



On disk, each screen only uses four blocks which means that in theory 658 could be stored on each disk. The only problem is that the directory only has room for 244 entries so a copy of the master program and its machine code patch may as well be stored on each disk at the negligible cost of two screens.

The uses of the system depend upon individual needs. If you're a football fan then all of the results can be stored for future reference, job addicts can work out a complex daily viewing schedule or simply fans can keep a record of the story so far.

The only problem is the cost of the unit, £99.95 for the adapter and £119.98 for the adapter plus the tuner. The system makes hybrid systems as something similar to Microsoft without the user interaction, the price is not so high. After all, a modem would cost at least as much but on top of that would be the fee for accessing the system, which isn't the case with teletext. The Microsoft teletext adaptor is highly recommended for those who aren't bothered with load rates or pause above pauses. It is a marvelous unit and so simple to use. Even if you dream of upgrading to the Amiga, you have no excuse because an Amiga Upgrade can be supplied for £24.99.

In my descriptions of the future, the concept of a tailor-made newspaper that is prepared while you sleep is to be read at breakfast commonly occurs...this brings the future one step closer. A truly excellent utility which should ensure the future of coat hangers in my household!

### Footnote:

Supplier: Microsoft, 7 Reddy Close, Monmouth, Gwent, PO26 9PW. Tel: (0303) 500664.

# Storage

**N**eed more array storage space for a particular application? There aren't many options available. Relative files can effectively circumvent memory, but there are drawbacks, for example speed of recall. This is desirable, especially for accounting-type programs needing mathematical treatment, because each record has to be read before the calculations.

Another problem is wear and tear on the 1341. Of course you can compile your program and create a bit more room for arrays and variables in the Basic storage area, but if you've already done this and still need more array storage, then what follows may be useful to you.

## Unused Memory

The 64 has two 8k Ram areas which are often unused and are unavailable to Basic. These are the Rams behind the Kernel and Basic Rooms. If you're using a compiled program, the compiler will probably be using the 8k or Ram behind the Basic Room for its library of routines, but this still leaves 8k of Ram behind the kernel capable of array storage.

Obviously if your program is uncompiled, you have 16k available to you behind both Kernel and Basic Rooms. The 4k of memory from \$C000(\$B12C) onwards is also available, provided you haven't already used some of it for a machine code routine.

So assuming a compiled program is already in use (for speed and efficient memory usage), the program which follows uses part of the area above \$C000 for a machine code routine and array reference store, and stores the array data strings under the Kernel Room (\$F080 onwards), giving an extra 8k of array space all instantly available.

The Program is arranged to store strings of up to 40 characters in length, giving 400 records if the average string length is 20 characters. The X and Y

2	3	3
3	2	4
6	6	6
4	3	4
2	6	3

array references can take any value between 1 and 255.

The number of records able to be stored depends on the average length of the strings, up to a limit of approximately 800 (fixed by the array reference store (Index.array) space). It's easy to increase the maximum string length which can be handled - this is dealt with later.

## Description of Program

The whole consists of four parts:

1. Basic program to act as a subroutine from within your application to Read, Write and Amend the array.
2. Machine code to carry out the actual operations, located \$C000-\$C136.

# eSpace

How to extend  
your Array  
Storage facilities

by Brian Halesworth.

Figure 1

```

SOURCE CODE
0 END
10 ; INITIALISE ARRAY STORAGE
20 ; INITIALISE 20-ADDRESS WORDS
30 ; 2000-2009
40 ; 2010-2019
50 ; 2020-2029
60 ; 2030-2039
70 ; 2040-2049
80 ; 2050-2059
90 ; 2060-2069
100 ; 2070-2079
110 ; 2080-2089
120 ; 2090-2099
130 ; 2100-2109
140 ; 2110-2119
150 ; 2120-2129
160 ; 2130-2139
170 ; 2140-2149
180 ; 2150-2159
190 ; 2160-2169
200 ; 2170-2179
210 ; 2180-2189
220 ; 2190-2199
230 ; 2200-2209
240 ; 2210-2219
250 ; 2220-2229
260 ; 2230-2239
270 ; 2240-2249
280 ; 2250-2259
290 ; 2260-2269
300 ; 2270-2279
310 ; 2280-2289
320 ; 2290-2299
330 ; 2300-2309
340 ; 2310-2319
350 ; 2320-2329
360 ; 2330-2339
370 ; 2340-2349
380 ; 2350-2359
390 ; 2360-2369
400 ; 2370-2379
410 ; 2380-2389
420 ; 2390-2399
430 ; 2400-2409
440 ; 2410-2419
450 ; 2420-2429
460 ; 2430-2439
470 ; 2440-2449
480 ; 2450-2459
490 ; 2460-2469
500 ; 2470-2479
510 ; 2480-2489
520 ; 2490-2499
530 ; 2500-2509
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550 ; 2520-2529
560 ; 2530-2539
570 ; 2540-2549
580 ; 2550-2559
590 ; 2560-2569
600 ; 2570-2579
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620 ; 2590-2599
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650 ; 2620-2629
660 ; 2630-2639
670 ; 2640-2649
680 ; 2650-2659
690 ; 2660-2669
700 ; 2670-2679
710 ; 2680-2689
720 ; 2690-2699
730 ; 2700-2709
740 ; 2710-2719
750 ; 2720-2729
760 ; 2730-2739
770 ; 2740-2749
780 ; 2750-2759
790 ; 2760-2769
800 ; 2770-2779
810 ; 2780-2789
820 ; 2790-2799
830 ; 2800-2809
840 ; 2810-2819
850 ; 2820-2829
860 ; 2830-2839
870 ; 2840-2849
880 ; 2850-2859
890 ; 2860-2869
900 ; 2870-2879
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920 ; 2890-2899
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960 ; 2930-2939
970 ; 2940-2949
980 ; 2950-2959
990 ; 2960-2969
1000 ; 2970-2979
1010 ; 2980-2989
1020 ; 2990-2999
1030 ; 3000-3009
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1050 ; 3020-3029
1060 ; 3030-3039
1070 ; 3040-3049
1080 ; 3050-3059
1090 ; 3060-3069
1100 ; 3070-3079
1110 ; 3080-3089
1120 ; 3090-3099
1130 ; 3100-3109
1140 ; 3110-3119
1150 ; 3120-3129
1160 ; 3130-3139
1170 ; 3140-3149
1180 ; 3150-3159
1190 ; 3160-3169
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1210 ; 3180-3189
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14640 ; 8610-8619
14650 ; 8620-8629
14660 ; 8630-8639
14670 ; 8640-8649
14680 ; 8650-8659
14690 ; 8660-8669
14700 ; 8670-8679
14710 ; 8680-8689
14720 ; 8690-8699
14730 ; 8700-8709
14740 ; 8710-8719
14750 ; 8720-8729
14760 ; 8730-8739
14770 ; 8740-8749
14780 ; 8750-8759
14790 ; 8760-8769
14800 ; 8770-8779
14810 ; 8780-8789
14820 ; 8790-8799
14830 ; 8800-8809
14840 ; 8810-8819
14850 ; 8820-8829
14860 ; 8830-8839
14870 ; 8840-8849
14880 ; 8850-8859
14890 ; 8860-8869
14900 ; 8870-8879
14910 ; 8880-8889
14920 ; 8890-8899
14930 ; 8900-8909
14940 ; 8910-8919
14950 ; 8920-8929
14960 ; 8930-8939
14970 ; 8940-8949
14980 ; 8950-8959
14990 ; 8960-8969
15000 ; 8970-8979
15010 ; 8980-8989
15020 ; 8990-8999
15030 ; 9000-9009
15040 ; 9010-9019
15050 ; 9020-9029
15060 ; 9030-9039
15070 ; 9040-9049
15080 ; 9050-9059
15090 ; 9060-9069
15100 ; 9070-9079
15110 ; 9080-9089
15120 ; 9090-9099
15130 ; 9100-9109
15140 ; 9110-9119
15150 ; 9120-9129
15160 ; 9130-9139
15170 ; 9140-9149
15180 ; 9150-9159
15190 ; 9160-9169
15200 ; 9170-9179
15210 ; 9180-9189
15220 ; 9190-9199
15230 ; 9200-9209
15240 ; 9210-9219
15250 ; 9220-9229
15260 ; 9230-9239
15270 ; 9240-9249
15280 ; 9250-9259
15290 ; 9260-9269
15300 ; 9270-9279
15310 ; 9280-9289
15320 ; 9290-9299
15330 ; 9300-
```

3. Array Index store created by the operators m/c holding the parameters of each array string and its location. This is created by the M/C during Write operations, and is located from SC150 (just above the operator M/C).  
4. String Store located from \$D90 onwards under the Kernal Rom.

## Index Array Store SC150(4B488) Upwards

This holds the references for each String stored in the array. The conventional two-dimensional array is  $ASN(Y)$ . I've called the X value REC and the Y value COL (abbreviations for Record No. and Column No - this gave me a better mental picture), although I've used X and Y in the Basic to transfer the requisite array block references. Thus the Array Index holds the following in regular 5 byte blocks:

1st byte LEN length of the string  
2nd byte REC is X value  
3rd byte COL is Y value  
4th byte Labyte of string address  
5th byte Hlyte of string address

Thus a search up the Index array in 5 byte steps will find REC and COL (if they exist), hence LEN can be found, as well as the address at which to read the string.

## No Blanks - "" Or Nulls Stored

If a search of the index array fails to find a particular X,Y combination, the M/C generates a "". There are thus no "" or null strings stored in the array, which saves both index and string store memory, particularly as in many array applications the array consists mainly of blanks or nulls?

## Description of M/C

Read this in conjunction with the source and m/c listing, (fig1). After some address definitions, lines 76 to 180 set the variables, most of which will be obvious, but some merit some reference.

INADD1&2 always contains the (o/h) address of the start of the next Index array to be written to (initially SC150 & C151).

STADD1&2 similarly always contains the start of the next String address to be written to (initially \$D90 under Kernal).

MAXREC and its next byte (o/h) always contains the total number of strings which have been written, ie. No. of X,Y combinations.

SCHPTR and its next byte (o/h) is a search counter used by the m/c program to keep track of its search loop.

AMND is a single byte flag used to define when an Amend is to be carried out.

Lines 180-270 are the initialization routine, hence a SYS49184 (BCORC) must be called since at the beginning of your Basic Program, the m/c returning via the RTS in line 278, having set the start addresses of the Index array and the string store.

## Write Operations

Write operations commence in line 280 called by SYS49185 (SCORC), the address of the next Index array byte is then obtained, and LEN, REC, COL, STADD1 and STADD2 stored in sequence via lines 280-480, thereby creating the next (or first) element of the Index array store.

Lines 500-578 increment INADD 1&2 by 5 ready for the next write operation. Lines 580-750 get the next string address (STADD1&2), and read the buffer store (which is the string to be stored) into the memory via a loop between lines 690-730. Lines 650-670 & 740-750 deal with interrupts and switch the Kernal Rom out and in before and after the actual write to memory operations. Lines 770-848 update STADD1&2 ready for the next write operation, the sequence ending at line 850 with a return to Basic.

## Read Operations

Read operations commence at line 800 called by SYS49205 (SCORF). Having set SCHPTR to zero and set the Index array start address in ZP&ZP+1 via lines 910-970, it searches for RECNO, advancing up the Index array via the branch in line 1010 (testing SCHPTR against MAXREC on the way for read of Index), the branch at line 1230 returning to TEST1 at each Index array address advance (all via lines 1080-1230).

If RECNO is found at the branch test in line 1010, it then immediately checks for COL, since we're looking for both RECNO and COL in the NAME Index array record (lines 1070-1080). The branch line at 1050 shows that both RECNO & COL are found sending operation to lines 1290-1540 to read the string. Failing the branch at 1050 leads directly to 1230-1040 to advance further up the Index as above.

Reading the string is the inverse of a Write operation, get string length,

get string address, switch out Kernal rom (preventing interrupts, read string into buffer via the loop in lines 1460-1510, reset Kernal, reset interrupts and return to Basic via RTS in line 1540).

Two points to note:  
1. Failure at the branch in line 1230 occurs if the particular RECNO/COL combination can't be found in the Index array, and leads on to lines 1240-1270, whereby a Blank character is returned prior to the return to Basic via RTS in line 1280.

2. Immediately on entry to the read string coding (lines 1290-1780), a check is made to see if an amend operation is intended (lines 1290-1300).

## Amend Operation

To save coding, this uses the search part of the Read and Write operations to rewrite a 55 and a Read operation is called. The program then finds the Index array record, but on branching to the read String section and AMND check in lines 1290-1300 directs the program to lines 1610-1680.

If an amend is inadvertently attempted on a RECNO/COL combination not present in the array no harm is done, and the program exits at RTS in line 1280 having set a "-" in the buffer, but without writing anything.

Lines 1610-1680 set LEN,RECNO and COL, to "" in the Index array, and then jump to the WRITE coding to write a new record from the buffer at a new string address which will have the original RECNO/COL references in its new Index.

Since we don't use a "" as either a RECNO or COL reference, the old Index record and its associated string won't now be found, but the new Index and string will. This leaves the Index array and String store arrays containing redundant data, but both will be removed and memory recovered when the array is next saved to disk or tape and subsequently reloaded!

## Procedure

To use the array program (having loaded it to memory and called the initialization routine) we need the following actions in our Basic routine.

### WRITE

1. Poke string length (LEN), RECNO (x value), COL (y value) into locations 49152, 49153 and 49154 respectively.
2. Evaluate Lx(H) values of MAXREC (total number of X, Y records)

Figure 2

67	40000	REP	*****	68	40090	OPEN	FILE
68	40010	REP	WRITE COMMUNICATING	69	40020	FOR	INDEXED, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

and Poke into 49158 and 49160.

3. Poke the string characters into locations 49442 onwards, but beware of limit of length.
4. Call SY549035.

#### READ

1. Poke RDCND and COL into locations 49151 and 49154.
2. Call SY549035.
3. PEEK49152 for string length
4. PEEK49442 onwards to length of string to reassemble string record.

#### AMEND

1. Carry out a read operation, if a "-" is returned proceed to WRITE, N.B. You'll probably need a read and display before attaching a record to see what was there anyway! If not a "-" character
2. Poke RDCND and COL to locations 49151 and 49154.
3. Increment MAXREC, evaluate Lx/H values, poke to 49034 and 49160.
4. Increment a Basic Counter to keep track of the number of amend operations.
5. Poke 91 to 49983 (AMEND Flag).
6. Poke new string length into 49152.
7. Poke the new string characters to 49442 onwards.
8. Call SY549035 (Read Operation).
9. Poke 9 into 49163 (Next AMEND).

Obviously, the three preceding Basic operations could be subroutines to be called as needed within your program.

Fig. 2 shows the Communicating Basic routines ready for use as Open, Rep, or the Write and Read Input. Output string variable, whilst ZS is the Amend Input variable, thereby enabling checks to be carried out.

The Communicating Basic shown also enables a record to be deleted using the AMEND operation by typing a "-" character.

## Loading and Saving the Array

Figure 3 shows the coding needed to save a sequential file of the array and is conventional, apart from the following points. M% is the Basic counter for MAXREC, the total number of records.

AM% is a counter for the number of amend operations carried out, since each amend operation increments M% but resets the original record (up to now still in memory) so that it cannot be read, it is necessary to decrement M% by the number of amend operations. This is carried out by line 5070.

Since the original of the amended record cannot be read, the save operation removes it from the array file, and on reloading the necessary space it used is thereby increased. An unusual garbage collect routine!

Lines 50140/50150 read the array and prevents blank records being written to the file - since blanks are all generated by the m/c program, they're not filed.

It's essential to save MAXREC, and usually necessary to know the range of X and Y values in the array - these are saved as M%, H and N. Note that in lines 50160-50180 the particular X,Y values are saved with each string.

Unlike most sequential files, the load program does not have to be a mirror image of the save program. MAXREC is the number of records in the file, so a simple loop of MAXREC (via test in 50020) reads every item. Since each record includes its X,Y values, the whole array is easily reconstructed using the Write operation.

Obviously for Tape operations all the OPEN and CLOSE commands need variable corrections.

Figure 3

40	50000	REP	*****
41	50010	REP	WRITE RECORD
42	50020	REP	WRITE NEW ARRAY
43	50030	REP	*****
44	50040	REP	*****
45	50050	REP	WRITE RECORD
46	50060	PRINT	*****
47	50070	PRINT	*****
48	50080	PRINT	*****
49	50090	PRINT	*****
50	50100	PRINT	*****
51	50110	PRINT	*****
52	50120	PRINT	*****
53	50130	PRINT	*****
54	50140	PRINT	*****
55	50150	PRINT	*****
56	50160	PRINT	*****
57	50170	PRINT	*****
58	50180	PRINT	*****
59	50190	PRINT	*****
60	50200	PRINT	*****
61	50210	PRINT	*****
62	50220	PRINT	*****
63	50230	PRINT	*****
64	50240	PRINT	*****
65	50250	PRINT	*****
66	50260	PRINT	*****
67	50270	PRINT	*****
68	50280	PRINT	*****
69	50290	PRINT	*****
70	50300	PRINT	*****
71	50310	PRINT	*****
72	50320	PRINT	*****
73	50330	PRINT	*****
74	50340	PRINT	*****
75	50350	PRINT	*****
76	50360	PRINT	*****
77	50370	PRINT	*****
78	50380	PRINT	*****
79	50390	PRINT	*****
80	50400	PRINT	*****
81	50410	PRINT	*****
82	50420	PRINT	*****
83	50430	PRINT	*****
84	50440	PRINT	*****
85	50450	PRINT	*****
86	50460	PRINT	*****
87	50470	PRINT	*****
88	50480	PRINT	*****
89	50490	PRINT	*****
90	50500	PRINT	*****
91	50510	PRINT	*****
92	50520	PRINT	*****
93	50530	PRINT	*****
94	50540	PRINT	*****
95	50550	PRINT	*****
96	50560	PRINT	*****
97	50570	PRINT	*****
98	50580	PRINT	*****
99	50590	PRINT	*****
100	50600	PRINT	*****

## Change Size of Buffer

Since the Buffer array is located after the operative, MFC and before the start of the index array, all that's needed to increase/decrease the size of the Buffer is to raise or lower the start of the index array - i.e. address of START1. This is easy if you're working from the Source Code via an Assembler, otherwise POKE the revised address Lo/Hi bytes into SC022, C034 and SC04D, C0AF.

