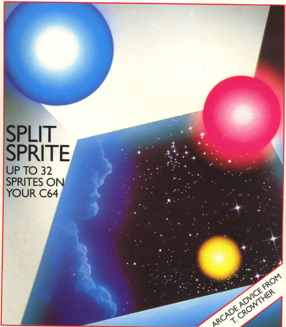
YOUR

COMMODORE

AN ARGUS SPECIALIST PUBLICATION

APRIL 1987 £1.10



SPLIT SPRITE

UP TO 32 SPRITES ON YOUR C64

ARCADE ADVICE FROM T. CROWTHER

50 C16 GAMES TO BE WON ■ CRIBBAGE ON THE PLUS/4 ■ PROTECTOR-PROGRAM SCRAMBLER ■

STRETCH YOUR MIND AS WE

Take the next step forward into a dimension of computer entertainment where action and excitement take on a new meaning. From the world's greatest creator of simulation software comes an unbelievable collection of war games, fantasies and adventurous challenges.

No longer are you restricted to the confines of a gameplan, no longer are you reliant upon the abilities and limitations of a remote software programmer for your enjoyment. Here is a challenge in which you take complete control. You make the decisions and you manipulate the circumstances to meet your objectives. Here you are the true master, your destiny is not simply in the speed of your reflexes, it's in the power of your mind as well.

CBM 64/ APPLE
BALTIC 1985
Can you lead the West Germans into West Berlin and free it from Soviet domination.
£24.99

CBM 64/ APPLE/ ATARI
USAAF
As a General in charge of 8th and 15th Air Forces, plan your assaults over 90 possible targets.
£29.99

CBM 64/ APPLE/ ATARI
BROADSIDES
Captain an 18th Century warship in this game. Return to the Swash Buckling battles against Pirates.
£24.99

CBM 64/ APPLE/ ATARI/ ST
COLONIAL CONQUEST
This Award Winning Simulation lets you fight for World domination during the Age of Imperialism.
£24.99/£29.99

CBM 64/ APPLE
RDF 1985
Defend Saudi Arabia from attack by Soviet Forces using the US Rapid Deployment Forces.
£24.99

CBM 64/ APPLE/ ATARI/ IBM/ ST
PHANTASIE
Transform your character from a thief to a wizard while you track down the Nine Rings.
£19.99/£24.99

CBM 64/ APPLE/ ATARI/ ST
PHANTASIE II
Remove the Curse of the Dark Lord, to do so, you need the Evil Orb.
£19.99/£24.99

CBM 64*/ APPLE/ ATARI
VIETNAM
Control the US Army through 6 historic Vietnamese operations.
£14.99/£19.99

CBM 64*/ APPLE
GERMANY 1985
When "Superpowers" collide Nato Forces must repel the Soviet invasion of West Germany.
£14.99/£19.99

CBM 64*/ APPLE/ ATARI*
BATTALION COMMANDER
Command a modern armoured Battalion against the computers real-life simulation.
£14.99/£19.99

CBM 64/ APPLE/ ATARI/ AMIGA
MECH BRIGADE
This is the most modern armour warfare program which features 70 different weapon types.
£29.99

CBM 64*/ APPLE/ ATARI
FIELD OF FIRE
Assume command of the First Infantry and relive the storming of Omaha Beach on D-Day.
£14.99/£19.99

CBM 64/ APPLE/ ATARI
CARRIER FORCE
Encounter the real drama of 4 famous battles during WWII in the Pacific.
£29.99

CBM 64/ APPLE/ ATARI/ AMIGA
FIGHTER COMMAND
Defend your country during the Battle of Britain using this superb strategic level simulation.
£29.99

CBM 64/ APPLE/ ATARI*/ IBM
KNIGHTS OF THE DESERT
Battle with armoured tanks against opposing enemies during the North American Campaign 1941-82.
£14.99/£19.99/£24.99

CBM 64/ APPLE/ ATARI/ IBM
TIGERS IN THE SNOW
Hitlers final desperate attempt to win WWII is recreated during this simulation of the Battle of the Bulge.
£14.99/£19.99/£24.99

CBM 64/ APPLE/ ATARI/ IBM/ ST
ROADWAR 2000
Travel forward in time where you search the gang lands for 8 scientists. The roads are treacherous where fuel is in short supply.
£19.99/£24.99

CBM 64/ ATARI
WARGAME CONSTRUCTION SET
Unleash your imagination and now create your own scenarios, historical, modern, fantasy or even Battle for the Stars.
£19.99

S WELL AS YOUR FINGERTIPS

CBM 64/ APPLE

BATTLEGROUP
The Western Front is being threatened, could you take control and repel an attack.
£29.99

CBM 64/ APPLE/ ATARI/ AMIGA/ IBM

KAMPFGRUPPE
This is a tactical game of armoured warfare on the Soviet Front from 1941-45.
£29.99

APPLE/ ATARI

WAR IN RUSSIA
This game requires skill in controlling every division of the Russian Campaign during WWII.
£29.99

CBM 64/ APPLE/ ATARI/ IBM

BATTLE FOR NORMANDY
Guide the troops during that furious day in June 1944 on a French Beach, D-Day.
£14.99/£19.99/£24.99

CBM 64/ APPLE/ ATARI/ IBM

GETTYSBURG
The outcome to this game could change the course of American History from the Civil War.
£29.99

CBM 64/ ATARI

WARSHIP
Control sides during this surface naval warfare simulation in the Pacific during WWII.
£29.99

CBM 64/ APPLE/ ATARI

PANZER GRENADIER
This program puts you in charge of an elite regiment of infantry attacking Russia under Hitler's direct orders.
£24.99

CBM 64/ APPLE

GEOPOLITIQUE
Outwit the computer in a political, economical and military struggle for world dominance.
£24.99

CBM 64/ APPLE/ ATARI

COMPUTER AMBUSH
Hand to hand combat is the only way to win the war in this WWII game.
£29.99

CBM 64/ APPLE

NORWAY 1985
Nato's ski infantry try to regain Norway from Soviet control, can you plan the attack.
£24.99

CBM 64/ APPLE/ ATARI/ IBM

BATTLE OF ANTIETAM
Relive the bloodiest day in American History, the Rebels threaten to escape, so you must stop them.
£29.99

CBM 64/ APPLE/ ATARI

GEMSTONE WARRIOR
Search the deadly Netherworld for the magical Gemstone in this exciting action-strategy game.
£19.99

CBM 64/ APPLE/ ATARI/ AMIGA/ IBM/ ST

WIZARDS CROWN
Guide a valiant band of Adventurers to recover the precious Wizards Crown.
£19.99/£24.99

CBM 64/ APPLE/ IBM/ ST

RINGS OF ZILFIN
Search for the last ring of the Wizard Zilfin to become Grand Master Wizard
£19.99/£24.99

CBM 64/ APPLE/ ATARI/ IBM/ ST

SHARD OF SPRING
Hunt the Sorceress for the stolen Shard and bring prosperity back to your island
£19.99/£24.99

CBM 64/ APPLE

GEMSTONE HEALER
Recover the healing tool and revive the Gemstone's power but beware one mistake could be catastrophic.
£19.99

CBM 64/ APPLE/ ATARI

QUESTRON
Defeat the Wizard Mantor and recover the Evil Book but beware of his hideous defence.
£19.99

CBM 64/128/ APPLE/ ATARI

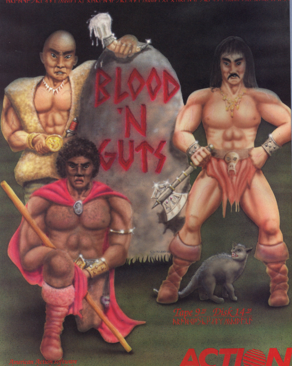
REALMS OF DARKNESS
PHANTASIE III
WAR IN THE SOUTH PACIFIC
BATTLECRUISER
Coming soon £19.99

U.S. Gold Ltd., Units 2/3 Holford Way, Holford,
Birmingham B6 7AX. Telephone: 021 356 3388
Telex: 337268

STRATEGIC SIMULATIONS INC

* Available on Cassette £9.99

Blood 'n Guts – An ancient barbarian decathlon with all the violenc and brutality you've ever dreamed about in a computer game...