## Use RAM under Basic

This depends on exactly what you want. Replacing the use of the RAM under the Kernel ROM by that under the BASIC ROM only involves a change of address of START1 to \$4000 and a change of ROM/RAM switching code, see below.

If, however, you want to use BOTH RAMs giving 16k of array string space,

then proceed as follows:

1. Duplicate the M/C commencing at a revised address further up the \$C000-\$A000 memory space, not forgetting to change the Index Array start address (to an appropriate value) and string array START1 address to \$4000.
2. Change the ROM/RAM switching codes in lines 640, 1440 to \$40010410 (\$4 Data in Basic Rom) and the

Figure 4

40 100 ROM ADDRESS POINT TO A	40 470 ROM ADDRESS WRITE ADDRESS	10 800 ROM ADDRESS WRITE ADDRESS
40 110 ROM START1 SET TO ADDRESS	40 480 PRINT*PRINT*SPACE,SPACE,	10 810 POKE\$C022,\$C0AF0410410410
40 120 ROM START1 SET TO ADDRESS	40 490 PRINT*PRINT*FILE\$SPACE,SPACE	10 820 POKE\$C034,\$C0340410410410
40 130 ROM START1 SET TO ADDRESS	40 500 POKE\$C04D,\$C0AF0410410410	10 830 POKE\$C0AF,\$C0AF0410410410
40 140 ROM START1 SET TO ADDRESS	40 510 PRINT*PRINT*SPACE,SPACE,	10 840 POKE\$C022,\$C0AF0410410410
40 150 PRINT*PRINT*SPACE,SPACE,	40 520 PRINT*PRINT*SPACE,SPACE,	10 850 POKE\$C034,\$C0AF0410410410
40 160 PRINT*PRINT*SPACE,SPACE,	40 530 PRINT*PRINT*SPACE,SPACE,	10 860 POKE\$C04D,\$C0AF0410410410
40 170 PRINT*PRINT*SPACE,SPACE,	40 540 PRINT*PRINT*SPACE,SPACE,	10 870 POKE\$C022,\$C0AF0410410410
40 180 PRINT*PRINT*SPACE,SPACE,	40 550 PRINT*PRINT*SPACE,SPACE,	10 880 POKE\$C034,\$C0AF0410410410
40 190 PRINT*PRINT*SPACE,SPACE,	40 560 PRINT*PRINT*SPACE,SPACE,	10 890 POKE\$C04D,\$C0AF0410410410
40 200 PRINT*PRINT*SPACE,SPACE,	40 570 PRINT*PRINT*SPACE,SPACE,	10 900 POKE\$C022,\$C0AF0410410410
40 210 PRINT*PRINT*SPACE,SPACE,	40 580 PRINT*PRINT*SPACE,SPACE,	10 910 POKE\$C034,\$C0AF0410410410
40 220 PRINT*PRINT*SPACE,SPACE,	40 590 PRINT*PRINT*SPACE,SPACE,	10 920 POKE\$C04D,\$C0AF0410410410
40 230 PRINT*PRINT*SPACE,SPACE,	40 600 PRINT*PRINT*SPACE,SPACE,	10 930 POKE\$C022,\$C0AF0410410410
40 240 PRINT*PRINT*SPACE,SPACE,	40 610 PRINT*PRINT*SPACE,SPACE,	10 940 POKE\$C034,\$C0AF0410410410
40 250 PRINT*PRINT*SPACE,SPACE,	40 620 PRINT*PRINT*SPACE,SPACE,	10 950 POKE\$C04D,\$C0AF0410410410
40 260 PRINT*PRINT*SPACE,SPACE,	40 630 PRINT*PRINT*SPACE,SPACE,	10 960 POKE\$C022,\$C0AF0410410410
40 270 PRINT*PRINT*SPACE,SPACE,	40 640 PRINT*PRINT*SPACE,SPACE,	10 970 POKE\$C034,\$C0AF0410410410
40 280 PRINT*PRINT*SPACE,SPACE,	40 650 PRINT*PRINT*SPACE,SPACE,	10 980 POKE\$C04D,\$C0AF0410410410
40 290 PRINT*PRINT*SPACE,SPACE,	40 660 PRINT*PRINT*SPACE,SPACE,	10 990 POKE\$C022,\$C0AF0410410410
40 300 PRINT*PRINT*SPACE,SPACE,	40 670 PRINT*PRINT*SPACE,SPACE,	10 1000 POKE\$C034,\$C0AF0410410410
40 310 PRINT*PRINT*SPACE,SPACE,	40 680 PRINT*PRINT*SPACE,SPACE,	10 1010 POKE\$C04D,\$C0AF0410410410
40 320 PRINT*PRINT*SPACE,SPACE,	40 690 PRINT*PRINT*SPACE,SPACE,	10 1020 POKE\$C022,\$C0AF0410410410
40 330 PRINT*PRINT*SPACE,SPACE,	40 700 PRINT*PRINT*SPACE,SPACE,	10 1030 POKE\$C034,\$C0AF0410410410
40 340 PRINT*PRINT*SPACE,SPACE,	40 710 PRINT*PRINT*SPACE,SPACE,	10 1040 POKE\$C04D,\$C0AF0410410410
40 350 PRINT*PRINT*SPACE,SPACE,	40 720 PRINT*PRINT*SPACE,SPACE,	10 1050 POKE\$C022,\$C0AF0410410410
40 360 PRINT*PRINT*SPACE,SPACE,	40 730 PRINT*PRINT*SPACE,SPACE,	10 1060 POKE\$C034,\$C0AF0410410410
40 370 PRINT*PRINT*SPACE,SPACE,	40 740 PRINT*PRINT*SPACE,SPACE,	10 1070 POKE\$C04D,\$C0AF0410410410
40 380 PRINT*PRINT*SPACE,SPACE,	40 750 PRINT*PRINT*SPACE,SPACE,	10 1080 POKE\$C022,\$C0AF0410410410
40 390 PRINT*PRINT*SPACE,SPACE,	40 760 PRINT*PRINT*SPACE,SPACE,	10 1090 POKE\$C034,\$C0AF0410410410
40 400 PRINT*PRINT*SPACE,SPACE,	40 770 PRINT*PRINT*SPACE,SPACE,	10 1100 POKE\$C04D,\$C0AF0410410410
40 410 PRINT*PRINT*SPACE,SPACE,	40 780 PRINT*PRINT*SPACE,SPACE,	10 1110 POKE\$C022,\$C0AF0410410410
40 420 PRINT*PRINT*SPACE,SPACE,	40 790 PRINT*PRINT*SPACE,SPACE,	10 1120 POKE\$C034,\$C0AF0410410410
40 430 PRINT*PRINT*SPACE,SPACE,	40 800 PRINT*PRINT*SPACE,SPACE,	10 1130 POKE\$C04D,\$C0AF0410410410
40 440 PRINT*PRINT*SPACE,SPACE,	40 810 PRINT*PRINT*SPACE,SPACE,	10 1140 POKE\$C022,\$C0AF0410410410
40 450 PRINT*PRINT*SPACE,SPACE,	40 820 PRINT*PRINT*SPACE,SPACE,	10 1150 POKE\$C034,\$C0AF0410410410
40 460 PRINT*PRINT*SPACE,SPACE,	40 830 PRINT*PRINT*SPACE,SPACE,	10 1160 POKE\$C04D,\$C0AF0410410410
40 470 PRINT*PRINT*SPACE,SPACE,	40 840 PRINT*PRINT*SPACE,SPACE,	10 1170 POKE\$C022,\$C0AF0410410410
40 480 PRINT*PRINT*SPACE,SPACE,	40 850 PRINT*PRINT*SPACE,SPACE,	10 1180 POKE\$C034,\$C0AF0410410410
40 490 PRINT*PRINT*SPACE,SPACE,	40 860 PRINT*PRINT*SPACE,SPACE,	10 1190 POKE\$C04D,\$C0AF0410410410
40 500 PRINT*PRINT*SPACE,SPACE,	40 870 PRINT*PRINT*SPACE,SPACE,	10 1200 POKE\$C022,\$C0AF0410410410
40 510 PRINT*PRINT*SPACE,SPACE,	40 880 PRINT*PRINT*SPACE,SPACE,	10 1210 POKE\$C034,\$C0AF0410410410
40 520 PRINT*PRINT*SPACE,SPACE,	40 890 PRINT*PRINT*SPACE,SPACE,	10 1220 POKE\$C04D,\$C0AF0410410410
40 530 PRINT*PRINT*SPACE,SPACE,	40 900 PRINT*PRINT*SPACE,SPACE,	10 1230 POKE\$C022,\$C0AF0410410410
40 540 PRINT*PRINT*SPACE,SPACE,	40 910 PRINT*PRINT*SPACE,SPACE,	10 1240 POKE\$C034,\$C0AF0410410410
40 550 PRINT*PRINT*SPACE,SPACE,	40 920 PRINT*PRINT*SPACE,SPACE,	10 1250 POKE\$C04D,\$C0AF0410410410
40 560 PRINT*PRINT*SPACE,SPACE,	40 930 PRINT*PRINT*SPACE,SPACE,	10 1260 POKE\$C022,\$C0AF0410410410
40 570 PRINT*PRINT*SPACE,SPACE,	40 940 PRINT*PRINT*SPACE,SPACE,	10 1270 POKE\$C034,\$C0AF0410410410
40 580 PRINT*PRINT*SPACE,SPACE,	40 950 PRINT*PRINT*SPACE,SPACE,	10 1280 POKE\$C04D,\$C0AF0410410410
40 590 PRINT*PRINT*SPACE,SPACE,	40 960 PRINT*PRINT*SPACE,SPACE,	10 1290 POKE\$C022,\$C0AF0410410410
40 600 PRINT*PRINT*SPACE,SPACE,	40 970 PRINT*PRINT*SPACE,SPACE,	10 1300 POKE\$C034,\$C0AF0410410410
40 610 PRINT*PRINT*SPACE,SPACE,	40 980 PRINT*PRINT*SPACE,SPACE,	10 1310 POKE\$C04D,\$C0AF0410410410
40 620 PRINT*PRINT*SPACE,SPACE,	40 990 PRINT*PRINT*SPACE,SPACE,	10 1320 POKE\$C022,\$C0AF0410410410
40 630 PRINT*PRINT*SPACE,SPACE,	40 1000 PRINT*PRINT*SPACE,SPACE,	10 1330 POKE\$C034,\$C0AF0410410410
40 640 PRINT*PRINT*SPACE,SPACE,	40 1010 PRINT*PRINT*SPACE,SPACE,	10 1340 POKE\$C04D,\$C0AF0410410410
40 650 PRINT*PRINT*SPACE,SPACE,	40 1020 PRINT*PRINT*SPACE,SPACE,	10 1350 POKE\$C022,\$C0AF0410410410
40 660 PRINT*PRINT*SPACE,SPACE,	40 1030 PRINT*PRINT*SPACE,SPACE,	10 1360 POKE\$C034,\$C0AF0410410410
40 670 PRINT*PRINT*SPACE,SPACE,	40 1040 PRINT*PRINT*SPACE,SPACE,	10 1370 POKE\$C04D,\$C0AF0410410410
40 680 PRINT*PRINT*SPACE,SPACE,	40 1050 PRINT*PRINT*SPACE,SPACE,	10 1380 POKE\$C022,\$C0AF0410410410
40 690 PRINT*PRINT*SPACE,SPACE,	40 1060 PRINT*PRINT*SPACE,SPACE,	10 1390 POKE\$C034,\$C0AF0410410410
40 700 PRINT*PRINT*SPACE,SPACE,	40 1070 PRINT*PRINT*SPACE,SPACE,	10 1400 POKE\$C04D,\$C0AF0410410410
40 710 PRINT*PRINT*SPACE,SPACE,	40 1080 PRINT*PRINT*SPACE,SPACE,	10 1410 POKE\$C022,\$C0AF0410410410
40 720 PRINT*PRINT*SPACE,SPACE,	40 1090 PRINT*PRINT*SPACE,SPACE,	10 1420 POKE\$C034,\$C0AF0410410410
40 730 PRINT*PRINT*SPACE,SPACE,	40 1100 PRINT*PRINT*SPACE,SPACE,	10 1430 POKE\$C04D,\$C0AF0410410410
40 740 PRINT*PRINT*SPACE,SPACE,	40 1110 PRINT*PRINT*SPACE,SPACE,	10 1440 POKE\$C022,\$C0AF0410410410
40 750 PRINT*PRINT*SPACE,SPACE,	40 1120 PRINT*PRINT*SPACE,SPACE,	10 1450 POKE\$C034,\$C0AF0410410410
40 760 PRINT*PRINT*SPACE,SPACE,	40 1130 PRINT*PRINT*SPACE,SPACE,	10 1460 POKE\$C04D,\$C0AF0410410410
40 770 PRINT*PRINT*SPACE,SPACE,	40 1140 PRINT*PRINT*SPACE,SPACE,	10 1470 POKE\$C022,\$C0AF0410410410
40 780 PRINT*PRINT*SPACE,SPACE,	40 1150 PRINT*PRINT*SPACE,SPACE,	10 1480 POKE\$C034,\$C0AF0410410410
40 790 PRINT*PRINT*SPACE,SPACE,	40 1160 PRINT*PRINT*SPACE,SPACE,	10 1490 POKE\$C04D,\$C0AF0410410410
40 800 PRINT*PRINT*SPACE,SPACE,	40 1170 PRINT*PRINT*SPACE,SPACE,	10 1500 POKE\$C022,\$C0AF0410410410
40 810 PRINT*PRINT*SPACE,SPACE,	40 1180 PRINT*PRINT*SPACE,SPACE,	10 1510 POKE\$C034,\$C0AF0410410410
40 820 PRINT*PRINT*SPACE,SPACE,	40 1190 PRINT*PRINT*SPACE,SPACE,	10 1520 POKE\$C04D,\$C0AF0410410410
40 830 PRINT*PRINT*SPACE,SPACE,	40 1200 PRINT*PRINT*SPACE,SPACE,	10 1530 POKE\$C022,\$C0AF0410410410
40 840 PRINT*PRINT*SPACE,SPACE,	40 1210 PRINT*PRINT*SPACE,SPACE,	10 1540 POKE\$C034,\$C0AF0410410410
40 850 PRINT*PRINT*SPACE,SPACE,	40 1220 PRINT*PRINT*SPACE,SPACE,	10 1550 POKE\$C04D,\$C0AF0410410410
40 860 PRINT*PRINT*SPACE,SPACE,	40 1230 PRINT*PRINT*SPACE,SPACE,	10 1560 POKE\$C022,\$C0AF0410410410
40 870 PRINT*PRINT*SPACE,SPACE,	40 1240 PRINT*PRINT*SPACE,SPACE,	10 1570 POKE\$C034,\$C0AF0410410410
40 880 PRINT*PRINT*SPACE,SPACE,	40 1250 PRINT*PRINT*SPACE,SPACE,	10 1580 POKE\$C04D,\$C0AF0410410410
40 890 PRINT*PRINT*SPACE,SPACE,	40 1260 PRINT*PRINT*SPACE,SPACE,	10 1590 POKE\$C022,\$C0AF0410410410
40 900 PRINT*PRINT*SPACE,SPACE,	40 1270 PRINT*PRINT*SPACE,SPACE,	10 1600 POKE\$C034,\$C0AF0410410410
40 910 PRINT*PRINT*SPACE,SPACE,	40 1280 PRINT*PRINT*SPACE,SPACE,	10 1610 POKE\$C04D,\$C0AF0410410410
40 920 PRINT*PRINT*SPACE,SPACE,	40 1290 PRINT*PRINT*SPACE,SPACE,	10 1620 POKE\$C022,\$C0AF0410410410
40 930 PRINT*PRINT*SPACE,SPACE,	40 1300 PRINT*PRINT*SPACE,SPACE,	10 1630 POKE\$C034,\$C0AF0410410410
40 940 PRINT*PRINT*SPACE,SPACE,	40 1310 PRINT*PRINT*SPACE,SPACE,	10 1640 POKE\$C04D,\$C0AF0410410410
40 950 PRINT*PRINT*SPACE,SPACE,	40 1320 PRINT*PRINT*SPACE,SPACE,	10 1650 POKE\$C022,\$C0AF0410410410
40 960 PRINT*PRINT*SPACE,SPACE,	40 1330 PRINT*PRINT*SPACE,SPACE,	10 1660 POKE\$C034,\$C0AF0410410410
40 970 PRINT*PRINT*SPACE,SPACE,	40 1340 PRINT*PRINT*SPACE,SPACE,	10 1670 POKE\$C04D,\$C0AF0410410410
40 980 PRINT*PRINT*SPACE,SPACE,	40 1350 PRINT*PRINT*SPACE,SPACE,	10 1680 POKE\$C022,\$C0AF0410410410
40 990 PRINT*PRINT*SPACE,SPACE,	40 1360 PRINT*PRINT*SPACE,SPACE,	10 1690 POKE\$C034,\$C0AF0410410410
40 1000 PRINT*PRINT*SPACE,SPACE,	40 1370 PRINT*PRINT*SPACE,SPACE,	10 1700 POKE\$C04D,\$C0AF0410410410







Output port that's responsible for telling the computer where Ram, Rom and Input/Output will appear within the computer's memory. A word of caution: this port also controls the cassette clock operations, so be careful, especially if you are not a drive user.