Tape 9.95 Disk 14.95

American Action software distributed in the U.K. by Microdealer International Telephone (0908) 74000.

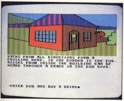
ACTION

Entertainment software with some bloody special effects from American Action AB, P.O. Box 10090, S-200 43 Swe Telephone (+46) 40 23 25 20, Telex 32135 Comput S.

VOLUME 3 NUMBER 7

FEATURES

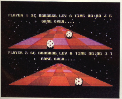
- *Data Statements* 7
- *I.Q.* 12
Intellectual games playing.



```
PATHS FROM ALL DIRECTIONS FORM A
CROSSING HERE. IN ONE CORNER IS THE PUB.
NOISES FROM INSIDE THE BUILDING CAN BE
HEARD THROUGH A CRACK IN THE PUB DOOR.


-ENTER PUB AND BUY A DRINK●
```

- *Football Fortunes* 18
Game of the month.
- *Games Review* 29


PLAYER 1 SC 0003660 LEV A TIME 00:00 J 6
GAME OVER....
PLAYER 2 SC 0000000 LEV A TIME 00:00 J 7
GAME OVER....

- *Competition* 66
50 copies of C16 exploding fist must be won.
- *Software for Sale* 78
- *Letters* 97
- *Contributions* 101
- *Listings* 102
- *Back Page* 106

REGULARS

- *Shepherds View* 21
We talk to Nigel Shepherd of Commodore North America.
- *Sport on Channel 64* 24
Sporting simulations for the C64.
- *Basic Memory* 26
Hiding variables away on your C64.
- *C-16 Games* 48
What's new for the baby of Commodores range.
- *Split Sprite* 56
Up to 32 sprites on your C64.
- *Arcade Action* 68
Arcade programing advice from Tony Crowther.
- *Percussion Section* 76
Turn your C64 into a drum machine with this add-on.
- *Device 1* 80
We review what may be the ultimate printer interface.
- *CP/M and the C128* 82
We take a second look at this mysterious subject.
- *Go Forth + ** 86
Just what does Forth offer the average user?
- *Expanding Systems* 89
We review the latest software for the Sound Expander.
- *Red Boxes* 95
Let your C64 control your home.

PROGRAMS AND UTILITIES

- *Cribbage* 40
Superb game for your Plus/4.
- *Diskit 4* 45
Protect your programs with Scrambler.
- *Diskit 5* 53
Turn your machine code into DATA statements.
- *C128 Keypad Modifier* 85
Make your numeric keypad more useful.
- *Letter Writer* 90
A novel way to send letters to your friends.
- *Double Print* 98
Double height characters on your C64.

GRANGE HILL – THE GAME
GH

Argus Press Software Group

Victory House,
Leicester Place,
London, WC2H 7NB.
Telephone 01-439 0666

Available for Spectrum,
Commodore 64
and Amstrad: £9.95

Grange Hill © Phil Redmond Enterprises Ltd

APS

Argus
the of
Grang
Spin
about
game
'Gon
Th
schoo
withi
lies y
durin
witho
moth
What
schoo
your
your
a litt
gener
W
Hollo
nickn
brains
your
your
Th
of l
eleme
with
shoul

Mis

Final
their
we sp
R
adver
Orc.
inten
huma
peop
digiti
visua
Out s
A
launc
Cont
Acad
traini
skim
desig
parti
quali
skim

DATA STATEMENTS

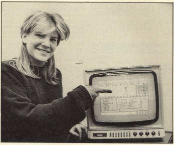
APS at School

Argus Press Software is soon to release the official Grange Hill game, entitled *Grange Hill – the Computer Game*. Spin off of the long running TV series about a comprehensive school, the game casts you in the part of Luke 'Gonch' Gardner.

The scenario is the darkened school, closed for the night. However, within the confines of the staff room, lies your Walkman, confiscated earlier during class. You cannot return without it for fear of the wrath of your mother. So, you have to get it back. What better idea than to break into the school after everyone else has left, find your way to the sfaffroom and claim your lost property? Well, it may sound a little far-fetched but that's the general idea.

With the aid of your pal, Hollo Holloway (presumably supporting this nickname because he has even less brains than you), you aim to complete your dirty deed by midnight otherwise your mum will go spare.

This adventure has a large number of locations and contains arcade elements as you guide the characters with the keyboard or joystick. It should be in the shops now and is £9.95 on cassette.



Bully Imelda

Also look out for these other titles, coming soon on APS labels: *Wibstars, Agent Orange, Circus Maximus, World War One, Stellar Holocaust, Roundheads and The Hunt for Red October*, All are for the C64.

Touchline
Argus Press Software: *Victory House, Leicester Place, London WC2H 7NB.*
Tel: *01 439 0666.*

Miscellaneous Software

Finally a look at a few games winging their way to your local shops even as we speak.

Rainbird is releasing a new level 9 adventure for the C64 entitled *Knight Orc*. It casts you as an opressed orc intent on getting your own back on the humans who have subjugated your people for generations. State of the art digitised graphics are an impressive visual feature of the new adventure. Out soon.

Academy, from CRL, is due to be launched for the C64 in the spring. Continuing the theme of *Tau Ceti*, *Academy* enrolls you in the top secret training school of the Galcorp for skimmer pilots. You have to learn to design your own space ship, and participate in all the classes needed to qualify to become a full fledged skimmer pilot. It will be available on cassette and disk at £8.95 and £14.95 respectively.

Airolasoft has a bargain package for the C16. *Void Runner and Hellgate* is a two-games-in-one cassette for only £6.95.

Also from Ariolasoft is *Killer Ring*, the latest Tony Crowther game on Commodore 64 cassette (£8.99) and disk (£12.99). The inlay card features a special recipe for K-Ring cup cakes.

Blitzkreig, a C64 game based on the Len Deighton thriller of the same name, will also be available for the C64 from Ariolasoft in the near future. Based on the assault against Britain in World War Two, you lead the German forces in a game of strategy and action.

C16 users are still being supported handsomely by Gremlin, and a new release for this machine is on its way to the shelves. *The Way of the Tiger*, based on the fighting fantasy series of books of the same name, combines strategy, action and unique animation. It features three action packed levels 'superb sound effects and inspiring backdrops'. Yours for £6.95.

Touchline
Rainbird: *First Floor, 74 New Oxford*

Street, London WC1A 1PS. ***Tel:*** *01 240 8838.*
CLR: *CLR House, 9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2981.*
Ariolasoft: *68 Long Acre, Covent Garden, London WC2E 9JH.* ***Tel:*** *01 836 3411.*
Gremlin: *Alpha House, 10 Carvar Street, Sheffield S1 4FS.* ***Tel:*** *0742 753423.*

Links On Line

Who says computer owners aren't romantics at heart? News has recently come in of the first online engagement on *Compunet*.

The couple are Paul Hurrell and Margaret Northey. They were introduced by Carol, Margaret's mother. She said "I was chatting to Paul on Party-Line at Christmas and he sounded a bit down, so I brought Margaret online to cheer him up".

A five hour party line session lead to a phone call and then Paul made the journey from his home town in Winterbourne near Bristol, to Leeds, Margaret's home, where they met face to face for the first time. Soon afterwards Margaret surprised her family with a diamond and sapphire engagement ring. The couple plan to marry in about two years.

Margaret's father Chris said: "When I bought a modem, I didn't bargain for a wedding".