The port for the chip appears at address 0000 of the memory map, the Data Direction Register for the port at memory location 0000. Like all other ports of the system, this 6510 port is controlled by the Data Direction Register (known as the DDR). The DDR controls whether a given bit will be set for input or output. The actual transfer however, is carried out through the chip port.

If all this seems too complex to follow, look at Figure 3. This should help to make things a little clearer. The default values for the DDR are shown in Figure 4. The 1's signify an output and the 0's an input. Judicious tinkering with these control bits allows us to juggle around with memory.

Before showing the eight different

BREAKDOWN OF MEMORY FROM \$D000-\$DFFF		
\$D000-\$D0FF (DDR)	VIC CHIP (VIDEO CONTROLLER)	1K
\$D100-\$D1FF	SID CHIP (SOUND GENERATOR)	1K
\$D200-\$D3FF	COLOUR MEMORY	1K
\$D400-\$D4FF	CHAT (KEYBOARD)	N/A
\$D500-\$D5FF	CIAS (SERIAL/USER PORT (RS232))	N/A
\$D600-\$D6FF	OPEN I/O SLOT 1 (CP/M)	N/A
\$D700-\$D7FF	OPEN I/O SLOT 2 (CP/M)	N/A

FIGURE 3

the I/O devices are banked in, and the character Rom is not accessible (this is the normal state of affairs). When the line is set to 0, the character Rom is banked in, and the I/O devices cut (the processor only needs to access the Rom when downloading the character

Rom values, and not the Shadow Ram area).

I've mentioned the Input/Output devices. So just what are they? If you look at Figure 3, this gives you the breakdown of the 4K of memory from \$D000-\$DFFF, which is the I/O area.

As I said before, there are eight different memory configurations. But what they are best suited for, and how do you set them up? Figure 5 shows the table of the first four bits of the 6510 processor line - remember that this is location \$0001, and remember also what values are stored there to get each map.

TITLE	BIT POSITION	DIRECTION	BRIEF DESCRIPTION
LORAM	1	OUTPUT	CONTROL RAM/ROM AT \$D000-\$DFFF
BRAM	2	OUTPUT	CONTROL RAM/ROM AT \$D000-\$DFFF
CHAREN	3	OUTPUT	CONTROL ROM/CHAR AT \$D000-\$DFFF
	4	INPUT	CHARACTER MOTOR CONTROL
	5	OUTPUT	DATA BITTS MOTOR CONTROL

FIGURE 3

memory configurations available, a little more technical information is required. If you look at Figure 3 again,

BIT No.	5	4	3	2	1	0
BIT TO OUTPUT	1	0	1	1	1	1

NOTE: 1 = OUTPUT 0 = INPUT

FIGURE 4

you'll notice CHAREN, LORAM and BRAM. For those of you who don't know what these words mean here's an explanation:

**CHAREN**, which as you can see is controlled by bit 3, can be thought of as short for Character generator. Its sole purpose is to either bank in or bank out the 4K of character Rom. As far as your processor is concerned, the character generator sits at the same address space as the input/output device. When the line is set to a 1,

set into Ram. The Charen line can be overridden by certain other control lines in other memory configurations. **BRAM** is controlled by bit 1, and controls the operation of the Kernel Ram. If the line is set with a 1, the Kernel Rom appears in the processor space. By setting the line to 0, we can access the Ram underneath. This is an ideal place for storing screen data or music data.

**LORAM** controls the area of memory containing the Basic Rom. Set the line to 1, and you have access to the Rom. Set the line to 0, and you bank out the Rom and gain access to the Ram. Once again, this is an ideal place for storing data or text. Quickly referring back to Figure 1 again, you'll see that there are a total of three of these 'Shadow Ram' areas. If we write or poke to the Rom, the values we're writing will be stored in these Shadow Ram areas. If we read or peek however, the values returned are the

MAP NUMBER	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1
ONE	1	1	1	1	1
TWO	1	0	1	1	1
THREE	0	1	1	1	1
FOUR	0	0	1	1	1
FIVE	1	1	1	0	0
SIX	0	1	0	0	0
SEVEN	1	1	0	0	0
EIGHT	1	0	0	0	1

FIGURE 5

Map 1 gives you the default setting. In this setting you have Basic I/O, and 512K of user Ram. Map 2 allows you 64K of Ram, and the I/O devices. However, the user will have to write his own driver routines for any input/output operations.

Map 3 is rather an interesting one. You are provided with the I/O devices, Kernel Rom and 512K of Ram. This set-up is best suited for CP/M operations. Map 4 allows for all 64K of Ram. However, for any input/output activity, the Rom at \$D000-\$DFFF must be banked in again. Map



5 is the standard configuration when using an expansion cartridge, and it's ideal also for writing your own extensions to Basic.

Map 6 gives us 40K of Rom, plus an extra 1K of plug-in Rom for applications that don't require Basic. Map 7 allows us 32K of user Rom and 16K of plug-in Rom. Once again, this is ideal for applications that don't require the use of Basic. Finally, Map 8 is what's known as the "Ultimate Video Game" map (I've never actually come across this set-up).

That more or less concludes our tour around memory - I hope that things are a little clearer by now. Try experimenting yourselves (you won't harm the computer - lock it up if you need to). There follows a short example of putting some of this knowledge into use. Suppose you've written a short extended basic program. Underneath Basic Rom, you will probably have put some of the essential data (data for F-key redirection).

However, at some stage you'll want

to read the directory of a disk. To do this you will need the Rom banked in. Therefore, your coding may look something similar to this:-

```
LDA $01
ORA # $01
STA $01
read directory
LDA $01
AND # $FE
STA $01
return
```

This is only a very simplified example - I'll leave the rest to your imagination.

# News Maker 128

Can you really use a C128 for desk-top publishing?

Gordon Davis investigates News Maker 128



**D**TP programs for the C128 are uncommon animals. This means that the 128 is not the prime choice for a prospective publisher - anyone with serious magazine requirements will look at a Mac, or at least an Amiga. Those must be a fair number of C128 owners, however, who would welcome the chance to try their hands at DTP, particularly when it comes to producing small newsletters and things of that sort.

News Maker 128 seems to be aimed at this sort of market area. It's produced by Free Spirit, a Californian software house which also turned out Sketchpad 128, a graphics package which is also compatible with News Maker. Like Sketchpad, News Maker is written in Basic 8. This is an advanced, graphics-orientated Basic for the C128 published by Watson's last year.

## Hardware requirements

Again like Sketchpad, News Maker requires the use of a Commodore 128 mouse or a similar type, so purchasers will have to take this into account as a possible hidden cost. Apart from this, it will work with a standard C128D, but C128 owners will have to have the 64K Video Ram chips installed.

To those unfamiliar with DTP, this is basically a matter of page layout. Like most such packages, News Maker will allow you to place both text and graphics in a multi-column format on an image of a printed page. Five preset page formats are supported. The standard one is three columns with a header area which spreads all the way across the page. This is where you would put the title of your publication,

plus possibly a major headline. Two, four columns and other layouts are also available.

## Written words

Before you can get started knocking out your page, you'll need raw material. Text can be produced for the program by using an associated package on the same disk called Note Pad. Note Pad is a base-level wordprocessor with almost no features to speak of.

It would have been helpful if Free Spirit had specified alternative word-processors whose files were compatible with News Maker. I'm sure there are some, but users will have to figure that out for themselves.

Once your text files have been prepared, you can 'pour' them into the columns in News Maker. This simply makes the text conform to a given rectangular area. Of course, some control over text size and style is essential to any DTP package, and News Maker is no exception. A number of fonts are available on disk, and text can be displayed in any of these over a number of different typelines.

## Is it art?

The other essential element we need on a page is graphics. The manual is more forthcoming about this. Art can be imported into News Maker from any other Basic 8 or graphics package. In practice, this cuts the possibilities down a lot, since the only two I can think of are Sketchpad 128, Free Spirit's own, and the Graphics demo on the Basic 8 program disk itself.

So that as a rule, Clip art, known

by the program as a 'brush' file, can be loaded from disk and dumped into a rectangular area, just like text. Of course, that isn't quite enough to produce a professional-looking page. The user will need to modify the graphics and add extra elements such as lines and blocks to the screen.

Modifications to the pictures are quite basic. They can be reversed, flipped or mirrored, besides of course being cropped for size. Besides this, you can also use all tools to draw lines, boxes and circles wherever you wish on the screen.

The thickness of any of these in pixels can also be specified, and can be anything from one to nine. You can also draw graphics freehand, although I would not especially recommend this. A useful zoom feature also allows you to adjust individual pixels, and needless to say you can also erase areas of the page.

That's about the size of it. News Maker is not the most cosmic program I've ever seen, but it doesn't have much competition in its area. Provided you don't want to do anything too advanced, it may well meet your needs, particularly for small requirements-like newsletters.

But beware of hidden costs. Besides the 128D mouse, plus video Ram for C128, as opposed to C128D users, you will really need a copy of Sketchpad 128, even the same authors. News Maker, by the way, suffers from the same unappealing documentation as the other program.

## Conclusion

**File:** News Maker 128. **Supplier:** FSL, 28 High Street, Parkside, Worcester-shire, WR9 3BQ. **Tel:** (0866) 451111. **Price:** £24.95.

# Tech Troubles

*A crop of problems from the postbag ably answered by our agony uncle, Andy Andrews*



**I**'ve been thinking of getting a printer for my C128D but all this talk about RS232, Centronics and serial interfaces totally confuses me. Can you tell me what the differences are and why Centronics interfaces seem to be either very cheap or incredibly expensive?

Sid Kenyon, Bolton, Cornwall

Dear Sid,

It's no wonder you're confused, because I could write a hefty tome about printers and interfaces. Basically, there are three types of printers available for the C128 and the other eight bit Commodore machines. Since you are asking about interfaces, I will presume that you've decided that

the Commodore printer don't fit your needs. This means we are left with Centronics and RS232 machines.

All types of printers do roughly the same job, it's just the extra facilities that differ from manufacturer to manufacturer and the way in which the information is passed from the computer to the printer. RS232 and Centronics are the names of two different methods of transmitting data.

RS232 is a general purpose interface which is designed so that the computer can send and receive data. This interface is used for applications such as modem linking and peripheral control systems. A printer falls into this latter category but in my opinion an RS232 link is wasted on most printers. A printer doesn't need sophisticated communications because its vocabulary only consists of *feed me some data and busy - please wait*. My main criticism of RS232 is that the computer will need an RS232 interface plus driver software. The software is the real problem because although many commercial software packages contain an RS232 driver, an awful lot don't and it is usually impossible to patch your own driver into the system because of software protection tricks.

The driver program serves two purposes. Firstly, it sets up the correct communications link (protocol) so that the printer receives the data in a particular form. Secondly, it acts as a translator because Commodore don't use standard ASCII characters but printers do (except Commodore's own, of course). You may have used Commodore's ASCII codes, these are the numbers allocated to letters, number characters and the graphics shapes that are produced using the SHIFT and CRM keys. For example, when the Commodore is in the mode that allows upper and lower case together, a lower case 'a' is allocated the decimal value of 65 and a capital 'A' is CHR\$ 67. In four ASCII the opposite rule applies and 'A' is 65 but 'a' is 97. This is only one of the problems and when the graphics characters are considered the situation becomes extremely complicated.

My advice is to forget about RS232 and concentrate on Centronics interfacing because the majority of manufacturers favour this system and interfacing is much simpler.

A basic Centronics interface consists of a lead which connects directly into the printer from the computer's user port. Once again a

translation program is needed and this carries the same warning that I gave about BS232 drivers - it won't work in every situation. As you correctly point out, the price range can be confusing, until you realize that Commodore interfaces come in two forms: the basic lead that costs around £10 (including software), and the Centronics interface module that starts around £30 but can cost as much as £80 plus.

The interface module has several advantages but the main one is that it connects to the serial port, leaving the user port free for other applications. The reason that this is possible is that the module does the job of translating Commodore ASCII into standard ASCII and that means that driver software is unnecessary. Many interfaces can be switched so that the computer thinks that it is finding a Commodore printer while the printer thinks it's found its perfect partner. Consequently, the interface will work with any software and, when the user has mastered the use of the printer in this mode, the interface can be switched to allow access to any advanced features which the printer may possess.

In a nutshell, a Centronics printer with an interface module is the perfect combination for use with the C128, C14, C16 or Plus 4. It may not even add to the cost of the printer because some manufacturers include an integral interface into the cost of the machine but this may mean buying a new interface when upgrading the computer in the future. The risk is whether the interfaces will still be available when upgrade time arrives!

I'll now favour to express a printer preference it would be a Citizen (2012 (around £160) or a Star Microdots LCN (around £190) which both have a Commodore interface option. Since I have an unquenchable thirst for hardware availability, I would go for the Centronics versions of these machines and add an interface to the cost (and it means money, if you like!). At the bottom end of the range there is the Super-G interface (around £15) but the Raik Rayer is the Super Graphics Gold interface (£99.95) with a XLE buffer and graphics facilities which make it worth every penny.

**I** recently bought a 1541C disk drive but I can't seem to get the save and replace command to work. My wordprocessor seems to save and replace alright but for some reason whenever I try to do it from Basic it fails. I'm a complete beginner and I want to check that it's not my fault before I return it for repair.

Ken Curtis, Rippon, N Yorks

Dear Ken,

I hesitate to say this but I think the fault lies in your syntax. What you should be typing is:

**SAVE "0 program",A**

Please check it carefully and let me know if it works before doing anything else!

As a beginner, you may not be aware that this command should come with a Government Health Warning. The 1541 is a reasonably good drive but it does have some bad habits where save and replace is concerned. There appears to be a very nasty bug which snarls up the system occasionally when this command is executed. The result is that the newly saved program will load back with no problems but it may have overwritten part of an existing program on the disk. To avoid this I prefer to attach the program using OPEN 13,8,15:PRINT#13,"0 program";CLOSE13. Then the program in the computer can be saved with the normal SAVE command.

**I** got a copy of Activision's Music Studio as a Christmas present but it won't load. Every time I try it crashes out. I have tried taking it back to the shop but the man there tried it on their C64 and it worked perfectly. He said my cassette recorder must be faulty so I went back home and borrowed a friend's but it still wouldn't load even though it loaded on his alright. Is there something wrong with my computer?

Vera Mitchell, Billingham, Cleveland

Dear Vera,

No, if your computer loads everything else without any problems then there can only be one problem - you've got an old C64.

During its lifetime the Commodore 64 has gone through several changes and the various Commodore machines sometimes show this kind of incompatibility. I'm afraid that there is no way any way to your problem and all I can suggest is that you take the reply to the 'man in the shop' and see if you can get your money refunded. If not, send the whole package back to Activision by recorded delivery and I'm sure they'll replace it or refund your money - they're quite helpful like that. Incidentally, the address on the packaging is probably out of date. Their current address is Activision (UK) Ltd, Blake House, Manor Farm Road, Reading, Berks RG2 0JN

**I**'ve just bought an Amiga and I got Defender of the Crown because my friend has it on his C64 and I like playing it. Was I disappointed! Apart from the superb graphics, the game seems worse than the C64 version! How is this possible? Sometimes I leave some cats at my home castle and when I return I find they've been breeding like rabbits while I was away. The C64 soldiers don't seem to be as handy! Why?

Trevor James, Stratford, London

Dear Trevor,

Come off it - the Amiga version is still pretty good. I think you're being a little hasty with your comments but I must confess that there are a few bugs (any Commodore, I mean additional features) in the Amiga version which cause the problem that you've outlined. The reason this is different from the C64 version is that the programmers only realized that there was a problem after the game was released. At that time the C64 version was still in the pipeline and could be fixed before release.

*If you have a problem let us know and Andy will try to help. Write to: Tech Troubleshooter, Your Commodore, 1 Golden Square, London W1R 3AA.*

# Routine Programming

Serve up your menu options without making a hash of it

By Eric Dwyer

Menus are often characterized by lots of 'K' and 'Q' symbols, and listings of text. A simple subroutine can dole out the options without fuss.

A menu page consists of a title and a list of options, with some form of selection system. This subroutine menu displays any title and up to ten options, which can be selected by moving a highlighting bar up and down the screen and then pressing the RETURN key. Each directory entry can have up to 39 characters, and everything is beautifully centered on the screen.

The finished routine is not a fine example of variable usage because all of the assigned letters are the same, 'Z'. This is done to assist with the writing of the master program — as long as variables starting with Z are avoided, the programmer is free to use any variables without regard to any library routines that are to be employed. Debugging is thereby simplified, because the subroutines all work perfectly, and any faults must therefore lie in the master program.

## Starters For Ten

The subroutine needs certain variables passing to it so that it can work properly. The menu title is assigned to Z1, and up to ten options of line than 40 characters are each assigned to the array Z(1), where 1 is the option number. The total number of options is stored as variable Z. Limiting the options to a maximum of ten means that a DIM command isn't necessary.

The first line of the subroutine calculates the length of the title, and then checks for valid values of Z1 and Z. After the calling program is complete, this IF...THEN trap can be added.

```
8000 Z1=LEN(Z1) : IF=0ORZ1>39:
      EXITDP
```

The screen is then cleared by the next line, and the title centered by calculating the number of spaces to be left (Z2). Once this has been done, the text can usually be easily printed as the screen. The only exception occurs when the title occupies all 40 character spaces, because the next program line, which underlines the title, would be forced to print one line lower than desired. To avoid this, the PRINT statement is terminated with a semi-colon, and an extra PRINT command

is only executed if the title is less than 40 characters long.

```
8005 PRINT "CALL Z1"; Z1=LEN(Z1)+1
      PR=PRINT(2,0,0) : IF=LEN(PR)
      EXITDP
```

Using the Z2 value which was set for positioning the title, an underline character is printed to the same length as, and in a similar way to, the title.

```
8006 PRINT(2,Z2) : PRINT(1,LEN
      Z1); PRINT(2,Z2) : GOTO 1
      PR=PRINT(2,0,1)
```

The bottom of the screen carries the instructions for using the menu. After the cursor is positioned at a point three lines from the bottom of the screen, the message is printed in reverse characters to make it stand out.

```
8007 PRINT "HOME, COL=60, SP=0"
      :
      PRINT(2,0,0) : GOTO 1 : G
      TO OPTION WITH THE CURS
      OR
      8008 PRINT "TAB=LEN(LEN(Z1))
      AND TO SELECT IT"; PR
      EXITDP,LEN
```

Without the final command, the whole screen would scroll up as the first space was printed. Poking a value to location 2023 fills the space without invoking the scroll routine.

## The Main Course

To allow maximum flexibility, the number of menu options can range from between one and ten entries. This causes the problem of sensibly positioning the options on the screen. The solution is to derive the first line's screen position from the total number of options given in variable Z.

The formula in line 8008 does this, and the following line then prints sufficient cursor down's to locate the cursor on the correct line.

```
8009 Z1=7+Z-1: Z1=Z1-1: IF=LEN(Z1)
      PRINT(2,0,0) : FOR=1 TO Z1
      : PRINT(2,0,0); GOTO
```

Certain conditions have to be met so actually print the menu on the screen. All of the menu options must be less than 40 characters long, so a trap is included after the length is measured in line 8009. Another problem is ensuring each option on its line, and this is further complicated because of the decorative means of printing.

Instead of the normal left to right printing, the program reveals each option from the centre of the screen outwards.







contents of the two registers without losing any data. The exchange instructions are \*EXA, \*EYA, AND \*EYX.

## Mathematical Instructions

These are the instructions that allow calculations to be performed between the A register and either the X or Y register. In all cases, the X and Y registers are unaffected by the operations, and the the A register is altered to hold the result of the calculation. \*AXA adds the X register to the A register (Add X to A), and \*AYA adds the Y register to A. \*AAA adds the A register to A; i.e., it doubles the A register without using X or Y.

\*SXA subtracts the X register from A (Subtract X from A), and must have the A register larger than or equal to X or a system error results. \*SYA is identical but subtracts the Y register from A. \*MXA multiplies the X and A registers and \*MYA multiplies Y and A registers. If the numbers in both registers are large, then the result will exceed the normal limit of 1180 digits. The A register has been made twice the size of the other registers to allow this.

Multiplying two registers together will still give a valid result, even if both are set at the maximum number of digits, and the resulting number will be up to 16380 digits long. However, any further manipulation of the number is liable to produce errors. Subtraction will give correct results but addition, multiplication and even division may produce errors. Obviously transfers and exchanges with the other smaller registers are invalid, but are not flagged as errors.

\*MAT (Multiply A by Ten) multiplies the A register by ten without using X or Y registers. \*DVA divides X into A. The remainder from the integer-division is left in the A register, and the result of the division is in a temporary register, and can be swapped into A by \*ETA (Exchange Temp and A). \*DVA is similar for the Y register.

\*CNA compares the X and A registers and alters address Z as follows:

```
A < X PEEK(Z) returns 0
A > X PEEK(Z) returns 1
A < X PEEK(Z) returns 255 if 1 is 2's complement binary arithmetic)
```

The number should be read immediately, as several routines in the

calculator use address Z for temporary data storage. \*CTA is again similar.

\*INX increments the X register by 1 without affecting Y or A. There is no \*INY instruction; incrementing is only done on the X register. The incremental value is stored in RAM at \$C067 (\$1000), and can be altered if required to any valid BCD number, but once changed it will remain at the new increment value (I deliberately note: Invalid BCD numbers will cause erroneous results).

To convert a normal two digit decimal into BCD format, the first digit is multiplied by 10 and added to the second digit: eg. 27 becomes 2\*10+7=27, simply PEEK'ing 27 into \$C067 is NOT valid as 27 does not correspond to any BCD number.

## Input Output Instructions

\*IN inputs a number from the keyboard. Only the numeral keys and the delete key will affect the displayed number, and pressing the return key will terminate the input. Numbers of up to 8190 digits can be entered if required, (although there is no flashing cursor in the routine).

\*SIA (String Into A) enters a string of numbers into the A register. \*SIA is followed by a string in brackets eg. SIA ("12345678"). or \*SIA\$TR\$ (899745 2), the string must be an integer, but can be in exponential format, e.g. 2.45E12, but must be normalised to only one figure before the decimal point. The string is restricted by the usual BASIC string limitations. String variables are not suitable for this routine, and may give spurious answers.

\*PIA (Print A register) simply prints the A register to any active device: eg. screen or printer. Because the numbers are stored in pairs - two decimal digits per byte - the print routine will always print an even number of digits. If the number of digits is an odd, then a leading 0 will be printed so 125 will print as 0125.

\*KPD and \*KPT save (Keep) the contents of the A register to Disk or Tape respectively. Both require a name for the file to be saved eg. \*KPD"GOOGOL.". \*LDD and \*LDT reload a previously saved number back into the A register. The routine needs the name of the file to be reloaded eg. \*LDP"GOOGOL".

The mathematical routines are accurate but somewhat slow, as they use decimal rather than binary

arithmetic. The A register occupies the 8k of memory from 32768 to 40959 (\$8000-\$FFFF), and can be PEEK'ed from Basic. This register is twice the size of the X and Y registers as mentioned earlier, and if the A register exceeds 8190, digits then transfers and exchanges will not give valid results.

The size of the number in the A register is identified as an "offset" by the values held in \$2AB and \$2AC (\$81, \$82), and can be read using: PEEK(\$81)+PEEK(\$82)\*256/2=2

This will always give an even number of digits, so even if a single digit number is held, the expression will give the answer 2. Also it is considered a single digit number, and will retain an answer of 2. The X and Y registers are stored under the BASIC ROM, and are not directly accessible to BASIC programs; the temporary register mentioned in the divide routine can be used for extra storage, but the contents of this register are affected by both multiplication and division routines.

The BCD (Binary Coded Digit) format is not often used in CBM64 programs, since compared to binary it is wasteful of memory. The BCD format stores two decimal digits in each byte of memory, so a single byte can represent numbers from 0 to 99 (binary can store from 0 to 255 in a single byte).

In BCD, each half of the byte represents one digit.

```
Hex 07 = 014 0110
HIGH LOW
DIGIT DIGIT
```

Each half byte is called a nibble (and whoever thought up that pun of a name should be shot), and the number in each nibble is represented by normal binary arithmetic:

```
1 = 001
2 = 010
3 = 0011
4 = 0100
5 = 0101
6 = 0110
7 = 0111
8 = 1000
9 = 1001
```

The binary patterns 000, 011, 100, 1001, 1110 and 1111 are not allowed in BCD, and will generate errors if allowed to creep into BCD calculations. Ten in binary is 00001010, but in BCD is 00000000, and the bit pattern 0010000 is 10 in binary. So if you're trying to directly interpret other numbers, you must take care to use the BCD system.

# 80 Column Software

*How to get the most out of your 80 column chip*

*D. Kelsey*

**T**he C128 has been provided with an 80 column chip, but it has several facilities that aren't covered for by the operating system of the C128. There's a large amount of text available about the internal workings of this chip, and a brief description follows.

The 80 column chip has access to 16k of memory. This is expandable to 64k, and there are bits available that do this. It isn't possible to directly access this memory, as the 6502 processor can't actually 'see' it, so how is it accessed? Two memory locations are provided that communicate with the chip. One memory location contains a register number which is in the chip, and the other gives the contents.

Using this method, a register within the chip can be examined or changed. The registers provide different facilities, one of which is address selection of the 16k available, which then allows memory locations in the 16k to be read or modified. I won't go into how to access the registers.

The 80 column chip is capable of all sorts of interesting things. It can change the dimensions of the screen,

give you 26 lines by 80 columns if you want, then a light pen can be used on the 80 column screen, user defined characters are possible, and smooth vertical and horizontal scroll is also available. Many other strange functions can be done, but the most useful one and the one that will be discussed here is the ability to display high-resolution graphics.

Hi-res is possible on 80 columns, but if you only have 16k, there are some limitations. It isn't easy to show if you only have 16k available, but on the whole, if you haven't had an upgrade then you only have 16k on the C128. I gather that some very early versions of the C128 did actually have 64k.

These limitations are to do with the fact that to have both hi-res and colour of dimension 640x200 (which is the standard hi-res output for the 80 column chip, although it should be possible to increase this to over a million) you need more than 16k. To get around this, the screen size was reduced to allow colour and hi-res. The new dimensions were 640x176. If you display graphics in monochrome mode, then a full 640x200 can be displayed, as there is

no memory used for colour.

The programs presented here are concerned only with the facilities of hi-res, and a couple of useful text control options. The first program deals with manipulating the screen, and the second is a screen dump program that contains several special options to control how the screen is output.

## Where the program resides

This package is stored at 3F280 - 3F2FA. It will run in either bank 0 or bank 1. When loading this package, you should specify the bank. Although it should be possible to use this program with other languages, you may have to relocate the software using a relocation program. The one limitation is that it cannot be stored in address range 3D800 - 3DFFF.

It's possible for Basic to overwrite the code - to stop this you have to set up certain pointers.

```

Loading to Bank 0
  BANK 0:LOAD "BCOL.COM"
  POKE 4327,244:NEW
  
```

**Loading in Bank 1**

```
BANK 1:LOAD "80COL.DIB"
POKE 54,264:POKE 58,264:CLR
```

The pointers at the end are used to stop Basic from overwriting the code stored. This last step won't be necessary unless you have a very large Basic program, or use a large amount of variables, however it's a good idea to do this just in case.

**User Guide**

There has been no wriggle supplied to include extra Basic commands for these routines, but you may consider using the label-linker featured in the March '88 edition of Your Commodore to set up modular subroutines and allow easy access to these routines from Basic.

The following routines are provided - a description followed by a BASIC and machine code call will be given. Make sure you're in the appropriate bank before trying to call the routine.

**1. Poke80**

Description: provides the facility to poke to the 80 column memory

**BASIC:**

```
SYS DEC ("F208"),CO,INT(AD)/256,
256*AD-INT (AD)/256)*256
```

where

AD = Address

range 0..16383 for 64k

range 0..65535 for 64k

CO = contents to be stored

M/C:

LDA address hi

LDY address low

LDA data

JSR 5F208

**1. Poke80**

Description: provides the facility to poke the 80 column memory

**BASIC:**

```
SYS DEC ("F208"),INT (AD)/256,
AD-INT (AD)/256:RREG CO
```

AD = Address

range as above

CO = contents of address

M/C:

LDX address hi

LDY address low

JSR 5F208

STA data

**3. Mode select**

Description: allows the mode of the 80 column chip to be changed from

text to hi-res. The following options are available:

mode = 0 : display in text mode

mode = 1 : display 640x200 hi-res in monochrome

mode = 2 : display 640x175 hi-res in 16 colours

mode = 3 : display 640x200 hi-res in 16 colours (64k only)

The colour is displayed in the same way on hi-res as 40 columns. It's not possible to have a multicolour mode. If you have 64k and selected mode 2, selecting mode 0 will not clear the screen, in all the old text will be kept. BASIC:

```
SYS DEC ("F20C"),MO
```

MO = mode number (0..3)

M/C:

LDA mode

JSR 5F20C

**Important:** MODE 3 has not been tested. I haven't got 64k, so I wasn't able to test this mode. It is provided purely for a convenience for people with 64k.

**4a Set Background Colour**

Description: will set the background colour to the colour specified. In Hi-res colour mode the background colour is only displayed on the border. The actual screen colour stays black. BASIC:

```
SYS DEC ("F20F"),CL
```

CL = Colour number (0..15)

M/C:

LDA colour

JSR 5F20F

**4b Set foreground Colour**

Description: will set the foreground colour to the colour specified. Notice that this will only be noticed in 640x200 monochrome. BASIC:

```
SYS DEC ("F217"),CL
```

CL = Colour number (0..15)

M/C:

LDA colour

JSR 5F217

**5. Set point**

Description: sets a point on the hi-res screen

**BASIC:**

```
POKE 234,CL (colour hi-res only)
```

```
SYS DEC ("F215"),INT (X)/256, X-INT (X)/256)*256,Y
```

CL = colour

X = x co-ord range 0 - 639

Y = y co-ord

range 0 - 199 for monochrome and mode 3 with 64k

range 0 - 175 for mode 2

M/C:

LDY y-coord

LDX x-coord/low

LDA x-coord/hi

JSR 5F215

**6. Clear point**

Description: clears a point on the hi-res screen

**BASIC:**

```
POKE 234,CL (colour hi-res only)
```

```
SYS DEC ("F408"),INT (X)/256, X-INT (X)/256)*256,Y
```

CL = colour

X = x co-ord range as above

Y = y co-ord range as above

M/C:

LDY y-coord

LDX x-coord/low

LDA x-coord/hi

JSR 5F216

**4. Draw Line**

Description: draws a line from two specified points

**BASIC:**

```
POKE DEC ("F225")+1,INT (X1)/256
```

```
POKE DEC ("F225"),X1-INT (X1)/256)*256
```

```
POKE DEC ("F225"),Y1
```

```
POKE DEC ("F226")+1,INT (X2)/256
```

```
POKE DEC ("F226"),X2-INT (X2)/256)*256
```

```
POKE DEC ("F226"),Y2
```

```
SYS DEC ("F228"),1 - to clear a line
```

```
SYS DEC ("F228"),0 - to set a line
```

M/C:

LDA X1-coord/hi

STA 5F224

LDA X1-coord/low

STA 5F223

LDA Y1

STA 5F225

LDA X2-coord/hi

STA 5F227

LDA X2-coord/low

STA 5F226

LDA Y2

STA 5F228

LDA 0 (to set, 0=clear)

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

JSR 5F228

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JSR 5F228

JSR 5F228

JSR 5F228

```
POKE DEC ("F2H7")+LO-L, MID8
(7), LO, D
NEXT LO
POKE DEC ("F237"), LEN (7)
POKE DEC ("F237"), MO
SYS DEC ("F247"), INT (X/256), X-
INT (X/256)*256, Y
Where
```

```
X = X position on screen
Y = Y position on screen
MO = mode
0 = Upper case
64 = Reversed
128 = Lower case
192 = lower + reversed
M/C:
```

```
Place Text starting at $F214
LDA length
STA $F210
LDA addresshi
LDX addresslow
LDY rowcnt
JSR $F204
```

### 1. Draw Box

Description: this will draw a box on the screen and optionally fill it in.

```
BASIC:
POKE DEC ("F287")+1, INT (X1/
256)
POKE DEC ("F287"), X1-INT (X1/
256)*256
POKE DEC ("F289"), Y1
POKE DEC ("F28A")+1, INT (X2/
256)*256
POKE DEC ("F28C"), Y2
SYS DEC ("F28D"), MO, FF
Where
```

```
X1, Y1 = top left corner
X2, Y2 = bottom right corner of box
MO = draw mode, 1 = set, 0 = clear
FF = fill flag, 1 = fill box.
```

```
M/C:
LDA X1addresshi
STA $F288
LDA X1addresslow
STA $F287
LDA Y1
STA $F289
LDA X2addresshi
STA $F28B
LDA X2addresslow
STA $F28A
LDA Y2
STA $F28C
LDA MO (same as above)
LDX FF (same as above)
JSR $F28D
```

### 9. Swap Basic Screens

Description: allows two basic screens to be maintained from within a program. Not to be used in hi-res mode.

```
BASIC:
SYS DEC ("F12F"), CF
where
CF = clear flag, 1 = clear screen
```

```
M/C:
LDA CF
JSR $F21F
```

## Other routines

### 1. SWOP

This routine is similar to the BASIC SWOP routine, but doesn't update any of the Basic screen pointers. This may be useful for programs that don't utilize the screen controller in the operating system. The calling address is \$F22C. Register A is used as the clear flag, if A=0 then the screen isn't cleared. A=1 will clear the screen.

### 2. READ/WRITE registers

These routines allow reading of the registers from any BANK you are in. They are required for this package, and may be of some use to other programmers.

```
M/C:
LDX register number
JSR $F209
STA register contents
LDX register number
LDA value to be stored
JSR $F205
```

### 1. Block clear

The 80 column chip provides a rapid block data store facility. This routine allows easy access to this.

```
LDA start address hi
STA $F218
LDA start address low
STA $F20F
LDA No. of bytes hi
STA $F212
LDA No. of bytes low
STA $F211
LDA fill character
JSR $F213
```

## Example program

A commented demonstration program has been provided to give examples of how to use these routines. To load, type `LOAD "80C6MO"` and run at your leisure. Make sure that the 80 column package is also on the same disk as this program will try to load it.

## Ending comments

This package provides just the basics for hi-res control. The chip is capable

of many other things as well as described above, and if you are interested, a good book is the C128 programmers reference guide for further information.

## Screen Dump program

This program provides a screen dump facility for 80 columns. The first thing to note is that it isn't possible to fit a full screen on a hi-res picture onto a Commodore compatible printer - any hi-res print is actually printed sideways. A text dump is printed the correct way. Also note that all text dumps will be printed in upper case only.

The driver is stored at locations \$1800 - \$1A6F, and cannot really be located easily. To load the program, you type in the following: `BANK @BLOAD "S1800.DDU"`

The program MUST be loaded into RAM 0, so BANK 0 is usually a good choice. The screen dump has variable control information so that different parts of the screen can be dumped individually. Different types of output are also possible.