Paul summed up the couple's feelings about their romance: "It's thanks to *Compunet*. Living 240 miles apart, we'd never have met if it hadn't been for Party-Line".

On to the more serious aspect of communications, BT's *Electronic Yellow Pages (EYP)* went live in early January, allowing most online communicating terminals in the UK and abroad free access to a database of *Yellow Pages* advertisers.

Initial information covers the whole of London, Reading, Guildford, Watford and St Albans.

In areas where the 1987 edition of *Yellow Pages* are not available until later in the year, users interested should ring the *EYP* Helpline (see Touchline) for a free copy of the user instructions.

Touchline
Compunet: *01 965 8866.*
EYP Helpline: *0734 506259.*

Sports Pick

New from Activision is an America's Cup game, simply and appropriately tagged *Sailing*.

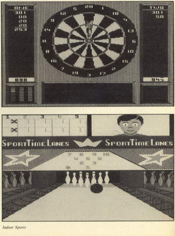
It's a game of strategy and simulation designed to capture the thrill of competing in top level sailing competitions. Even before you start racing you have to design the boat that wil get you across the finishing line first.

You can choose overall length, waterline length, freeboard and mast length as well as adding wings to your keel and changing the hull material. Once you've sorted this out and made your allegiance to a particular nation then you're ready to compete.

The display is spit into two halves, the top shows the prow out over the sea, so that you can see if your opponent is ahead. The bottom contains your gauges which you need to monitor closely to get the best from your boat. It's available for the C64/128 at £9.99 cassette and £14.95 disk.

Four sports games in one are available from Advance Promotions in the form of a new release entitled *Indoor Sports*. The four sports featured on the cassette for C64 are *10 Pin Bowling*, *Air Hockey*, *Table Tennis* and *Darts*. The Commodore 64 version is £8.95 and Advance claims that all the games could stand alone at full price.

Touchline
Activision: 23 Pond St, Hamsptead, London, NW3 2PN ***Tel:*** *01 431 1101*
Advance: *17 Staple Tye, Harlow, Essex CM18 7LX.* ***Tel:*** *0279 412441.*



Indoor Sports

Pocket Money

A new range of budget games has recently been launched by Midas Marketing. There are two initial releases on the new label: *X29 Fighter Mission* for the C64 and *Space 2* for the C16. Both are priced at £2.99.

X29 Fighter Mission is essentially a flight and combat simulator. Your fighter must be flown with skill and daring to avoid the constant onslaught of enemy fire and heat seeking missiles. At the same time you must concentrate on destroying the enemy craft.

Space 2 is a combination of shoot 'em up action and skill and nerve in manouevering a large space craft through dark caverns. There are two programs on *Space 2*. The first *Galaxy*, involves a lost starship trying to return to the mothership. However, there are the inevitable galactic mutations trying to hinder your journey.

Pilot X is the second program where you must guide your large fuel supply vessel to stranded scientists on the planet Vogon. They are situated deep underground so you need to negotiate the treacherous route through caverns strewn with strange obstacles.

Mastertronic is also launching a new lable named Bulldog (best of British).

The company claims to have commissioned some startling original products for the new label which will have a distinct identity to complement the existing Mastertronic £1.99 and £2.99 ranges. The first title, already in the shops, is *Feud*, at £1.99.

Recently formed Budget House, Code Masters, has just announced a competition for buyers of Code Masters games. Anyone buying a Codemasters game will get an entry form to the BMX competition. All you have to do is spot the fallen rider which has been deleted from a screen shot of the Code Master game *BMX Simulator*. Entries are only limited to the number of Code masters games you buy. Hurry, because the competition closes on 31 March 1987 and the prize is a 20" Sony Trinitron colour TV.

Other new pocket money priced games are *Willow Pattern* on the Firebird Silver £1.99 label and *Cyber I* on the Supersparklers label from CDS at £2.99. Both are for the C64.

Touchline

Midas Marketing: *35 West Hill, Dartford, Kent DA1 2EL.* ***Tel:*** *0322 92513.*

Mastertronic: *8-10 Paul Street, London EC2A 4JH:.* ***Tel:*** *01 377 6880.*

Code Masters: *1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.*

Firebird: *First Floor, 74 New Oxford Street, London, WC1A 1PS.* ***Tel:*** *01 240 8838.*

Supersparklers: *CDS, Unit B11, Armstrong Mall, Southwood Summit Centre, Southwood, Farnborough, Hands, GU14 ONP.* ***Tel:*** *0252 522200.*

Drives and Data Recorders

The *Enhancer 2000*, the only available alternative to Commodore's own series of disk drives, although viable and reasonably priced, has always suffered from compatibility problems. Now Evesham Micros claims to have solved this.

Evesham claims that on the enhanced version of the *Enhancer*, all disk turbos and virtually all disk protection schemes can be handled without a problem.

Priced at £149.95 (fully inclusive) and an option to purchase with Freeze Frame Mk3b and 10 disks for £179.95, Evesham reports high demand from all quarters.

At the moment supply is restricted to mail order, unless you call in at one of Evesham's two branches. However, Evesham hopes to expand availability to other retailers in the near future.

Load-It

For those still struggling with data recorders, you may be interested in the *Load-It* system.

The system works in the following way: a small slot is cut in the case to allow the datafinder adjuster to move forward and backwards as play and stop are requested. A knob is attached to a threaded shaft which replaces the azimuth screw allowing an adjustment of 180 degrees. Sound is also fitted for the Commodore 64 allowing the user to adjust to the clearest data signal. For the technically minded there is a DIY kit available. If you're interested, then contact the address in Touchline for more information.

Touchline

Evesham Micros: *63 Bridge Street, Evesham, Worcs WR11 4SF.* ***Tel:*** *0386 41989.*

Load-It: *35 Stretton Road, Shirley, Solihull, W Midlands B90 2RX.* ***Tel:*** *021 745 4970.*

Notes on Utilities

Supersoft, the company which has ardently supported the PET series from the beginning, has now fulfilled a recent promise to continue to provide software for these machines.

Fast Copy is a disk copying facility for the 8050 and 8250 drives which can drastically reduce the time it takes to make vital check-up copies of data disks. It saves time by omitting the formatting process on an already formatted disk and by copying only those blocks that have been used. Available at the low cost of £15 (ex VAT).

Blitz is a Basic compiler for the 3032, 4032, 8096 and 8296 computers. *Blitz* has been available in Europe for some time and has now been licensed to Supersoft in the UK. Compiled programs run five, 10 or even 20 times faster with *Blitz* and since they are impossible to alter by anyone who hasn't got access to the uncompiled original, they are also more secure.

Blitz costs £99 (ex VAT) and comes with a comprehensive manual. Additional versions on the same disk are only £30 extra, so for example the 8032 and 8096/8296 version would be £129 altogether.

Fast Copy and *Blitz* are available from Supersoft or on order from your local computer store.

Staying with utilities but moving to

the C64, Systems Software has recently published *Oxford Basic*. This is a complete C64 Basic programming environment and gives the user a full library of powerful utilities including: *Oxford Analyzer*, a report optimisation utility; the *Compressor* which eliminates time consuming spaces and REM, the *Toolkit* which introduces new commands; *Ox-Comp* a fast fully compatible Basic compiler to give you the speed and professionalism of machine code without an assembler. The all-inclusive price is £34.95.

Touchline

Supersoft:** Winchester House, Canning Road, Wealstone, Harrow, Middz HA3 7SJ.* ***Tel: *01 861 1166.*

Systems Software:** 16B Worcester Place, Oxford, OX1 2JW.* ***Tel: *0865 54195.*

Potential Millionaires Wanted

American software company MicroProse, which has recently established a UK base, is looking for Commodore software writers with the potential to become millionaires overnight.

The man behind the hunt is Simon Barnard, MicroProse software development manager. He said: "We believe that the UK has the best Commodore software writers. And my job is to find them and offer them, not only money, but international recognition".