## Information required

The following information must be sent to the screen dump program before you start:

1. Starting X column on the screen.
2. Starting Y column on the screen.
3. Starting Printer column.
4. Ending X column on the screen.
5. Ending Y column on the screen.
6. Control flag.
7. screen mode.
8. address of hi-resolution information.
9. Address of colour information.

Most of this information can be automatically set up using the drive program provided. This driver will also set up the control starting and ending X,Y information, so that a whole screen is displayed. It will also select the correct screen mode and correct screen and colour addresses. The only information that needs to be set-up is the printer start column and the control flag.

## Printer Start Column

This is a value from 0 - 79 which specifies how many characters from the left hand margin should be indicated for the print, that is, it allows the output to offset from the left. Usually this value is zero.

To set this in Basic, BANK 0 POKE DEC (\*1307), P5  
 Where P5 = printer start column.

### Control Flag

This allows selection of the many facilities that the screen dump can provide. It is a binary flag, and requires some knowledge of binary to set-up.

```
128 64 32 16 8 4 2 1
X X E D C X R A
```

The bits A-E affect what the screen dump will do.

A,  
 0 prints one dot across for every screen pixel  
 1 refers to bit B

B,  
 0 prints two dots across for every screen pixel (if bit A is set)  
 1 prints three dots across for every screen pixel

C,  
 0 prints one dot down for every screen pixel  
 1 prints two dots down for every screen pixel

D,  
 0 Shade mode off  
 1 Shade mode on

E,  
 0 shade background as well as foreground  
 1 shade foreground only.

X,  
 This bit does nothing, so keep it 0.  
 The actual meanings will be described later.

Once you've decided which options you want, you can then work out the value by creating the bit pattern and then converting the number to decimal.

For example, I want to print 3 dots across and 2 dots down, that means I require A=1, B=1, C=1, this gives a bit pattern of

```
128 64 32 16 8 4 2 1
X X E D C X R A
0 0 0 0 1 0 1 1
```

Therefore, the number required is  $8 + 2 + 1 = 11$ .

To set the control flag, BANK 0 POKE DEC (\*1307), C0 where C0 = control flag. In the above case:  
 BANK 0 POKE DEC (\*1307), 11

### Description of options

**Dots Across:** you can specify up to

three dots here. For each screen pixel, three dots will either be printed/or skipped across the page. This has the effect of expanding the screen across the page.

**Dots Down:** similar to above, but expands the screen down the page.

**Shading:** most printers are not capable of printing colours, so a method of shading is provided to simulate colour. Depending on the colour found, a special shade is displayed, thus giving output more depth. Sometimes, it's useful not to include the background colour as a shading to be printed. The option to turn it on or off is available.

One thing to note is that if you try to shade a full screen, it may not fit on your printer. You'll then have to reduce the size of the screen output. The screen size control is described later.

### The driver

Once this information has been set up you can now call the driver. A flag is provided to say whether you want the full default option. If you want a full screen then you need to set the flag. In Basic, this is done by the command BANK 0 POKE DEC (\*1307), 1 (usually, you can be in any bank which has access to RAM 0). To run the SD program, type SYS DEC (\*1307).

### Selecting the screen dimensions

If you only want to print a portion of the screen, it's possible to select part of a screen to print. You must first turn off the default flag for the driver by typing BANK 0 POKE DEC (\*1307), 0 (again, it can really be any BANK which has access to RAM 0). To set up the dimensions type

```
POKE DEC (*1304), X5-INT (X5/256) *256 POKE DEC (*1304)+1, INT (X5/256)
POKE DEC (*1306), Y5
POKE DEC (*1308), X5-INT (X5/256) *256 POKE DEC (*1308)+1, INT (X5/256)
POKE DEC (*130A), Y5
where X5, Y5 is the top left hand corner of the screen
X6, Y6 is the bottom right hand corner of the screen
```

You have to make sure you get the dimensions right for the correct screen mode. For example, if I have a screen in hi-res with dimensions 640x176,

then I may set the screen print dimensions to:  
 X5 = 90; X6 = 309  
 Y5 = 20; Y6 = 173  
 a full screen has dimensions  
 X5 = 0; X6 = 639  
 Y5 = 0; Y6 = 189

### Defining your own screen addresses

If you have a good knowledge of the internal workings of the 80 column chip, then you may want to set up your own screen and attribute addresses where the screen dump program gets the information. This is possible by not going through the driver at all. To do this, you have to set up the following addresses

```
$130E screen low address
$130F screen hi address
$1310 attribute low address
$1311 attribute hi address.
```

Once this and all the above parameters are set up, you call the basic dump program by BANK 0 SYS DEC (\* 7).

### Screen Dump Key

The final facility is a screen dump key. If you want to make a copy of a screen, then a simple key press would be very useful. The screen dump key will go through the driver program, and the required parameters such as the control flag will need to be set.

To activate the screen dump key, type BANK 0 SYS DEC (\*3127).

To dump a screen, press CTRL.

To deactivate this facility, type BANK 0 SYS DEC (\*3115).

You may like to set up a boot program that loads the screen dump program and sets the default flag on, printer start and control information and activates the screen dump key. The key is automatically ready for use.

One final Note - you must be in a BANK which allows access to the address \$1300 in RAM 0. In the above examples, BANK 0 was used to do this, but this isn't the only choice, for example, BANK 12 would work just as well. Also once a bank is selected in, it stays in that bank until changed, so you only have to set the bank once.

### Demo Program

The Screen Dump key is activated during the running of the demonstration program. At any time you can get a screen dump, if you require one.

Some versions of Basic (though not, of course, the one you get with the C64) offer the programmer the facility to scroll part of the screen, and leave the rest permanently on display. This can be very useful if you want to show a table of results, with headings for each column and a set of instructions ("Press-any-key-to-halt") type of thing at the bottom.

You know damn well that if you try this with the C64, and the results occupy more than the 20-odd lines left on the screen, the heading will disappear off the top, and bits of the bottom line will stick out of one line and scroll up the screen with your data. So apart from being unable to remember what each column means, you're left with an un tidy display, and the frustration of not remembering the instructions telling you how to stop the flood of data!

While we're about it, there's no elegant way to set up that bottom line and then return to the top of the table in the first place—

```
10 PRINT[CLR,HOME] ITEM NUMBER PRICE TOTAL
20 PRINT OFF EACH COST
30 FOR I=0 TO 10 PRINT[DOWN];NEXT
40 PRINT " PRESS ANY KEY TO HALT"
50 PRINT[HOME];DOWN];
```

That's one solution, but it's a bit clumsy, isn't it? Again, some versions of basic give you a "PRINT-AT" command, which allows you to put a line of text anywhere on the screen at any time.

AUTOSCROLL contains two short machine code routines that give you these missing facilities. The scrolling routine works just like the normal screen scroll, except that it starts where the text matches the line you specify as "lower", and leaves the lines above the one you specify as "upper" where they are. You also get the normal facility for slowing the scroll by holding the "CTRL" key down.

The second routine simulates the "PRINT-AT" command, moving the cursor to the specified position anywhere on the screen. To keep things simple, and to minimize on the length of the code to be typed in, the routines are accessed via an "SYS" call, rather than by adding new words to basic. AUTOSCROLL was developed initially for use with the stan-

# Autoscroll

*Perfect scrolling is possible on the 64, and this program proves it*  
by Derek Tripp

forming program "TABULATE" that first appeared in the April 1988 issue of *Your Commodore*.

## Getting Autoscroll Into Your Own Programs

There are several ways in which you can get this routine into your library of goodies, and add it as required to new and existing programs. Which

of your own program. If you do it this way, leave out the "END" in line 6006, and change the variable LN in line 6009 and the "THEN" address in line 6001 to suit your new numbering system.

With either method, you'll have to type the whole thing in by hand each time you want to add it to an existing program, unless you have access to a "MERGE" or "APPEND" utility that does the job for you. For new programs, of course, you start by loading AUTOSCROLL and then write your own program before or after it, as the case may be.

You may "crunch" the loader program by omitting all the REM and spacing lines, and by the usual horrible trick of cramming as much onto one line as you can. Check-out the loader program at any stage as you enter it — it doesn't "self-destruct" as some loaders do! This allows you to be sure it's OK before you save it to disk or tape. However, don't try to shrink the machine code routines by the "SYS" call until you've saved the completed program!

If you have a utility cartridge or anything else that gives you access to a machine code monitor, you may enter the Basic Loader (just as it is given, run it, and then use the monitor to save the machine code file that's produced to your disk or tape. Don't forget to call this by a different name to the one you've used to save the Basic loader program, though!

Those of you with an assembler will probably prefer to use the listing given in that format. In this case, you can relocate the routines as you wish to avoid clashing with any other programs you may want to use with them.

If you end up with a machine code file from using an assembler or monitor, you can load this from a suitable line in your Basic masterpiece

way you choose will depend on the number of utilities, other versions of Basic etc, you have, or can borrow!

For those who have no "add-ons" of any kind, a Basic loader listing is given. There are two ways of using this loader. The most obvious way is to tack it onto the end of your own program, and use it as a sub-routine called up by "GOSUB 6006". In this case, the "END" in line 6006 should be replaced by "RETURN".

If you choose to use it this way, you must make sure that all DATA statements in your own program have been read before you call the loader up. If they haven't, it will read the earlier data instead of its own, and the resulting machine code will not be what was intended. In all probability, the first "SYS" call to one of its routines will send the computer into a lock-up state, and you'll have to switch it off to reset it before it will talk to you again!

As an alternative which avoids this problem you can remember the loader program and put it as the first part



- making sure you have a copy of AUTOSCROLL on the same disk as (or if you use tape, immediately after) your Basic program.

I prefer to check to see if the machine code has been loaded into memory from either the Basic loader or machine code versions, with a PEEK at two in the area of memory used by the routines (see lines 110 to 160 of the DEMO program). This method has the advantage that while you're developing your own program and test-running it, you only have to load the routines once. If you use the more common method of putting a line such as:

```
10 IF A=0 THEN A=1: LOAD "A",S"3"
```

at the beginning of your program, then you have to wait while the machine code loads each time you RUN it. This is slow enough if it's loading from disk, but is even more annoying if it means running the Basic loader each time.

## How To Use The Routines

You can use these routines in the "immediate" mode from the keyboard as well as from within Basic programs. The format to set up the scrolling area between "upper" and "lower" lines (where the top line is 1, and the bottom one 25, is:

```
SYS 52992, upper, lower
```

To position the cursor on the desired "line" at the position "column" (where the left-hand margin is column 1, and the right-hand margin column 40, use the format:-

```
SYS 53048, line, column
```

To reset the computer to the normal scrolling mode, use:

```
SYS 53052
```

So the example gives before becomes:-

```
10 PRINT"(CLR:HOME) ITEM NUMBER PRICE TOTAL"
20 PRINT" OFF EACH COST"
30 SYS 53048, 25, 1:REM MOVES CURSOR TO START OF BOTTOM LINE
40 PRINT" PRESS ANY KEY TO HALT";
50 SYS 53048,1:REM PUTS CURSOR AT START OF TABLE
```

To set up the scrolling window, we note that, as the header in this example occupies the top two lines, the scroll should start at line 3. We have a "header" line on line 25, so the scroll area should end at line 24. A line such as:-

```
60 SYS 52992,1,24
```

does the trick.

## The Demonstration Program

Just in case you don't happen to have a suitable hard program around, or you don't fancy risking it until you've tried these routines out on somebody else's work (careful), I've included a short demonstration program for you to try. At least, it would be short without all those confounded REM statements!

This has a few optional lines (read the REM statements before you key them out) which allow you to use it with either the basic loader or a machine-code version. If you use the latter with tape, change the device number in the appropriate line.

## Does Autoscroll Clash With Other Programs?

As presented here, the machine code routines occupy 211 bytes at the top of the free RAM area between addresses \$C900 to \$CFFA. In addition, they use the four spare two page bytes \$D0F0 to \$D0FF. The command "SYS 52992, upper, lower" brings the scroll routine into play by changing the output vector at \$0326, which is restored by the command "SYS 53052".

The Basic loader uses the following variables:-

```
AO, CS, D, LM, RC
```

and line numbers \$3010-\$3039 if you have out the REMs to \$3089, or

whatever you remember them to yourself.

## Footnotes

1. AUTOSCROLL modifies the output vector at \$0326. If you use a utility cartridge, especially one that offers a Centronics printer interface, it may modify this vector for its own purposes. In this case, SCROLL will probably work OK from within a Basic program, but will be taken out of play when the program ends and returns the computer to the READY state. So if you try OUT SYS 52992 in the "immediate" mode, and nothing happens, disable your cartridge and try again.

2. AUTOSCROLL moves the contents of the text RAM around and, as this lies just below the area where your Basic program sits, it's necessary to protect the program area from corruption. You'll find that if you try to set a line number greater than 25 you will halt, from either the "SCROLL" or "PRINT AT" routines. You'll get the same result if you try to make 'lower' equal to or greater than 'upper', or if you try to use zero or negative values (sorry - you can't scroll backwards, or get the text to disappear up its own... leader?... with this program!)

3. You may set the scrolled area anywhere within the normal screen. However, if you set 'lower' to 25 and the line you print ends with a carriage return, or fills the line, then the normal CR scroll routine may operate and shift the whole screen up one or two lines. The same thing may happen if 'lower' is set to 24, and the line printed spills over to line 25.

4. You can leave the scroll routine in action while you list a program, and edit the text within the window normally over all but the last line of the window. This is sometimes seen by the computer as being an 80-character line, even though it may really be a 40-character line. In this case, it reads the next line as part of the line you are editing, and you will, most likely, get a "syntax error" message. I have not yet succeeded in curing this little bug yet - if anyone can find a solution with a few extra bytes, do let me know.

# Basex

*Sweep up your 64 with this new Basic Enhancer*

*By Peter Finch*

## Snd Chip Control

**SOUND** - Define general sound volume and filter.

System: SOUND *n* - *n* = disable Snd  
 SOUND *n1*, *n2* [*n3*, *n4*, *n5*].

*n1* filter mode 0-15 (1 low pass, 2 band pass, 4 high pass, 8 voice 2 off - can be additive eg. 5 notch reject/low-high).

*n2* volume 0-15.

*n3* filter resonance 0-15.

*n4* filter voice 0-15 (1 voice 0, 2 voice 1, 4 voice 2, 8 external).

*n5* filter cut-off frequency 0 (0.08 Hz) - 2047 (0.28 KHz).

**ENVELOPE** - Define envelope for each voice.

System: ENVELOPE *n1*, *n2*, *n3*, *n4*, *n5*, *n6*

*n1* voice number 0-2.

*n2* attack 0-15.

*n3* decay 0-15.

*n4* sustain 0-15.

*n5* release 0-15.

*n6* pulse width 0-4095 (proportion of pulse high eg. 2047=50%).

**VOICE** - Produce sound of certain pitch and timbre.

System: VOICE *n1*, *n2* [*n3*, *n4*, *n5*]  
*n1* voice number 0-2.

*n2* frequency 0-65535  $\pi$  (Hz = 16.77216).

*n3* waveform 1-8 (1 triangular, 2 sawtooth, 4 pulse, 8 noise).

*n4* special effects 0-2 (1 synchronous, 2 ring modulator).

*n5* duration 0-155 (seconds\*50).

Note: Use full system for first sound, thereafter can use short form to change frequency eg. in glissando. End of sound can be detected by PEEK (\$135+*n1*).

## Vic Chip Control

(Colour parameters - 0 black, 1 white, 2 red, 3 cyan, 4 purple, 5 green, 6 blue, 7 yellow, 8 orange, 9 brown, 10 light red, 11 grey1, 12 grey2, 13 light grey, 14 light blue, 15 grey3).

**MODE** - Change screen mode.

MODE 0=cl Text, background n1.

MODE 1=*n1*,*n2* Graphics, background *n1*, cursor *n2*.

MODE 2=*n1*,*n2*,*n3* Multicolour text, background *n1*, cursor1 *n2*, cursor2 *n3*.

MODE 3=*n1*,*n2*,*n3* Multicolour graphics, background *n1*, cursor1 *n2*, cursor2 *n3*.

MODE 4=*n1*,*n2*,*n3*,*n4* Extended *n1*, background1 *n1*, background2 *n2*, background3 *n3*, background4 *n4*.

CLS - Clear the text screen. (Will alter graphics colours).

CLG - Clear the graphics screen. (Will substitute characters in text mode).

CSR - Change cursor color.

System: CSR *n* (*n*=0-15 in text

mode, 1-3 in mode 3)

**EDGE** - Change screen border.

System: EDGE *n* (*n*=0-15).

**SCROLL** - Scroll text screen.

System: SCROLL *n* (*n*=0) up, 1 down, 2 left, 3 right)

**BAR** - Draw a vertical bar in text mode.

System: BAR *n1*, *n2*

*n1* Horizontal displacement 0-79.

*n2* Vertical displacement 0-159.

**PLOT** - Plot a point on screen.

System: PLOT *n1*, *n2*

*n1* Horizontal axis 0-79 text mode, 0-319 mode 1, 0-159 mode 3.

*n2* Vertical axis 0-69 text mode, 0-159 graphics mode.

**DRAW** - Draw a straight line from last point plotted.

System: DRAW *n1*,*n2*

Parameters as for PLOT.

**CIRCLE** - Draw a circle (ellipse in mode 3).

System: CIRCLE *n1*,*n2*,*n3*

*n1* Radius

*n2*,*n3*, X,Y position of centre. Parameters as for PLOT.

**Basex** - or Basic extension - is an 18, machine code program residing in memory from 58000 to 59777 above Basic. It extends the code Basic resides on the Commodore 64, and enables the user to utilize the powerful hardware capabilities of this machine, without the need for numerous complicated POKE statements to locations which must either be memorized (!), or looked up in a reference manual.