MicroProse in the US spends in excess of $1 million in developing its software programs. However, Simon is not just looking for simulation specialists, he also wants programmers of top quality arcade games.

Simon revealed his reasons for believing that successful applicants may soon gain millionaire status: "MicroProse titles remain at the top of the US charts, literally for years. And that translates into a lot of royalties, besides substantial advances. So I don't think it would be unfair to claim that if we can find someone who can write simulation like Silent Service, they could be a millionaire almost overnight".

MicroProse has an extensive list of simulation programs, the latest of these, due for imminent release, is *Gunship* for the C64/128, £14.95 cassette, £19.95 disk.

Gunship is an accurate simulation of the Hughes AH-64A Apache combat helicopter – one of the most lethal weapons in the modern military arsenal.

Gunship is the result of extensive research and the culmination of five man years of programming and games design. It was held back from release until military helicopter pilots had actually test flown *Gunship* themselves. Now the US army uses it to stress test pilots, attaching sensors to their bodies to measure reactions.

Touchline

MicroProse:** 2 Market Place, Tetbury, Gloucestershire GL8 8AD.* ***Tel: *0666 54326.*

MICRO MEDIA Computer Supplies

0707 52698 or 0707 50913

Rydal Mount, Baker Street,
Potters Bar, Herts EN6 2BP
Dept YC.

Unbranded 5¼" Discs

Certified lifetime warranty
hub rings, envelope, labels

Prices per 10 Discs

	10+	30+	50+
SS/DD	6.50	6.00	5.50
DS/DD	7.50	7.00	6.50
3M 5¼" Lifetime Guarantee			
SS/DD	10.30	9.90	9.60
DS/DD	12.50	12.20	11.90
3M 3½" Lifetime Guarantee			
SS/DD	20.50	20.30	20.00
DS/DD	25.50	25.30	25.00
Unbranded 3½" Discs			
SS/DD	17.00	16.00	15.00
DS/DD	19.00	18.00	17.00

Disc Care

Discs with 15ml cleaning solution

5¼" Head Cleaner	4.00
3½" Head Cleaner	5.00

5¼" Disc Doubler

Utilise reverse side of single sided discs
Accurate position guide **£5.50**

Dept. YC.
Next day delivery available.
Please ask for details.
All prices inc. of P & P UK only.
Please add 15% VAT.

Swivel Bases for Monitors

Pan tilt revolves around 360°
12.5° tiltable up and down
adjustable by front mechanism.
12" Monitors **£12.00**
14" Monitors **£15.00**

Copy Holder

Adjustable with desk clamping arm

£13.90

Printer Stand

For 80 column printers

Dimensions 405 x 325 x 100mm
Made from 5mm clear perspex **£19.90**

PRINTER RIBBONS

Mixed types for quantity breaks
1 off if ordered with other products

	2+	5+	12+
Canon PW1156/1080	3.20	2.70	2.50
Red Brown Blue Green	4.70	4.20	3.90
Commodore			
1516/1526/4023 MPS 802	3.80	3.00	2.80
2022/4022	2.80	2.40	2.20
Red Brown Blue Green	4.00	3.30	3.10
MPS 801	3.70	3.10	2.90
Red Brown Blue Green	4.90	4.60	4.20
Vic 1515/1525	2.80	2.30	2.10
DPS 1101	2.30	1.90	1.70
MPS 1000	2.80	2.40	2.20
Red Brown Blue Green	4.00	3.30	3.10
MPS 803	3.50	3.00	2.80
Red Brown Blue Green	4.95	4.65	4.25
Epson FX/MX/RX 80	2.80	2.40	2.20
Red Brown Blue Green	4.00	3.30	3.10
Kaga KP 810/910	3.20	2.70	2.50
Red Brown Blue Green	4.70	4.20	3.90
Shinwa CP 80	3.80	3.00	2.80
Star Gemini 10x 15x	1.50	1.20	1.10
Red Brown Blue Green	2.40	2.00	1.80

If the ribbon you require is not listed ring 0707 52698 and let us quote

Computer Paper

Plain, fanfold, micro perf edges

Size	Weight gsm	1000's per box	Price per box 1 box	2 bxs+
11 x 9½	60	2	14.40	13.60
	80	2	17.80	16.30
EXACT A4	70	2	24.00	21.30
11⅔ x 9¼	90	1	15.20	12.70

Computer Labels

Cont fanfold Sprocketted	Price per 1000 1,000	2,000+
70 x 36	4.20	3.80
89 x 36	4.30	3.90
89 x 49	5.90	5.30

Please state no of labels across sheets (1, 2 or 3)

MM 100

MM 50

MM 80

MM 40

Disc Boxes

MM 100	5¼ x 100	11.70
MM 50	5¼ x 50	8.70
MM 80	3½ x 80	11.90
MM 40	3½ x 40	8.50

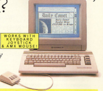
All MM boxes anti-static with lock

24-Hour Credit Card Orders

VISA

0707 52698

Stop Press! What's so special about The Amiga, The Mac, The Atari St., Windows and Gem?



It's no surprise that nearly all new 16 bit 'state of the art' micros now come with a Mouse and Wimp environment (Windows, Icons, Menus and Pointers) as standard.

With the COMMODORE 64 you already own one of the classic micros and by simply adding the 'AMX Mouse' and 'Stop Press' you can achieve the same ease of use, freedom and versatility of much more sophisticated computers.

The AMX Mouse with Desktop Publishing software – it's what you and your COMMODORE micro have been missing!

AMX MOUSE PACKAGE 5¼" DISC £69.95

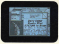
There's not much joy in a joystick and keyboards can be all fingers and thumbs. Acclaimed by the press as 'the best input device', already over 50,000 micro users have adopted an AMX Mouse. The AMX Mouse combined with Stop Press puts you right at the heart of the desktop publishing revolution.

At long last you can produce newspapers, posters, leaflets, notices and handouts in your own school, home or office. We're not talking about amateurish results, but extraordinarily professional work with crisp text and exciting graphics. Available for the Commodore 64, 64c and 128.

STOP PRESS & CONTROL (ONLY) £39.95

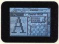
MENU DRIVEN PROCESSOR

Provides easy access to all the 'Stop Press' modes. A comprehensive and versatile filing system that makes management a joy! Powerful graphic and full proportional text options enable you to give your documents the professional look with the minimum of effort. Allows windowing, copying, re-scaling, and all the printer options at the touch of a button.



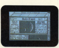
FONT AND PATTERN DESIGNERS

Allow your creativity to really come to the fore. Use the built-in designer to create your own fonts or change any of the 50 fonts supplied. You can also design your own patterns to use with the amazing spray and paint options.



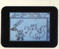
PROCESSOR ACCESSORIES

A fast preview facility that displays the full width of the document. Provides an ideal way of viewing the composition of your masterpiece. An innovative 'kwik-klik' window makes changing graphic options unbelievably easy. Allows full page scrolling with one click of the button.



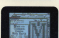
CLIP ART

Over 150K of clip-art is supplied with 'Stop Press' covering a wide variety of subjects including sport, music, transport, cartoons, technology, and a host of miscellaneous items. Alternatively areas of your page can be "cut" to disc, building into your own unique library of clip-art. Cut-outs can be "pasted" into any page, at any position, preventing the need to re-do headers and footers, etc.



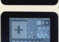
FULL PIXEL EDITING

The most advanced pixel editor available on the Commodore 64 is provided with stop press. Any area on the screen can be brought into close up and altered. Intelligent continual pixel 'set/unset' and real time scroll, while zoomed-in, make this an extremely powerful editing tool.