Furthermore, the default memory map is reorganised to utilize the (normally unused) shadow RAM, hidden behind the ROMs, for the memory-expensive, high-resolution graphics screen, leaving more Basic bytes free. The complex character set is user-definable, and is also located in shadow RAM.

Basex is used in the form of keywords, and operators which are tabulated in the same way as Basic. As with Basic, an abbreviated form of the first few letters and a shifted letter is acceptable and will save time. The utilities cover four areas:

**FILL** - Fill graphics screen area within plotted boundary.

System: FILL *n1*,*n2*

Fill starting from position *n1*,*n2* = X,Y.

**MOB** - Define a movable object block (sprite).

System: MOB *n1* (to activate MOB *n1*)

MOB *n1*,*n2*,*n3*,*n4*,*n5*,*n6*,*n7*,

*n1* MOB number 0-7

*n2* MOB data address in Bank 3 0-255 (0000=*n1*7540).

*n3* Expansion 0-3 (1 Y expanded, 2 X expanded, 3 both).

*n4* Priority 0 Data > MOB, 1 MOB > data.

*n5* Colour.

*n6* Colour2 (Multicolour MOB).

*n7* Colour3.

**MOVE** - Move a MOB.

System: MOVE *n1*,*n2*,*n3*

*n1* MOB number 0-7

*n2* Horizontal position (0-320 visible).

*n3* Vertical position (29-259 visible).

1. Sound generation by the SID chip.
2. Graphics produced by the VIC chip.
3. A disk monitor.
4. Programming structures including function key definitions.

The Commodore operators are extended to include hexadecimal, binary, label variables with more than two significant letters, and numeric output with tabulated decimal places. In addition, there is a full two pass labelling assembler used from Basic, which even allows conditional assembly. Other machine code utilities include a disassembler, memory display in hex and ASCII, memory load and save.

## Summary of Basic's Contents

[ ] = optional parameters, n: numeric parameter, s: string DISK - Access disk monitor with directory (D) and usual commands (C, I, N, S, (U), V), X to exit. Status = < CR > alone. Syntax: DISK n:m defines the device number (usually 8).

## User Defined Graphics

The character set is defined in shadow RAM starting at \$E000, and may be redefined as required. This area of memory appears to be write-only because of the shadow effect, thus reading it will give erroneous values. A redefinition is conveniently performed in hexadecimal using the 8 byte poke with "B". For example the Commodore logo can be defined at \$E000 and will appear instead of . Note however that this character will still be treated in exactly the same way as

```
$E000 0011 00 01C
$E004 001 01110 536
$E008 01100111 967
$E00C 01100000 968
$E010 01100111 967
$E014 001 01110 536
$E018 0011 00 01C
$E01C 00000000 968
*E000 3C 36 67 68 67 1C 60
```

## Programming Features

**APPEND** - Append a program to that already in memory.

Syntax: APPEND s, n1  
Load file s from device n1.

**AUTO** - Automatic line numbering. STOP to escape.

Syntax: AUTO [n1,n2]  
n1 Interval (default 10).

n2 First line number (default 10).

**DELETE** - Delete line numbers within range.

Syntax: DELETE n1,n2  
Delete from line n1 to line n2.

**DUMP** - Screen dump to printer.

Note: requires OPEN 4,n to printer - assumes Epson type for graphics dump.

**KEY** - Define function keys. (F1 set to TAB).

Syntax: KEY n1 (colon) function key n1

KEY s1, s2 [-]

n1 Function key number 2-8.

s1 String definition (max length 6).

- Automatic carriage return.

**OLD** - Undo the effect of NEW.

**PIC** - Define decimal places for numeric output with !

Syntax: PIC n1  
n1 Number of decimal places 0-4.

**RENUMBER** - Line renumber (including GOTO/GOSUB etc).

Syntax: RENUMBER [n1,n2]  
n1 Interval (default 10).

n2 First line number (default 10).

**REPEAT UNTIL/WHILE** (conditional) - Structured programming.

Example: J=0: REPEAT: PRINT J: J=J+1: UNTIL J=10.

J=0: REPEAT: PRINT J: J=J+1: WHILE J = 10.

## Operators

**PRINT s1,n1,s2** - Prints string s1 at row n1, column s2.

!n1 - Outputs n1 as a hexadecimal string.

!s1 - Outputs n1 as string with tabulated decimal.

!s2 - Outputs hex string s2 as numeric variable.

%s - Outputs binary string s2 as numeric variable.

!NAME - Label from assembly as numeric variable.

## Machine Code Features

\*ASS - Commence two pass labelling assembler.

Syntax: \*ASS n1.

Commence assembly at address n1, terminated by \*END. Assembler code can include complex operands, including labels which must be signified by name; such code must be tabulated. However, tabulation of operands (eg AND, OR) and labels must be suppressed by REM (which is ignored). Note the use of EQU - a multipurpose DB/DS to define bytes or strings in memory. Characters to the right of ; are ignored. Labels are assigned the value \$0000 (\$FFFF) on first pass - thus LABEL+1 will fail unless the label has been assigned before the reference.

Example:

```
10 MA=5FF: LO=8000: REM =
MASK, LOCATION
20 *ASS $2800
30 START LDA MESSAGE/256:
LDY $C: Ignore this
40 REM AND MASK: STA
LOCATION
50 REM RTS
60 MESSAGE EQU $A, "This is a
message",END
70 *END
80 SYS START:REM Call this
(memory) program
```

\*DIS - Disassemble machine code.

Syntax: \*DIS n1[,n2]

Disassemble memory contents from n1 to n2, a page at a time.

\*LOAD - Load code without disturbing BASIC pointers.

Syntax: \*LOAD s,n1

Load file s from device n1 to header address.

\*MEM - Display memory in hexadecimal and ASCII.

Syntax: \*MEM s1[,s2]

Display memory contents from address s1 to s2

\*SAVE - Save code from anywhere in memory.

Syntax: \*SAVE s1,s1,s2,n1

Save file s2 on device n1, from address s1 to s2

% - Eight byte hexadecimal POKE.

Syntax: %C000 AA 55 AA 55 AA 55 AA 55

Place the right hexadecimal bytes to memory (here to \$C000)

# Zeus, by Jove!



**A** notable omission from the otherwise excellent CBM Disk Operating System provided on the C16 and Plus/4 computers is the facility to copy disk files from one disk to another. The ZEUS Magazine has been designed to remedy this.

There are in fact two ways of copying files from disk to disk, but both involve considerable problems. The first is to use the "SD.BACKUP" program provided on your disk-drive system disk, but this program will only copy whole disks, which is a tremendous waste of time. It also means that any files previously on the disk will be lost. The second method is to use one of the many simple file-copier programs available. The problem with these is that they can only copy files of up to around 200 blocks in length. If you're using such a program on a C16, the state of affairs is even worse - you'll be limited to copying files of up to 48 blocks or so.

Not being able to copy files larger than the capacity of your computer may not seem a great disadvantage, but if you use your computer for any serious programming or data storage, you'll realize that it's a bit ridiculous only being able to copy files 48 blocks long when a single floppy-disk can

*Mark Everingham's  
new program, ZEUS,  
will allow you to copy  
disk files of any length*

contain files up to 664 blocks in length! This is where ZEUS comes in.

ZEUS is a file-copier program of the second type mentioned above, but it can copy files of any length. ZEUS will copy files of any length from a one block midiget to a 664 block giant. In fact, ZEUS can copy files of infinite length, so it can also be used on a 1281 drive to copy the huge 2000 block files that are possible. ZEUS can also be of use to owners of C64's and C16's or Plus/4's - if you have a C64 file of say 250 blocks that you can't copy using your C64, just copy the file using ZEUS on your C16!

## How Does Zeus Work?

Conventional file-copyers work by loading a file into memory, waiting for you to change the disk in your Disk-drive, and then saving the file back onto the new disk again. This means

that you cannot copy files longer than the capacity of your computer - about 128 on a C16 or 664 on a Plus/4. ZEUS works in a slightly different way. The process for copying a file is shown below:

- LOOP**
1. Load in "Chunk" of data
  2. Change Disk in Disk-Drive
  3. Save in "Chunk" of data
  4. Have we loaded & saved the whole file?  
Yes - Jump to FINISH
  5. Read in "Chunk" of data
  6. Jump to LOOP for 2nd, 3rd, 4th "Chunks" etc...
- FINISH**
7. End

The operation of ZEUS relies entirely on the Append function of CBM DOS (OPEN "S,""FILE-NAME",A"). This function allows your computer to add data to the end of a disk-file, and it's this function which is used in stage three of the copying process. By the use of a number of manual disk changes, files of infinite length can theoretically be copied!

## Starting To Use Zeus

When you first run ZEUS, you'll see the screen divided into three "Windows" by two horizontal lines. In the first window, which is called the Title Window, you'll see a Title message and below this, the text "SOFTWARE RUNNING ON CMMT", where MM is the type of your computer - C16 or +4. ZEUS automatically configures itself to whichever computer you're using in order to make full use of the facilities offered by each.

Below the Title Window is the Status Window. At the top of the window should be the text "(TYPE) FILENAME" followed by a flashing line cursor. Underneath this should be two messages: "BLOCKS COPIED:" and "KILOBYTES COPIED:". The "(TYPE) FILENAME" message is explained later, as are the other two.

The third window, at the base of the screen, is the Dialogue Window. In this window is displayed all the requests for information from your computer. At present it should be displaying the message "ENTER COPY FILE-NAME AND PRESS (RETURN)".

## Copying a File

The first thing to do before running ZEUS to copy a file, is to remember the file-name and type of the file. These can be found by looking at the Disk Directory. The file-name should be apparent, the type is one of PRG, SEQ or USR and is displayed on the left of the directory. ZEUS cannot copy mixed files, as these have complex file structures.

When you know the file-name and type of the file to be copied, load and run ZEUS. You should then push either "P", "S" or "U", to tell ZEUS what type of file you wish to copy. This character should appear in the status window on the screen, followed by an oblique stroke. You should then type in the file-name of the file to be copied, and press (RETURN). The file-name you specify should not include "?" or "\*" characters, and ZEUS will reject these itself. You can use the (DEL) key to delete characters, or if you make a mistake or want to exit ZEUS, you can press the (ESC) key to return to BASIC.

Once you've entered the Type and File-name, the cursor will disappear and the message in the dialogue

window change to "INSERT SOURCE DISK AND PRESS (RETURN)". At this point, insert the disk on which the file to be copied is found into your disk-drive, and hit (RETURN). The disk should start to spin.

When you press (RETURN), the dialogue window should display the message "- SEARCHING FOR SOURCE FILE -". After a few seconds, this should change to "LOADING SOURCE FILE DATA -". At this point, ZEUS starts loading data into RAM, and the Status Window should show the "BLOCKS COPIED:" and "KILOBYTES COPIED:" counters increasing as the data is loaded. "BLOCKS COPIED" is the number of 256-byte disk blocks that ZEUS has copied, and "KILOBYTES COPIED" is the number of 1024-byte Kibibytes that ZEUS has copied. In one pass, ZEUS loads 41 blocks on a C16 or 238 on a Plus/4.

When ZEUS has finished loading a chunk of data, the dialogue message changes to "INSERT DESTINATION DISK & PRESS (RETURN)". At this point you should remove the original disk from your disk-drive, replace it with the disk onto which you wish your file to be copied, and press (RETURN). The message "- OPENING DESTINATION FILE -" will be displayed, and ZEUS tries to open a new file to copy data to. If it is successful, the message "- WRITING DATA TO NEW FILE -" is displayed and ZEUS starts writing data to the new file.

As ZEUS finishes writing data to its new file, one of two things will happen. If it's copied the whole of your file, the message "- COPYING PROCESS COMPLETE -" will be displayed in the dialogue window, and ZEUS will return to BASIC with the file copied. If, however, there is still more of your file to be copied, then the message "INSERT SOURCE DISK AND PRESS (RETURN)" will be displayed in the dialogue window. Do as ZEUS instructs, and after "- SEARCHING FOR SOURCE FILE -", ZEUS will say "- READING SOURCE FILE DATA -". At this point, ZEUS skips past the first chunk of data in order to load the second. When it has done this, the message "- LOADING SOURCE FILE DATA -" is shown, and the process described above is repeated until the whole file has been copied.

When ZEUS returns to BASIC, you'll find on your destination disk a perfect and identical copy of the original file you selected. If anything goes wrong during the process of copying a file, ZEUS will display a suitable error message. It then displays the message "PRESS (RETURN) TO ACKNOWLEDGE" and when you do so, ZEUS returns to Basic. ZEUS will cope with any standard DOS error message and displays the Error Number, Message and Track & Sector at which the error occurred. Full explanations of these messages may be found on page 174 of your computer's manual. Alternatively, consult page 35 of your disk-drive manual.

The process of copying very long files can take quite a long time between disk changes, so in addition to the message ZEUS displays, it makes two sounds in order to inform you what it is doing, or to attract your attention to change disks or acknowledge a disk error. In essence, a low frequency beep indicates that ZEUS has finished part of the copying process. A high frequency beep indicates that ZEUS requires some human input or a disk change. When a disk error occurs, ZEUS beeps alternately high and low to attract your attention. The use of sounds means that you are not continuously tied to the computer doing nothing!

## Getting Zeus "Up & Running"

As you can see, the process of copying a file is quite straightforward when using ZEUS, and getting the program working is equally easy. The process is as follows:

1. Type POKE 5884:POKE 44,2:NEW
  2. Enter the ZEUS/LOADPR program
  3. Type RUN and follow the instructions given by the program
- When you've done the above, there will be saved on your disk two files: "ZEUS/LOADER" and "ZEUS". To copy a file, just run your machine and type:

1. DLOAD "ZEUS"
  2. RUN
- ZEUS will now be in operation, and you can run the program as many times as you wish to copy more than one file. If you then want to run another program or write your own, you should press the (RESET) button on your computer before starting to do so.

# Contributions

*So you own a Commodore? So you've  
written some programs? So why haven't you  
sent them to us?*

**Y**our Commodore is always on the look out for new programs, hints and tips, articles and even regular series. In fact if you have something that you think could be of use to other Commodore owners we want to hear about it.

So if you have got something which you think we may be interested in, how do you go about submitting it to us?

Below you will find a list of guidelines that will help us to deal with any item that you send us to us. We don't expect everybody to be the next William Shakespeare but if you do follow these simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.

2) All text should be double spaced i.e. there should be a blank line between each line of text. You should also leave a margin of about 10 characters around the text.

3) On the very first page you should put the following:

Name of the article  
Machine that it is for  
Any extras required - disk, printer etc.  
Your name  
Your address  
Your telephone number

4) The top of every page should have the following information on it:

Abbreviation of the article title  
Your name  
The page number

For example, suppose you had submitted an article on C64 interrupts. You should put something like the following at the head of the page:

Interrupts/J.Smith/1

5) Please make sure that you do not make any additional marks on your text especially underlining.

6) Try and write in clear concise English, it does not have to be a work of literature but it must be comprehensible.

7) On the bottom of each page you should put the word MORE if there are more pages to the article or ENDS if it is the last page.

8) If possible, enclose a listing of all programs.

9) Under no circumstances use a staple to hold the pages together. Use a paperclip instead.

10) Programs should be included on either disk or tape. Make sure that you SAVE two copies of every program so that we have a better chance of loading them if problems occur.

11) Programs under 10 lines can be included in the text. If your program is longer than this you must enclose a disk or cassette.

12) If your article needs any artwork then supply clear examples of what is needed. We don't expect you to be an artist but we do need to see what is required.

13) Photographs, if necessary, must be either black and white prints or colour slides. We can take shots ourselves so don't worry about this too much.

14) Submissions of any length are welcome. If you have a five line routine that you think may be of use to someone else we welcome it just as much as a full blown six part series.

15) Payment varies quite a lot and depends on quite a number of factors, such as complexity of program, presentation of program, number of magazine pages it takes up etc. Payment is generally between £10.00 and £200.00.

16) All payments are made in the month that the magazine containing your article has appeared in print.

17) If we do find your submission suitable for inclusion in the magazine we will write to you giving the terms of publication, the date of payment and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.

18) If you want the program returning to you, should we find it unsuitable for publication, then you should enclose a stamped self addressed envelope.

19) The last and most important point to make is 'get writing', we are waiting for your articles.

# Software for Sale

*If you think that one of our programs looks very interesting, but you can't afford the time to type it in, then our software service will help you out*

**I**t's three o'clock in the morning. You sit at the computer keyboard having just finished a marathon typing session. Entering one of the expert programs from *Your Commodore*, your fingers reach for the keyboard and press the letters R, U and N. You press RETURN, sit back and nothing happens.

Everyone has probably faced this problem. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

The *Your Commodore Software Service* makes available all of the programs from each issue on both cassette and disk at a price of £6.00 for disk and £4.00 for cassette. None of the documentation for the programs is supplied with the software since it is all available in the relevant magazine. Should you not have the magazine then back issues are available from the following address:

INFONET LTD, 5 River Park Estate, Berkhamsted, Herts, HP4 1BL.  
Tel: (04477) 36661

Please contact this address for prices and availability.

## The Disk

Programs on the disk will also be supplied as totally working versions, i.e. when possible we will not use Basic Loaders thus making use of the programs much easier. Unfortunately at the moment we cannot duplicate C18 and Plus/4 systems. However programs for these machines will be available on the disk.

What programs are available?

At the top of each article you will find a strip containing the article type, C64 Program etc. So that you can see which programs are available on which format, you will also find a couple of symbols after this strip. The symbols have the following meaning:



This symbol means that the program is available on cassette.



These programs are available on disk.

## Please Note

Since the programs supplied on cassette are total working versions of the program, we do not put disk-only programs on tape. There is no sense in playing a program that expects to be reading from disk on to tape.