MOUSE CONTROL SYSTEM + ICON DESIGNER

Write your own mouse driven programs using the powerful basic extentions. The Mouse control system adds over 30 commands to Basic, including Windows, Icons, Menus, Pointers, line drawing, memory load and save. The Icon designer is a sophisticated Icon editing program developed entirely using the extra commands provided by the Mouse control system and shows the high quality of program that can be achieved using this system.



This superb product is available now from all good computer dealers or direct by cheque, Access or Visa. All prices include VAT and post and packaging.

FOR INSTANT ACCESS/VISA ORDERS TELEPHONE (0925) 413501/2/3

AMX SOFTWARE

IMAGINATION AT YOUR FINGERTIPS

ADVANCED MEMORY SYSTEMS LTD. 166/170 WILDERSPOOL CAUSEWAY, WARRINGTON, WA4 6QA. TELEX 628672 AMSG. FAX 0925 58039.

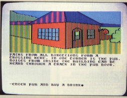
TUBELINK ON PRESTEL PAGE 2582182 SUPPORTS THE AMX MOUSE AND ALL AMS SOFTWARE

Macintosh is a licenced trade mark of Apple Inc. Atari St. is a trade mark of Atari Inc. Amiga is a trade mark of Commodore Business Machines Inc. Windows is a trade mark of Microsoft Inc. Gem is a trade mark of Digital Research Inc.

I.Q.

More and more people are turning to games which need grey matter rather than thumb power on a joystick. Here's another exciting selection to tax your mind.

Adventures can sometimes seem rather daunting to the uninitiated. Apart from the necessity of learning adventurespeak and the all important mapping technique, there's the bigger problem of mind bending puzzles to solve. All this could easily turn away the average punter, however we've decided to have a look at a couple of programs from Ariolasoft which may help to break you in gently so that you can cultivate the adventure bug.



PATHS FROM ALL DIRECTIONS FORM A CROSSING HERE. IN ONE CORNER IS THE PUB. NOISES FROM INSIDE THE BUILDING CAN BE HEARD THROUGH A CRACK IN THE PUB DOOR.

-ENTER PUB AND BUY A DRINK

THE PHILOSOPHER'S STONE

Commodore machines aren't the exclusive preserve of Britishers and our US Buddies. Europe is a hotbed of Commodore enthusiasm and Germany is perhaps the heart of this trend. It is fitting then that this game from Ariolasoft originally started life there. Actually called *Lapis Philosophorum*, but translated for non-classicists, this is an ideal starting point for new adventures and an interesting diversion for more experienced addicts, unfortunately only available for C64 and 128 disk users.

The basic storyline concerns a medieval king, Highet Gieselmer, whose stepson has been systematically poisoning him. The only hope left to the old boy is the Philosopher's Stone which has the fantastic powers of turning base metals into gold and curing all ills to boot.

Your character is that of an ageing alchemist. You have found clues to the whereabouts of the fabulous stone in a book in your loft (where else?). So you set out to get hold of it. Make sure that you explore your home town thoroughly first. Leaving town may be a problem as the prince has discovered the nature of your quest and the guards are ordered to detain you, however, with the right object you can hypnotise them into letting you pass.

One distinct advantage for new initiates are the HELP messages placed in strategic parts of the game. Heed them well as these cryptic clues may prove invaluable.

Most items which are available are included in the location description, however, if you go to the market there's more choice but you have to think hard about what you may need later on. Remember to SAVE your game position in the early stages so that you can go back for anything you may have omitted to collect.

The graphics are clear, colourful and reasonably detailed. Disk access is at the usual slow speed.

If you are moving between locations the format N,N,W,N,N,E,GET STICK can speed up progress. The interpreter understands basic verb/noun formations but on occasion a little more detail may be needed. One retrograde aspect is the necessity to enter all words in full with very few single letter entries understood. Two that you can use are I for Inventory and L for look to repeat a location description.

There is no RAM SAVE facility but there are seven named positions saved to disk. You will need these as in several places death will follow the wrong move, for instance if you lose a game of Hangman with a troll!

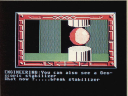
Although a most enjoyable game with lots to find and plenty of puzzles to solve. There are said to be seven different ways to complete the game so perhaps experienced players will appreciate that challenge. Definitely fun for all levels of player. **P.F.**

NECRIS DOME

Due to limitations of room and resources, the Earth's dead are no longer buried or cremated as used to happen, but are transported into orbit. There, a huge space cemetery called the Necris Dome circles around. Run by a group of mandroids, they in turn are controlled by an Arch-mandroid who is rumoured to be trying to create something of a powerbase for himself.

As weapons have been banned on Earth for a few centuries, it is really bad news when it is discovered that the Arch-mandroid has filled the Necris Dome with various potential forces and get smuggled into the dome in the next batch of coffins. Your mission is to seek out and destroy the Arch-mandroid at all costs.

Necris Dome is a somewhat simplistic adventure which starts with you in your coffin. The first illogicality strikes you straight away. Although you can see nothing in the coffin either now or when you open it, if you return to the coffin and close the lid, a pair of rubber gloves has mysteriously materialised. Nothing is guaranteed to put off an adventure player (or at least this reviewer) than such nonsense.



```
ENGINEERING:You can also see a Geo-
scopic stabilizer
What now ?.....break stabilizer
```

The atmosphere created by the game is minimal. Location descriptions are terse – 'you are in the reception level chamber three as opposed to chamber two or four. The graphics likewise have a feeling of similarity to them. Even at a budget price, I cannot recommend Necris Dome. **G.R.H.**

As promised in our I.Q. pages, we're not just trying to publish a run of the mill adventure column, so for those of you who want something a bit different, read on to check out some other original games.

TASS TIMES

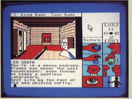
If your idea of style is a infra red dimmer switch then you'll relish this ludicrous graphic adventure from Activision.

The game is set in the ultra tass (trendy) world of Tonetown that exists in another dimension. Your favourite old fogey, Gramps has built an inter-dimensional machine and has got himself lost in Tonetown and it's up to you to find him. Helped by Gramp's dog Spot who is sitting there awaiting the Legend in Tonetown you must search this strange land trying not to look too much like a total tourist.

There's nothing weird about the excellent adventure system used to play this game. The screen display is split into areas including a graphic display of your current location, a text display (for text only freaks) and alongside them a series of large icons through which you can quickly generate the commands look, enter, hit, buy, get, drop, talk to, tell me about as well as north, south, east, west, up and down. You can also enter standard text commands use the predefined function keys to repeat commands and quicksave and load game positions. You can even examine and get objects illustrated in the pictures by simply pointing a cursor at them!

The villain of Tonetown is an ugly green brute called Franklin Snarl who would love to get his claws on you in between his attempts to buy up the town. His antics to date and other essential clues are packed into the latest edition of the Tonetown Times that also includes adverts that will help you become tass and the usual collection of curious small ads.

Tass Times is undoubtably a unique adventure featuring the most peculiar settings, characters and descriptions but it is also very good and will be Activision's best non Infocom adventure. Remember Tonetown welcomes visitors but not total tourists. **T.H.**



```
:GO SOUTH
You're in a messy bedroom.
Gramps was never the best
housekeeper, even though
he keeps a spotless
laboratory.
Spot sits by the foot of
the bed whining softly.
```

THE STANDING STONES

This is the second Ariolasoft title which holds a challenge for the beginner without being too complicated. Set in the ground beneath an ancient stone circle, the idea is to locate the long, lost Holy Grail.

When you begin play you must create a knight. Go carefully here, as it is important. A list of attributes appears with random ratings of up to 18. If you don't like the numbers assigned, you can try again. The instructions suggest that you only accept a character with at least three attributes in double figures. In which case, why do they give so many with less than 10? The attributes are: virility, intellect, holiness, agility, and initial hits. These can be roughly translated as strength, magical attack, peaceful spells (such as 'heal' and 'teleport'), agility is self explanatory and initial hits indicates your ability to withstand attack.