## NOVEMBER 1988

**SECRET WRITING** — Learn how to conceal messages and how to protect your Basic programs (C64).

**PAINLESS WINDOWS** — Extend the power of the C128's WINDOW command.

**UNLOCK HIDDEN 128 POWERS** — Use the full brunt of your C128 in C64 mode.

**WILLIAM TELL** — Fight off the Austrian soldiers in this great C64 arcade game.

**TALKING COMPUTERS** — Use speech synthesizers with your C64.

**ORDER CODE**

**TAPE TCNOV88 £4.00**

**DISK TDNOV88 £6.00**

## DECEMBER 1988

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**4-DIRECTORY EDITOR** — Rearrange your Plus/4 disk directory entries however you like. Available on disk only.

**DOUBLE HEIGHT** — Enhance your C64 text displays with a double height character set.

**PROGRAM PROTECTION** — Protect your latest C64 masterpieces from prying eyes.

**SPRITE CONTROLLER** — Basic sprite manipulation made easy. C64.

**GRAPHIC EDITOR** — A quick and simple C64 UDG editor.

**MASTERING THE RASTER** — The source code to accompany our article on raster interrupts (C64).

**CREATING CHARACTERS** — Give your Plus/4 and Commodore printer a better print quality. Available on disk only.

**WILLIAM TELL** — See November for details (C64).

**ORDER CODE**

**TAPE YDDECB88 £4.00**

**DISK YDDECB88 £6.00**





# Listings

## Listings

Get it right first time with our deluxe program system  
for the C64.

**Y**ou may have noticed that our listings are free of those horrible little black blobs which send you searching around the keyboard for a suitable graphic symbol. You may also have noticed the funny numbers by the side of each line of the listing. For reasons, it's all part of our easy entry and

instead of those nasty graphics and rows of countless spaces in PRINT statements and strings we use a special coding system. The code, or mnemonic, is always contained in square brackets and you'll soon learn to decipher their meanings.

For example, [SA] would mean type in a Shifted A, or an ace of spades in layman's terms, and [SA10] would mean a row of ten of those symbols.

[S+2] means hold down the shift key and press the plus key twice. It doesn't take a great leap of logic to realise that [C=2] means exactly the same thing except that the Commodore key (bottom left of the keyboard) is held down instead of the shift key.

If more than one space appears in a statement then this will be printed as [SPC4] or, exceptionally, [MPC4]. Translated into English this means press the spacebar four times or in the latter case hold the shift key down while you do it.

A string of special characters could appear as:

CTRL N, DOWN2,LEFTS,BLINK,  
PAGE

This would be achieved by holding

down the CTRL key as you press N, press the cursor key down twice, the cursor left key five times, press the key marked BLINK while holding down the CTRL key, press the F3 key and, finally hold the Commodore key down while pressing the number two key (C2) would of course make the computer print in brown.

Always remember that you should only have a row of graphics characters on your screen with no square brackets and no commas, unless something like this appears:

[SS][C\*]

In this case the two characters should have a comma between them.

On rare occasions [REV T] will appear in a listing. This is a delete symbol and is created by entering the line up to this mnemonic. Then type a closing quotation mark (SHIFT Q) and delete it. This gets the computer out of quote mode. Hold down CTRL and press the number nine key (RPS9), type the relevant number of reversed T's and then hold down CTRL and press zero (RPS0FF).

Now type another quotation mark and delete it again. Now finish the line and press RETURN.

A list of these special cases is given in the table but remember that only one of these mnemonics will appear outside of a PRINT string; the symbol for go. This may appear when its value is needed in a calculation so this may look something like:

### CC'syntax:

Ignore the square brackets and just type in a shifted upward pointing arrow (ie. the go symbol).

```
PROGRAM: BIRTHDAY CHECKER - ERIC DOYLE
20 BL=10  :LN=70  :MORNING=
30 FOR L=0 TO BL:DO=0:FOR LN=0 TO
40
50 BIRTH=0:IF MORNINGS=0:PRINT
60 "IT IS BIRTHDAY!!" :LN=LN+1:GOTO 30
70 CL=LN:FOR LN=0 TO LN-1:DO=DO+1
80
90 BIRTH=LN*(LN+1):MORNING=LN*LN
10 FOR LN=1 TO 10:PRINT DO
11
12 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
13
14 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
15
16 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
17
18 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
19
20 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
21
22 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
23
24 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
25
26 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
27
28 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
29
30 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
31
32 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
33
34 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
35
36 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
37
38 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
39
40 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
41
42 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
43
44 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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46 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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58 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
59
60 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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714 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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716 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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718 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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720 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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722 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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724 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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726 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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728 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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730 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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732 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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734 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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736 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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738 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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740 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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742 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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744 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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746 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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748 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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750 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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752 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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754 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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756 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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758 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
759
760 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
761
762 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
763
764 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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766 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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768 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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770 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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772 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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774 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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776 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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778 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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780 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
781
782 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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784 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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786 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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788 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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790 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
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792 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
793
794 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
795
796 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
797
798 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
799
800 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
801
802 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
803
804 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
805
806 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
807
808 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
809
810 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
811
812 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
813
814 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
815
816 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
817
818 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
819
820 DO=DO+1:IF DO=LN:PRINT DO:LN=LN+1
821
822 DO=DO+1:IF
```

the hexadecimal numbers appearing in a column to the left of the listing should not be typed in with the program. These are merely checksum values and are there to help you get each line right. Don't worry if you don't understand the hexadecimal system, as long as you can compare two characters on the screen with the corresponding two characters in the magazine you can use our line checking program.

When you use the program, make sure that you're not making any mistakes and save it to tape or disk immediately because it will be used with most of the present and future listings appearing in Your Commodore.

At the start of each programming session, load Checksum and run it. The screen will turn black with yellow characters and each time you type in a line and press the RETURN key a number will appear on the screen in white. This should be the same as the corresponding value in the magazine.

If the two values don't relate to one another, you have not copied the line exactly as printed so go back and check each character carefully. When you find the error simply correct it and

press RETURN again.

If you want to turn off the checker simply type SYS49131 and the screen will return to the familiar blue colours. You can then do whatever it was you wanted to do and if this doesn't use the area where Checksum lies you can go back to it with the same SYS command.

No system is foolproof but the chances of two errors cancelling one

Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. **TC**

## Checksum Program

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Mnemonic	Symbol	Keypress
[RIGHT]		CTRL left/right
[LEFT]		SHIFT & CTRL left/right
[DOWN]		CTRL up/down
[UP]		SHIFT & CTRL up/down
[F1]		F1 key
[F2]		SHIFT & F1 key
[F3]		F3 key
[F4]		SHIFT & F3 key
[F5]		F5 key
[F6]		SHIFT & F5 key
[F7]		F7 key
[F8]		SHIFT & F7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RYSOFT]		CTRL & 9
[RYSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[ROUND]		↑
[LARBROW]		←
[UPARROW]		↑
[PT]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		no key
[Clear]		CTRL + letter
[Store]		SHIFT + letter











# LISTINGS

67	9090 DATA 100,07,033,0,100,0 9,170,0,100,00,000,0,100,100 0,000,00,1000	67	9090 DATA 1,100,07,000,00,10 0,100,00,000,00,0,70,000,00, 000,0,1000	70	9091 BIT 000 "LOWER" SCREEN LINE
68	9090 DATA 170,0,000,000,007, 100,170,100,000,000,000,100, 000,00,100,100,000	68	9090 DATA 100,100,00,100,0,1 70,000,0,000,070,100,00,100, 000,0,000,0000	71	9091 BIT 000 "TWO SCREENS" APPR 0,100000
69	9090 DATA 070,00,000,00,00, 00,000,000,070,00,100,00,100, 000,100,00,0000	69	9090 DATA 00,100,000,000,000, 0,0,00,00,00,00,00,00,00,00,0, 00,1000	72	9091 BIT 000 "TWO SCREENS" F.
70	9090 DATA 00,00,100,00,00,0, 100,07,100,07,100,00,100,100, 100,100,000,1000	73	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	74	9091 BIT 000 "TWO SCREENS" F.
71	9090 DATA 07,100,00,100,101, 07,100,07,100,00,100,100,000, 100,00,100,1000	75	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	76	9091 BIT 000 "TWO SCREENS" F.
72	9090 DATA 07,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	77	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	78	9091 BIT 000 "TWO SCREENS" F.
73	9090 DATA 07,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	79	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	79	9091 BIT 000 "TWO SCREENS" F.
74	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	80	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	80	9091 BIT 000 "TWO SCREENS" F.
75	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	81	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	81	9091 BIT 000 "TWO SCREENS" F.
76	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	82	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	82	9091 BIT 000 "TWO SCREENS" F.
77	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	83	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	83	9091 BIT 000 "TWO SCREENS" F.
78	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	84	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	84	9091 BIT 000 "TWO SCREENS" F.
79	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	85	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	85	9091 BIT 000 "TWO SCREENS" F.
80	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	86	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	86	9091 BIT 000 "TWO SCREENS" F.
81	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	87	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	87	9091 BIT 000 "TWO SCREENS" F.
82	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	88	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	88	9091 BIT 000 "TWO SCREENS" F.
83	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	89	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	89	9091 BIT 000 "TWO SCREENS" F.
84	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	90	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	90	9091 BIT 000 "TWO SCREENS" F.
85	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	91	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	91	9091 BIT 000 "TWO SCREENS" F.
86	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	92	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	92	9091 BIT 000 "TWO SCREENS" F.
87	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	93	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	93	9091 BIT 000 "TWO SCREENS" F.
88	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	94	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	94	9091 BIT 000 "TWO SCREENS" F.
89	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	95	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	95	9091 BIT 000 "TWO SCREENS" F.
90	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	96	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	96	9091 BIT 000 "TWO SCREENS" F.
91	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	97	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	97	9091 BIT 000 "TWO SCREENS" F.
92	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	98	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	98	9091 BIT 000 "TWO SCREENS" F.
93	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	99	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	99	9091 BIT 000 "TWO SCREENS" F.
94	9090 DATA 00,00,100,100,100, 0,0,00,00,00,00,00,00,00,00, 00,100,100,1000	100	9090 DATA 00,00,000,00,100,1, 100,00,100,000,00,000,00,100, 0,00,100,1000	100	9091 BIT 000 "TWO SCREENS" F.

## Autoscroll



PROGRAM: AUTOSCREEN LOAD

41	9091 BIT 000 "AUTOSCREEN"
70	9091 BIT 000 "-----"
80	9091 BIT 000 BY D. J. 100 FF
81	9091 BIT 000 10/10/80
90	9091 BIT 000 PRODUCES A SCREEN
91	9091 BIT 000 BETWEEN PAGE 1000 AND
92	9091 BIT 000 "LOWER" SCREEN LINE
93	9091 BIT 000 "TWO SCREENS" APPR 0,100000
94	9091 BIT 000 "TWO SCREENS" F.
95	9091 BIT 000 "TWO SCREENS" F.
96	9091 BIT 000 "TWO SCREENS" F.
97	9091 BIT 000 "TWO SCREENS" F.
98	9091 BIT 000 "TWO SCREENS" F.
99	9091 BIT 000 "TWO SCREENS" F.
100	9091 BIT 000 "TWO SCREENS" F.

























```

870  AD=0+0000  SET SCREEN 010
875  AD=000000
880  SVS DEC("PUSH"),00,INTACD
885  AD=INTACD+00000000
890  AD=00
900  SETKEY AS
910  LOOP UNTIL KEY="" OR AD="0"
915  OR AD="0" OR AD="1" OR AD="2"
920  OR AD=0001 OR AD=00+01
930  IF AD="0" AND Y1 THEN Y1=
935  IF AD="1" AND Y1 THEN Y1=
940  IF AD="2" AND Y1 THEN Y1=
945  IF AD="0" AND Y2 THEN Y2=
950  IF AD="1" AND Y2 THEN Y2=
955  IF AD="2" AND Y2 THEN Y2=
960  IF AD=" " THEN DO=DO+1 OF
965  DO=DO THEN DO=0
970  LOOP UNTIL BREAK=1
980  SET
990  SET DO SWAP DO=0
1000  SET
1010  PRINT "Y1 COLOR 0,0"
1020  PRINT "Y2 TO SCREEN 1, PRT
1025  " TO SWAP TO SCREEN 2"
1030  SET
1040  PRINT "THIS JUST SHOWS THAT
1045  ALL TEXT IS LEFT "
1050  DO SWAP DO=DO+1 LOOP UNTIL AD="
1055  "
1060  SVS DEC("POP"),1  SET SWAP
1065  AND CLEAR
1070  PRINT "THIS IS SCREEN 1, PRT
1075  " TO SWAP TO SCREEN 2, AND
1080  TO UPPER CASE"
1090  PRINT
1100  PRINT "THIS IS BECAUSE THIS
1105  IS A NEW SCREEN."
1110  DO SWAP DO=DO+1 LOOP UNTIL AD="
1115  "
1120  SVS DEC("POP"),0  SET SWAP
1125  ONLY
1130  PRINT "NEW DATA WILL STILL B
1135  E DISPLAYED AT THE LAST POSITION
1140  OF SWAP SCREEN"
1150  PRINT "PRESS '0' TO SWAP THE
1155  SCREEN THIS"
1160  DO SWAP DO=DO+1 LOOP UNTIL AD="
1165  "
1170  SVS DEC("PUSH"),0
1175  COLOR 0,0
1180  PRINT CHARACTER "00" ON LINE 0
1185  HIDDEN COLOR HERE AS WELL"
1190  PRINT
1195  PRINT "PRESS ANY KEY TO CONT
1200 INUE"
1210  SETKEY AS
1220  SET
1230  SET S=0000 ZERO
1240  SET THIS SET(0) ON DECREMENTED
1245  TO FOLLOWING SCREENS
1250  SET
1260  SET BACKGROUND COLOR
1270  SET FOREGROUND COLOR
1280  SET SET POINT
1290  SET DRAW LINE
1300  SET DISPLAY TEXT
1310  SET
1320  SVS DEC("PUSH"),1  SET TURN
1325  ON SWAP=0
1330  SVS DEC("PUSH"),0  SET BACK
1335  GROUND COLOR
1340  SVS DEC("PUSH"),1  SET FORE
1345  GROUND COLOR
1350  DO=0+01
1360  DO=0+01+0000,00+1
1370  COLOR 0000  SET DRAW X AXIS
1380  DO=01+0000
1390  DO=00+00 00+0000,00+1

```

```

810  COLOR 0000  SET DRAW X AXIS
820  FOR 0 TO 500
830  IF Y1 THEN DO=00+00+00,00+1
840  DO=0000 1000  SET PLOT THE 0
845  LINE
850  SET X
860  SET Y THIS IS A SINE CURVE +
870  0-000 0000
880  DO=DO+1 SET LOWER CASE
890  COLOR 0000  SET DISPLAY TEXT
900  ON SCREEN
910  FOR 100 TO 10
920  FOR 0 TO 10
930  SVS DEC("POP"),0  SET
935  RAPIDLY CHANGE FOREGROUND
940  SET Y
950  SET X
960  SVS DEC("PUSH"),1
970  SET
980  DO=0000,0000
990  DO=0  SET LOWER CASE SCREENS 0
1000  COLOR 0000  SET CLEAR AREA
1010  SET=PRESS A KEY TO CONTINUE 0
1020  COLOR 0000
1030  COLOR 0000  SET
1040  RETURN
1050  SET
1060  SET "COLOR 0000"
1070  SET THIS DECREMENTED ONE F
1075 OLLOWING SCREENS
1080  SET
1090  SET COLOR LINE
1100  SET DISPLAY TEXT
1110  SET DRAW BOX
1120  SET BACKGROUND COLOR
1130  SET
1140  SVS DEC("PUSH"),2  SET TURN
1145  ON COLOR SWAP=0
1150  SVS DEC("PUSH"),11  SET SET
1155  BORDER COLOR
1160  DO=0+01+0
1170  DO=0+01+0+0000,00+1,00+0
1180  COLOR 0000
1190  DO=0
1200  HIDDEN 1000
1210  FOR 0 TO 10
1220  SET 0
1230  SET=0+01+0+0000+10
1240  SET=0+01+0
1250  SET=0+01+0
1260  IF DO=0 THEN DO=DO+1 ELSE I
1265  F DO=0 THEN DO=DO+1 OF DO=0 +
1270  DO=0
1280  DO=0,0000,0000  SET DRAW
1285  A BOX AND PLOT IT ON
1290  SET=00000000
1300  SET=0+01+0+0+0000,00+0,0000
1310  SET
1320  SET X
1330  SET Y THIS PRESS A KEY=DO=0+0+0
1340  DO=0+0+0,0000 1000
1350  SETKEY AS
1360  SET SVS DEC("PUSH"),0  SET SET
1365  TO 0
1370  RETURN
1380  SET
1390  SET S=0000
1400  SET THIS SCREEN DRAWS THE
1410  DRAWN
1420  SET
1430  SVS DEC("PUSH"),0  SET SET
1435  TO 0 TO 10 SET DRAW PICTURE
1440  PRINT "SCREENS" IN LINE 7, 0
1450  SET
1460  SET
1470  SET
1480  SET