Once you've settled your character, it's time to enter the 3D maze, where you must explore, fight monsters and collect treasure.

The maze must be mapped for you to stand any chance of success. On the first level a series of arrows points the way to the exit. It is best to use this over and over again so that you build up your experience. Leave it at your peril.

Apart from the monsters there are many useful items, including magical books, chests, potions, rings, weapons and armour. Unfortunately many of these articles are booby-trapped so it's not all plain sailing.

When you encounter a monster you have several courses of action: fight, greet, bribe or run away. Fighting is usually the best option, however, elves and gnomes will sometimes return a greeting and gives you a gift as well.

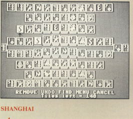
Throughout your quest you have a companion named Lancelot. Most of the time he is snoozing or sharpening his sword but ocassionally he bursts into action and despatches your present foes.

The deeper you go the harder the game becomes. Further down there are oases which will restore drained strength but they're not always in the same place.

The graphics consist of simple line drawings for the maze and fairly basic shapes for the enemies. You may leave the dungeons at any time to save your character.

Not a bad game if you choose your character carefully before testing the depths. Even then you should not expect to stay alive long unless you map your route and this can be difficult due to secret doors and one way passages. *The Standing Stones* calls for a lot of patience, a will to live and a lot of luck.

P.F.



SHANGHAI

A variation of the card game pairs doesn't sound like the usual fodder for a computer game but it's surprisingly addictive.

This variation uses the 144 tiles found in a Mah Jongg set (the ancient Chinese game) arranged in a set pattern that is supposed to represent a dragon. The pattern rises in the middle to a height of five pieces (the head) and down to rows of single tiles.

To complete pairs that are then removed from the game the player can only match tiles that aren't surrounded by others which usually means from the head and tail. By this method you must try and remove all of the tiles or at least as many as possible either on your own, in solitaire play or against other humans in a tournament game against the clock.

Matching pairs can be a strain on the eyes as you stare into the screen at an average of 80 tiles that are in view for most of the game. The others are hidden from view in the piles in the centre of the pattern which you must gradually whittle down.

Mah Jongg sets contain 144 tiles split into three major suits and craks, bams and spots (also known as characters, bamboos and circles) three dragons, four winds and an odd collection of flowers and seasons. As there are four of each piece you would think that matching pairs would be easy but you'd be surprised at the number of times you'll have a choice between three pieces and have to work out which one to leave.

Options at the bottom of the screen allow you to undo moves you want to play again and even peek at hidden tiles once you've given in.

At last an addictive strategy game. **T.H.**

DODGY GEEZERS

The big day has arrived. Your stay, courtesy of Her Majesty is about to end. It was only supposed to be for two years, but you got time added on for bad behaviour. You have been looking forward to this day for some three years now, not least because you have a small amount of unfinished business to attend to. You were stitched up something rotten over that Long Ditton Spaghetti caper and a spot of revenge would not go amiss.

Dodger Geezers is an adventure in two parts. In part one, you must find a crime to commit and assemble a team to help you do it. Part two involves pulling off the actual crime. The game is set in the East End of London, presumably because everybody knows that that is where all the real criminals hang out. There is the usual collection of misfits as you make your way round dark alleys, seeding pubs, a dockland area and the dog track. Crimes are being committed all round you, judging from the number of wanted posters about, but can you actually find the men required for your team? And who is the shadowy figure with the white Gucci shoes who turns up everywhere? And why are there several crates hidden in the warehouse full of two inch nails when they are clearly marked Banco di Palmermo? All you have to go on is a telephone number from a colleague who was released on the same day as you. All you want now is a working phone.

Dodgy Geezers is a reasonable enough game without being outstanding. The parser is fairly crude, being for the most part verb/noun input. There are a few spot graphics, usually the wanted posters which brighten the place up but the gangland atmosphere and jokes don't quite work.

G.R.H.

Touchline

Philosopher's Stone, Standing Stones: *Ariolasoft, 68 Long Acre, Covent Garden, London WC2E 9JH.*
Necris Dome: *Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.*
Tass Times, Shanghai: *Activision, 23 Pond Street, London NW3 2PN.*
Dodgy Geezers: *Melbourne House, 60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.*

DIMENSION computers l.t.d.

27/29 High Street
Leicester LE1 4FP
Tel: (0533)
517479/21874

THE MIDLAND'S LARGEST COMPUTER STORE

SOFTWARE

VIZA

Vizastar XL8 64	£99.95	£79.95
Vizastar XL8 128	£129.95	£99.95
Vizawrite Classic 128	£99.95	£79.95

PRECISION

Superscript 64	£60.95	£49.95
Superbase 64/+4	£90.95	£39.95
Superscript 64 & Superbase 64	£169.90	£79.95
Superscript 128	£89.95	£74.95
Superbase 128	£99.95	£59.95
Superscript 128 & Superbase 128	~~£189.90~~	£119.95
Superbase, The Book		£11.95

COMMODORE 64 COMPENDIUM PACK OFFER

Commodore 64, C2N Data Recorder, Music Maker Keyboard, Designer's Pencil, Adrian Mole Game and Book plus Pack of 12 Educational Titles or Pack of 10 Games Titles	£199.95

COMMODORE

Future Finance (Planning Package), Disc	~~£75.00~~	£17.95
Easyscript (Word Processor), Disc	~~£75.00~~	£24.95
Simons Basic Extension, Tape	~~£19.95~~	£12.95
Commodore 64 Programmers' Reference Guide	~~£9.95~~	£7.50
Typing Tutor 64, Cassette		£9.95

LOGO + PILOT

2 Educational Languages, Disc	~~£64.99~~	£14.95
Easyfile Database, Disc	~~£50.00~~	£17.95

AUDIOGENIC

Swift Spreadsheet 128, Disc	£24.95

AMIGA

System One	£1050.00
System Two	£1250.00

Including FREE Software Package — Please ring for details

MICRO CLERK 128

Accounts Package with Spreadsheet, Database and Word Processor	£99.95
Purchase Ledger	£69.95
Sales Ledger	£69.95
Accounts, Purchase Ledger, Sales Ledger Package now	£199.95

SWIFTCALC 128

CBM 128 Spreadsheet	£57.50

PRACTICORP

Inventory (Stock Control Package), Disc	~~£29.95~~	£14.95
Macro Assembler Development System, Disc		£14.95

6 DISC ADVENTURE GAMES PACK, 64/128

Exodus, Suspended, Starcross, Zork I, Zork II, Zork III	£19.95
Pack of 12 Commodore 64 Pre-School Educational Titles, Tape	£39.95

PLUS 4 COMPANIES PACK

Sales/Purchase/Nominal Ledgers with Invoicing and Stock Control	£24.95

1541C DISC DRIVE OFFERS

Pack A 1541C with 6 Infocom Disc Adventure Games	£199.95
Pack B 1541C with Quick Brown Fox Word Processor, Easyfile Database and Future Finance Planning Package	£199.95

PERIPHERALS

MUSIC MAKER 128 Keyboard and Software, Tape	£19.95
POWER CARTRIDGE Utilities including Tape and Disc Turbo and Screen Dump	£39.95
ACTION REPLAY Tape to Disc Back-up Cartridge	£24.95
64/128 PRINTER BUFFERS	
32K	£69.95
64K	£89.95
64/128 MUSIC SYNTHESIS PACK with Sound Expander, Sound Studio and 5 Octave Keyboard	£149.95
COMPOSER/EDITOR SOFTWARE for Sound Expander System, Tape or Disc	£24.95
TROJAN CADMASTER LIGHT PEN	
Commodore 64	£16.95
Commodore Plus 4/C16	£19.95
PRINTER RIBBON OFFER	
MPS 801, 802 Ribbons	£5.95
MPS 803 & MPS 1000	£4.95
MPS 1101 M.S. Ribbons	£3.50

BUY FOUR AND GET ONE FREE!

LOCKABLE DISC STORAGE BOXES Price includes pack of 10 Commodore compatible discs	
50 Capacity	£19.95
100 Capacity	£21.95
THE EXPERT CARTRIDGE ESM Tape to Disc System	£37.50
FREEZE FRAME 3	£39.95
COMMODORE MPS 803 TRACTOR FEED UNIT	£24.95
FCC CENTRONICS INTERFACE With Commodore Graphics and 8K Buffer	£64.95
QUICKDISC + 1541 FAST LOAD/UTILITY CARTRIDGE	£19.95
10 COMMODORE COMPATIBLE DISCS WITH FREE PLASTIC DISC HOLDER	£9.95

NEOS MOUSE the Ultimate Graphics Utility for the 64/128 WITH CHEESE SOFTWARE, Tape or Disc	£42.95
THE ARTIST Advanced Mouse Graphics Package	£29.95

COMMODORE DPS 1101 Daisy Wheel Printer	£199.95
COMMODORE 560P 2-colour Dot Matrix Printer takes $2\frac{1}{4}$ in. roll paper	£49.95
CITIZEN 120D CBM PRINTER High Quality Dot Matrix Printer • Near Letter Quality Mode • 120 cps Draft Print Mode • Friction and Tractor Feed • Needs no interface • Full Two-Year Warranty • 100% Commodore compatible	£199.95
STAR NL 10C NLQ PRINTER Fully Commodore compatible	£253.00
Commodore 1571 Double-sided Drive	£259.95
Commodore 1901 Colour Monitor	£339.95
64/128 Green Screen Monitor with 40/80 Column Leads	£79.95
Commodore 1541C Disc Drive	£189.95
Commodore 128D	£499.95
Commodore MPS 1000 CBM/Centronics Printer	£274.95

PERSONAL CALLERS AND EXPORT ENQUIRIES WELCOME

ALL OFFERS STRICTLY SUBJECT TO AVAILABILITY

ALL PRICES INCLUDE V.A.T.

To order, either send cheque/P.O. with coupon or ring **(0533) 517479/21874** with Access/Barclaycard number. Please allow 7 working days for delivery from receipt of order or cheque clearance.
Please add £1.00 towards carriage and packing on any software order.
Hardware orders add £1.00 under £65.00 value, and £5.00 over £65.00 value.
Printer orders add £5.00 towards carriage.

Send to: Dept. No. YC4, Dimension Computers Ltd.,
27/29 High Street, Leicester LE1 4FP.
Telex: 265871 MONREF G Quoting Ref. 72: MAG 95535
Fax: (0533) 511638

Item **Quantity** **Price**

....

....

Total

....

Name...

Address...

....

Telephone:...

THANATOS
DURELL
software getting harder

Spectrum in October, **Amstrad** in November, **Commodore 64** in December. All £9.95

Sales dept.,
Castle Lodge, Castle Gree
Taunton, Somerset TA1 4
England Telephone (0823) 54489 &

DURELL

SABOTEUR II
Avenging Angel

Available on Spectrum, Amstrad & Commodore

DURELL sales dept.,
Castle Lodge, Castle Green, Taunton, Somerset, TA1 4AB
Telephone (0823) 54489

R.R.P. £7.95

Football Fortunes

Polish up your footie boots, get your mum to wash your strip and sit down to a game of soccer with Brian Clough.

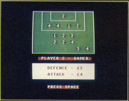
By Tony Hetherington

Brian Clough has always been known as an unusual football manager. Now the game that carries his name is a computer game with a big difference because it's also a board game!

Inside a packed video size cassette box is the game tape or disk, a folded game board, five coloured counters, 112 player cards, immunity cards and a heap of game money and, of course, an extensive instruction leaflet. As the game loads the players just have time to set out the board, cards and pieces and sign up as a top manager in a super league of 10 teams. Between two and five teams can be managed by humans the rest are controlled by computer and one of four skill levels. There's no great mystery here, the higher the skill level the stronger the computer teams that you'll face.

In fact the whole game is remarkably simple and after only a few fixtures you'll be wheeling and dealing with the best of them. Indeed the hardest part of the entire game is persuading the game board to stay flat after being folded up inside the box.

Brian Clough's
Football Fortunes



PLAYER 2 - GAMER

DEFENCE - 13
ATTACK - 14

PRESS SPACE

Once the game has loaded you have to choose your team from the list available or you can overwright one if your favourite's not included in the initial line up. After a brief pause, the computer displays the line up for each team in turn including two reserves. This line up consists of a series of numbers, between one and five that represent the skill levels of your goalkeeper, defenders, midfielders and attackers that form your initial squad of players. You then take the corresponding cards from the pack of playing cards to start the game. These cards also feature names for every player that are sure to cause rows particularly if you're favourite's only a level one and not an international standard level five. The names aren't important to the game but vital to football fanatics so a few blank cards are included to correct these "mistakes".

The game plays as alternate rounds of moving the pieces around the board and football fixtures on the computer although the computer is active throughout.

By throwing the computer dice players move their counters around and land on squares that contain the problems and crises that make up a manager's job. These range from the Manager's Luck and Selection Problem Cards that are displayed randomly on the computer screen to the dreaded Wages that are paid out and depend on the size and skill levels of your squad.

The Managers Luck cards are a bit of a lottery and can cost you £85,000 to install astro-turf or gain you £100,000 by selling the reserves' training ground. The same is true of the Selection Problems cards but most are bad news and can cost you a crucial player for a match through injury or suspension but the occasional one may get you a free transfer.

The most exciting squares generate player auctions in which the managers bid for the next card jin the player pack.

At some stages in the game bidding can get desperate as players out bid each other particularly if a level five player is involved. Occasionally a manager gains the advantage if he lands on a 50% Auction square as he only has to pay half of his final bid!

Before each match the players must enter their total attack and defence strengths that are calculated from their selection card team. A few seconds later having contemplated these and factors such as home advantage and league position the C64 teletype displays the results jand the gate money that the players receive.

The season consists of only nine matches as each team plays each other but also includes FA Cup matches featuring giant killers such as Yeovil Town, and, from the second season European matches, although your squad has to be good to live with the likes of Bayern Munich and Juventus.

Throughout the game your achievements and results are noted and are converted into game points and at the predetermined end (a number of seasons or a time limit) the player with most game points will be "over the moon" as he has won the game.

One final piece of advice is keep off the Crisis Square! This suicide space (renamed the "sick as a parrot" square) costs you £50,000 and your best player!

A fascinating mix of computer strategy and board game fun that combine to form the football favourite. YC

Touchline

Title: *Brian Clough's Football Fortunes.* ***Supplier:*** *CDS Software, CDS House, Beckett Road, Doncaster, DN2 4AD.* ***Machine:*** *C64.* ***Price:*** *£14.95 (tape) £17.95 (disk).* ***Originality:*** *8/10.* ***Playability:*** *10/10.* ***Graphics:*** *N/A.* ***Value:*** *10/10.*

In the numbers war you can win with

Polynomial

A Computer Aided Analysis Program for the Commodore 64/128

Polynomial is a self contained menu driven mathematics program which can really help you win your war against numbers. Polynomial has been specially written to allow you to play with numbers, draw graphs and investigate mathematical relationships. Just look at what Polynomial can do for you:

1. Solve your most complex equations (max order 99) Polynomial can find Real and Imaginary roots.
2. Draw graphs of all your polynomial equations. As many as you like all on the same screen. Double or single axis plots possible.
3. Solve those awkward experiments. Plot all your results on the screen. Calculate accurate curves based on your data. Full Polynomial graphics available.
4. Understand Simultaneous equations. Solve 2, 3 or more equations with the help of Polynomial.

Ideal for GCSE, 'A' level and Degree studies Send for your copy of Polynomial now!