```

```

1490  SET ON COLUMN PICTURE ROUTING
1500  SET
1510  SET TOTAL VARIABLES USED =
1520  SET
1530  SET,00,00,00,00,00,00,00,00,00,00
1540  SET
1550  SET
1560  SET THREE SETS OF VARIABLES
1570  PROVIDE SUBROUTINE PROLOGUE FOR 0
1580  ANY ACCESS
1590  SET TO THE 00 COLUMN ROUTING
1600  SET
1610  SET
1620  SET "STOP LINE"
1630  SET THIS ROUTING DRAWS A LI
1640  NE
1650  SET INPUT VARIABLES =
1660  SET X,Y
1670  = STARTING POINT OF LINE
1680  SET
1690  SET ENDING POINT OF LINE
1700  SET
1710  SET START POINT, ENDLINE POINT
1720  SET
1730  SET COLOR = 0 IF IN CORRECT MODE 1
1740  SET
1750  SET COLOR DEC("PUSH"),0,0,0,0,0,0,0,0
1760  SET DEC("PUSH"),0,0,0,0,0,0,0,0
1770  SET
1780  SET DEC("PUSH"),0,0
1790  SET DEC("PUSH"),0,0,0,0,0,0,0,0
1800  SET DEC("PUSH"),0,0,0,0,0,0,0,0
1810  SET DEC("PUSH"),0,0
1820  SET
1830  SET
1840  SET "PLOT POINT"
1850  SET THIS ROUTING PLOTS ON C
1860  LEANS A POINT
1870  SET INPUT VARIABLES = X,Y =
1880  CO-ORDINATES OF POINT
1890  SET
1900  SET START POINT, B-COLOR POINT
1910  SET
1920  SET COLOR = 0 IF IN CORRECT MODE 1
1930  SET
1940  SET IF DO=000 AND DO=0 THEN P
1945  OLE DEC("POP"),0
1950  SET DO=1 THEN SVS DEC("Y")
1955  1,INTACD,0,0,INTACD+000000,0
1960  SET
1970  SVS DEC("PUSH"),INTACD+0000
1975  0,0,INTACD+0000,0
1980  SET
1990  SET
2000  SET
2010  SET "DISPLAY TEXT"
2020  SET THIS ROUTING DISPLAY T
2030  EXT ON THE SCREEN
2040  SET INPUT VARIABLES =
2050  SET X,Y =
2060  CO-ORDINATES OF TOP LEFT START 0
2070  SET
2080  SET
2090  SET TO BE DISPLAYED
2100  SET
2110  SET COLOR = 0 IF IN CORRECT MODE 1
2120  SET
2130  SET MODE OF TEXT
2140  SET
2150  SET
2160  SET
2170  SET
2180  SET
2190  SET
2200  SET
2210  SET
2220  SET
2230  SET
2240  SET
2250  SET
2260  SET
2270  SET
2280  SET
2290  SET
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2950  SET
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2970  SET
2980  SET
2990  SET

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LISTINGS

1, 2, 3, 4, 5	170, 200	1700 DATA 123,188,30,79,19,50,30	170, 200	1700 DATA 187,9,52,257,8,82,173,
6, 7, 8, 9, 10	180, 210	1800 DATA 48,30,189,10,180,73,48	180, 210	1800 DATA 88,168,8,188,16,21,20,
11, 12, 13, 14, 15	190, 220	1900 DATA 30,800,38,174,85,32,38	190, 220	1900 DATA 818,288,2,188,8,188,18
16, 17, 18, 19, 20	200, 230	2000 DATA 107,9,52,257,8,82,173,	200, 230	2000 DATA 15,294,188,8,32,12,294
21, 22, 23, 24, 25	210, 240	2100 DATA 82,187,8,82,173,85,32,	210, 240	2100 DATA 83,220,182,1,30,24,220
26, 27, 28, 29, 30	220, 250	2200 DATA 7,52,188,8,188,8,188,8	220, 250	2200 DATA 217,238,248,70,228,14,
31, 32, 33, 34, 35	230, 260	2300 DATA 30,18,299,174,25,82,82	230, 260	2300 DATA 32,52,238,188,8,133,15
36, 37, 38, 39, 40	240, 270	2400 DATA 292,232,130,187,3,188,	240, 270	2400 DATA 3,123,183,30,123,12,18
41, 42, 43, 44, 45	250, 280	2500 DATA 13,299,30,82,238,30,74,	250, 280	2500 DATA 198,81,30,288,18,188,2
46, 47, 48, 49, 50	260, 290	2600 DATA 82,188,18,288,187,188,	260, 290	2600 DATA 78,288,189,189,30,287,
51, 52, 53, 54, 55	270, 300	2700 DATA 228,18,188,8,188,85,12	270, 300	2700 DATA 107,281,188,8,30,82,82
56, 57, 58, 59, 60	280, 310	2800 DATA 130,818,188,8,30,30,82	280, 310	2800 DATA 2,30,82,258,188,7,188,
61, 62, 63, 64, 65	290, 320	2900 DATA 8,188,141,82,258,177,8	290, 320	2900 DATA 81,32,87,288,188,288,1
66, 67, 68, 69, 70	300, 330	3000 DATA 292,232,130,187,3,188,	300, 330	3000 DATA 188,21,30,288,188,28,
71, 72, 73, 74, 75	310, 340	3100 DATA 292,232,130,187,3,188,	310, 340	3100 DATA 188,21,30,288,188,28,
76, 77, 78, 79, 80	320, 350	3200 DATA 292,232,130,187,3,188,	320, 350	3200 DATA 188,21,30,288,188,28,
81, 82, 83, 84, 85	330, 360	3300 DATA 292,232,130,187,3,188,	330, 360	3300 DATA 188,21,30,288,188,28,
86, 87, 88, 89, 90	340, 370	3400 DATA 292,232,130,187,3,188,	340, 370	3400 DATA 188,21,30,288,188,28,
91, 92, 93, 94, 95	350, 380	3500 DATA 292,232,130,187,3,188,	350, 380	3500 DATA 188,21,30,288,188,28,
96, 97, 98, 99, 100	360, 390	3600 DATA 292,232,130,187,3,188,	360, 390	3600 DATA 188,21,30,288,188,28,
101, 102, 103, 104, 105	370, 400	3700 DATA 292,232,130,187,3,188,	370, 400	3700 DATA 188,21,30,288,188,28,
106, 107, 108, 109, 110	380, 410	3800 DATA 292,232,130,187,3,188,	380, 410	3800 DATA 188,21,30,288,188,28,
111, 112, 113, 114, 115	390, 420	3900 DATA 292,232,130,187,3,188,	390, 420	3900 DATA 188,21,30,288,188,28,
116, 117, 118, 119, 120	400, 430	4000 DATA 292,232,130,187,3,188,	400, 430	4000 DATA 188,21,30,288,188,28,
121, 122, 123, 124, 125	410, 440	4100 DATA 292,232,130,187,3,188,	410, 440	4100 DATA 188,21,30,288,188,28,
126, 127, 128, 129, 130	420, 450	4200 DATA 292,232,130,187,3,188,	420, 450	4200 DATA 188,21,30,288,188,28,
131, 132, 133, 134, 135	430, 460	4300 DATA 292,232,130,187,3,188,	430, 460	4300 DATA 188,21,30,288,188,28,
136, 137, 138, 139, 140	440, 470	4400 DATA 292,232,130,187,3,188,	440, 470	4400 DATA 188,21,30,288,188,28,
141, 142, 143, 144, 145	450, 480	4500 DATA 292,232,130,187,3,188,	450, 480	4500 DATA 188,21,30,288,188,28,
146, 147, 148, 149, 150	460, 490	4600 DATA 292,232,130,187,3,188,	460, 490	4600 DATA 188,21,30,288,188,28,
151, 152, 153, 154, 155	470, 500	4700 DATA 292,232,130,187,3,188,	470, 500	4700 DATA 188,21,30,288,188,28,
156, 157, 158, 159, 160	480, 510	4800 DATA 292,232,130,187,3,188,	480, 510	4800 DATA 188,21,30,288,188,28,
161, 162, 163, 164, 165	490, 520	4900 DATA 292,232,130,187,3,188,	490, 520	4900 DATA 188,21,30,288,188,28,
166, 167, 168, 169, 170	500, 530	5000 DATA 292,232,130,187,3,188,	500, 530	5000 DATA 188,21,30,288,188,28,
171, 172, 173, 174, 175	510, 540	5100 DATA 292,232,130,187,3,188,	510, 540	5100 DATA 188,21,30,288,188,28,
176, 177, 178, 179, 180	520, 550	5200 DATA 292,232,130,187,3,188,	520, 550	5200 DATA 188,21,30,288,188,28,
181, 182, 183, 184, 185	530, 560	5300 DATA 292,232,130,187,3,188,	530, 560	5300 DATA 188,21,30,288,188,28,
186, 187, 188, 189, 190	540, 570	5400 DATA 292,232,130,187,3,188,	540, 570	5400 DATA 188,21,30,288,188,28,
191, 192, 193, 194, 195	550, 580	5500 DATA 292,232,130,187,3,188,	550, 580	5500 DATA 188,21,30,288,188,28,
196, 197, 198, 199, 200	560, 590	5600 DATA 292,232,130,187,3,188,	560, 590	5600 DATA 188,21,30,288,188,28,
201, 202, 203, 204, 205	570, 600	5700 DATA 292,232,130,187,3,188,	570, 600	5700 DATA 188,21,30,288,188,28,
206, 207, 208, 209, 210	580, 610	5800 DATA 292,232,130,187,3,188,	580, 610	5800 DATA 188,21,30,288,188,28,
211, 212, 213, 214, 215	590, 620	5900 DATA 292,232,130,187,3,188,	590, 620	5900 DATA 188,21,30,288,188,28,
216, 217, 218, 219, 220	600, 630	6000 DATA 292,232,130,187,3,188,	600, 630	6000 DATA 188,21,30,288,188,28,
221, 222, 223, 224, 225	610, 640	6100 DATA 292,232,130,187,3,188,	610, 640	6100 DATA 188,21,30,288,188,28,
226, 227, 228, 229, 230	620, 650	6200 DATA 292,232,130,187,3,188,	620, 650	6200 DATA 188,21,30,288,188,28,
231, 232, 233, 234, 235	630, 660	6300 DATA 292,232,130,187,3,188,	630, 660	6300 DATA 188,21,30,288,188,28,
236, 237, 238, 239, 240	640, 670	6400 DATA 292,232,130,187,3,188,	640, 670	6400 DATA 188,21,30,288,188,28,
241, 242, 243, 244, 245	650, 680	6500 DATA 292,232,130,187,3,188,	650, 680	6500 DATA 188,21,30,288,188,28,
246, 247, 248, 249, 250	660, 690	6600 DATA 292,232,130,187,3,188,	660, 690	6600 DATA 188,21,30,288,188,28,
251, 252, 253, 254, 255	670, 700	6700 DATA 292,232,130,187,3,188,	670, 700	6700 DATA 188,21,30,288,188,28,
256, 257, 258, 259, 260	680, 710	6800 DATA 292,232,130,187,3,188,	680, 710	6800 DATA 188,21,30,288,188,28,
261, 262, 263, 264, 265	690, 720	6900 DATA 292,232,130,187,3,188,	690, 720	6900 DATA 188,21,30,288,188,28,
266, 267, 268, 269, 270	700, 730	7000 DATA 292,232,130,187,3,188,	700, 730	7000 DATA 188,21,30,288,188,28,
271, 272, 273, 274, 275	710, 740	7100 DATA 292,232,130,187,3,188,	710, 740	7100 DATA 188,21,30,288,188,28,
276, 277, 278, 279, 280	720, 750	7200 DATA 292,232,130,187,3,188,	720, 750	7200 DATA 188,21,30,288,188,28,
281, 282, 283, 284, 285	730, 760	7300 DATA 292,232,130,187,3,188,	730, 760	7300 DATA 188,21,30,288,188,28,
286, 287, 288, 289, 290	740, 770	7400 DATA 292,232,130,187,3,188,	740, 770	7400 DATA 188,21,30,288,188,28,
291, 292, 293, 294, 295	750, 780	7500 DATA 292,232,130,187,3,188,	750, 780	7500 DATA 188,21,30,288,188,28,
296, 297, 298, 299, 300	760, 790	7600 DATA 292,232,130,187,3,188,	760, 790	7600 DATA 188,21,30,288,188,28,
301, 302, 303, 304, 305	770, 800	7700 DATA 292,232,130,187,3,188,	770, 800	7700 DATA 188,21,30,288,188,28,
306, 307, 308, 309, 310	780, 810	7800 DATA 292,232,130,187,3,188,	780, 810	7800 DATA 188,21,30,288,188,28,
311, 312, 313, 314, 315	790, 820	7900 DATA 292,232,130,187,3,188,	790, 820	7900 DATA 188,21,30,288,188,28,
316, 317, 318, 319, 320	800, 830	8000 DATA 292,232,130,187,3,188,	800, 830	8000 DATA 188,21,30,288,188,28,
321, 322, 323, 324, 325	810, 840	8100 DATA 292,232,130,187,3,188,	810, 840	8100 DATA 188,21,30,288,188,28,
326, 327, 328, 329, 330	820, 850	8200 DATA 292,232,130,187,3,188,	820, 850	8200 DATA 188,21,30,288,188,28,
331, 332, 333, 334, 335	830, 860	8300 DATA 292,232,130,187,3,188,	830, 860	8300 DATA 188,21,30,288,188,28,
336, 337, 338, 339, 340	840, 870	8400 DATA 292,232,130,187,3,188,	840, 870	8400 DATA 188,21,30,288,188,28,
341, 342, 343, 344, 345	850, 880	8500 DATA 292,232,130,187,3,188,	850, 880	8500 DATA 188,21,30,288,188,28,
346, 347, 348, 349, 350	860, 890	8600 DATA 292,232,130,187,3,188,	860, 890	8600 DATA 188,21,30,288,188,28,
351, 352, 353, 354, 355	870, 900	8700 DATA 292,232,130,187,3,188,	870, 900	8700 DATA 188,21,30,288,188,28,
356, 357, 358, 359, 360	880, 910	8800 DATA 292,232,130,187,3,188,	880, 910	8800 DATA 188,21,30,288,188,28,
361, 362, 363, 364, 365	890, 920	8900 DATA 292,232,130,187,3,188,	890, 920	8900 DATA 188,21,30,288,188,28,
366, 367, 368, 369, 370	900, 930	9000 DATA 292,232,130,187,3,188,	900, 930	9000 DATA 188,21,30,288,188,28,
371, 372, 373, 374, 375	910, 940	9100 DATA 292,232,130,187,3,188,	910, 940	9100 DATA 188,21,30,288,188,28,
376, 377, 378, 379, 380	920, 950	9200 DATA 292,232,130,187,3,188,	920, 950	9200 DATA 188,21,30,288,188,28,
381, 382, 383, 384, 385	930, 960	9300 DATA 292,232,130,187,3,188,	930, 960	9300 DATA 188,21,30,288,188,28,
386, 387, 388, 389, 390	940, 970	9400 DATA 292,232,130,187,3,188,	940, 970	9400 DATA 188,21,30,288,188,28,
391, 392, 393, 394, 395	950, 980	9500 DATA 292,232,130,187,3,188,	950, 980	9500 DATA 188,21,30,288,188,28,
396, 397, 398, 399, 400	960, 990	9600 DATA 292,232,130,187,3,188,	960, 990	9600 DATA 188,21,30,288,188,28,
401, 402, 403, 404, 405	970, 1000	9700 DATA 292,232,130,187,3,188,	970, 1000	9700 DATA 188,21,30,288,188,28,
406, 407, 408, 409, 410	980, 1010	9800 DATA 292,232,130,187,3,188,	980, 1010	9800 DATA 188,21,30,288,188,28,
411, 412, 413, 414, 415	990, 1020	9900 DATA 292,232,130,187,3,188,	990, 1020	9900 DATA 188,21,30,288,188,28,
416, 417, 418, 419, 420	1000, 1030	10000 DATA 292,232,130,187,3,188,	1000, 1030	10000 DATA 188,21,30,288,188,28,



# LISTINGS

62	1828	BRANDON	124,703,23,188,8	76	1758	BRANDON	177,8,138,8,173	87	1858	BRANDON	7,76,88,188,88
			178,888,188,888				178,8,173,8				833,188,88,88
63	1829	BRANDON	853,881,888,888	78	1868	BRANDON	173,887,8,133,87	88	1868	BRANDON	38,883,188,173
			183,178,888				177,888,8,133				188,8,177,178,8
64	1830	BRANDON	187,888,188,78	79	1878	BRANDON	182,3,188,178,8	89	1878	BRANDON	178,8,148,188,8
			8,178,8,818,888				788,88,888				178,188,8,178
65	1831	BRANDON	883,888,8,838,8	79	1878	BRANDON	88,188,3,188,18	89	1878	BRANDON	88,188,8,178
			88,188,8,888,188				8,788,88,888				88,188,8,178
66	1832	BRANDON	187,888,177	80	1888	BRANDON	888,88,188,8,88	90	1888	BRANDON	88,188,8,178
			883,133,8,188,8				81,888,177,88				88,188,8,178
67	1833	BRANDON	888,888,888	81	1898	BRANDON	88,88,888,88,78	91	1898	BRANDON	88,88,888,888
			1888,888,888,888				8,188,888,888				88,888,888,888
68	1834	BRANDON	888,888,888	82	1908	BRANDON	888,888,888,888	92	1908	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
69	1835	BRANDON	888,888,888	83	1918	BRANDON	888,888,888,888	93	1918	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
70	1836	BRANDON	888,888,888	84	1928	BRANDON	888,888,888,888	94	1928	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
71	1837	BRANDON	888,888,888	85	1938	BRANDON	888,888,888,888	95	1938	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
72	1838	BRANDON	888,888,888	86	1948	BRANDON	888,888,888,888	96	1948	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
73	1839	BRANDON	888,888,888	87	1958	BRANDON	888,888,888,888	97	1958	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
74	1840	BRANDON	888,888,888	88	1968	BRANDON	888,888,888,888	98	1968	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888
75	1841	BRANDON	888,888,888	89	1978	BRANDON	888,888,888,888	99	1978	BRANDON	888,888,888,888
			888,888,888,888				888,888,888,888				888,888,888,888





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