Write **FREEPOST** to:

Insight Software Systems Limited

INSIGHT SOFTWARE
FREEPOST
P.O. BOX 27,
BASINGSTOKE,
HAMPSHIRE,
RG22 4BR.

FOR AS LITTLE AS **£14.95** YOU GET: POLYNOMIAL AND A MANUAL SUPPLIED IN AN ATTRACTIVE PROTECTIVE CASE. FREE POST AND PACKAGING.

PLEASE SEND ME ...... COPY(IES) OF POLYNOMIAL
TICK AS APPROPRIATE ☐ CASSETTE £14.95
☐ DISC £19.95
☐ CHEQUE ☐ P.O.
.... YC
NAME ....
ADDRESS ....
....
SIGNATURE ....
DATE ....
PLEASE ALLOW UP TO 28 DAYS FOR DELIVERY.

Too Busy Earning a Living To Make Any Real Money?

You think you've got problems?

Well, I remember when a bank turned me down for a $200 loan. Now I lend money to the bank – Certificates of Deposit at $100,000 a crack.

I remember the day a car dealer got a little nervous because I was a couple of months behind in my payments – and repossessed my car. Now I own a Rolls Royce. I paid $43,000 for it – cash.

I remember the day my wife phoned me, crying, because the landlord had shown up at the house, demanding his rent – and we didn't have the money to pay it.

Now we own five homes. Two are on the oceanfront in California (I use one as my office). One is a lakefront "cabin" in Washington (that's where we spend the whole summer – loafing, fishing, swimming, and sailing). One is a condominium on a sunny beach in Mexico. And one is snuggled right on the best beach of the best island in Hawaii – Maui.

Right now I could sell all this property, pay off the mortgages – and – without touching any of my other investments – walk away with over $750,000 in cash. But I don't want to sell, because I don't think of my homes as "investments." I've got other real estate – and stocks, bonds, and cash in the bank – for that.

I remember when I lost my job. Because I was head over heels in debt, my lawyer told me the only thing I could do was declare bankruptcy. He was wrong. I paid off every dime.

Now, I have a million dollar line of credit; but I still don't have a job. Instead, I get up every weekday morning and decide whether I want to go to work or not. Sometimes I do – for 5 or 6 hours. But about half the time, I decide to read, go for a walk, sail my boat, swim, or ride my bike.

I know what it's like to be broke. And I know what it's like to have everything you want. And I know that you – like me – can *decide* which one it's going to be. It's really as easy as that. That's why I call it "The Lazy Man's Way to Riches."

So I'm going to ask you to send me something I don't need: money. £10 to be exact. Why? Because I want you to pay attention. And I figure that if you've got £10 invested, you'll look over what I send you and decide whether to send it back... or keep it. And I don't *want* you to keep it unless you agree that it's worth at least a hundred times what you invested.

Is the material "worth" £10? No – if you think of it as paper and ink. But that's not what I'm selling. What I am selling is information. *More* information than I give when I'm paid $1000 as a guest speaker. *More* information than I give in a one-hour consultation for $300.

But you're really not risking *anything*. Because I won't cash your cheque or money order for 31 days *after* I've sent you my material. That's the deal. Return it in 31 days – and I'll send back your cheque or postal order – uncashed.

How do you know I'll do it? Well, if you really want to be on the safe side, postdate your cheque for a month from today – *plus 2 additional weeks*. That'll give you plenty of time to receive it, look it over, try it out.

I know what your thinking: "He got rich telling people how to get rich." The truth is – and this is very important – the year before I shared "The Lazy Man's Way to Riches," my income was $216,646. And what I'll send you tells just how I made that kind of money... working a few hours a day... about 8 months out of the year.

It doesn't require "education." I'm a high school graduate.

It doesn't require "capital." Remember I was up to my neck in debt when I started.

It doesn't require "luck." I've had more than my share. But I'm not promising you that you'll make as much money as I have. And you may do better. I personally know one man who used these principles, worked hard, and made 11 million dollars in 8 years. But money isn't everything.

It doesn't require "talent." Just enough brains to know what to look for. And I'll tell you that.

It doesn't require "youth." One woman I worked with is over 70. She's travelled the world over, making all the money she needs, doing only what I taught her.

It doesn't require "experience." A widow in Chicago has been averaging $25,000 a year for the past 5 years, using my methods.

What does it require? Belief. Enough to take a chance. Enough to absorb what I'll send you. Enough to put the principles into action. If you do just that – nothing more, nothing less – the results will be hard to believe. Remember – I guarantee it.

You don't have to give up your job. But you may soon be making so much money that you'll be able to. Once again – I guarantee it.

I know you're sceptical. Well, here are some comments from other people. (Initials have been used to protect the writer's privacy. The originals are in my files.) I'm sure that, like you, these people didn't believe me either when they clipped the coupon. Guess they figured that, since I wasn't going to deposit their cheques for at least 31 days, they had nothing to lose.

They were right.

And here's what they gained:

'Thanks to your method I'm a half millionaire'

"Thanks to your method I grossed about $500,000. Would you believe last year at this time I was a slave working for peanuts?"

G.C., Toronto, Canada.

'$24,000 in 45 days'

"...received $24,000.00 in the mail the last 45 days.

"Thanks again."

Mr. E.G.N., Matewan, W.VA

'Made enough to retire at 41'

"If it hadn't happened to me, I wouldn't have believed it... A few years ago, I had nothing to lose. I was unemployed and broke."

"Now, thanks to you and the 'Lazy Man's' program, I have made enough money (at age 41) to retire in style.

R.A., Huntingdon Beach, Calif.

'There's no stopping me'

"Since I've got your (Lazy Man's Way to Riches) in July, I've started 4 companies... there's no stopping me and I'm so high I need chains to keep me on the ground."

M.T., Portland, OR

'Wow, it does work!'

"Oddly enough, I purchased Lazy Man's Way to Riches some six months ago, or so, read it... and really did nothing about it. Then, about three weeks ago, when I was really getting desperate about my financial situation, I remembered it, re-read it, studied it, and this time, put it to work and WOW, it does work! Doesn't take much time, either... I guess some of us just have to be at a severe point of desperation before we overcome the ultimate laziness, procrastination."

Mr. J.K., Anaheim, CA

'Made $70,000'

"A $70,000 thanks to you for writing The Lazy Man's Way to Riches. That's how much I've made...

"I use this extra income for all of the good things in life, exotic vacations, classic automobiles, etc. Soon I hope to make enough to quit my regular job and devote full time to making money the easy way..."

Mr. D.R., Newport Beach, CA

'$260,000 in eleven months'

"Two years ago, I mailed you ten dollars in sheer desperation for a better life... One year ago, just out of the blue sky, a man called and offered me a partnership... I grossed over $260,000 cash business in eleven months. You are a God sent miracle to me."

B.F., Pascagoula, Miss.

'Steadily upward ever since'

"I ordered Lazy Man's Way to Ri
June... by September, my caree
launched and has gone steadily upwa
since."

Mrs. B.A., Walnut Cre

'$7,000 in five days'

"Last Monday I used what I learned o
83 to make $7,000. It took me all wee
it, but that's not bad for five day's wo

M.D., Topeka,

What I'm saying is probably cont
what you've heard from your friend
family, your teachers, and maybe ev
else you know.

I can only ask you one question
many of them are millionaires?

So it's up to you.

A month from today, you can be
more than 30 days older – or you ca
your way to getting rich. You decide.

The wisest man I ever knew t
something I never forgot: "Most peo
too busy earning a living to mak
money."

Don't take as long as I did to find
was right.

I'll prove it to you, if you'll send
coupon to my publisher now. I'm not
you to "believe" me. Just try it. If I'm
all you've lost is a couple of minutes
postage stamp. But what if I'm right?

*Some have called it a Miracle. Som
called it Magic. You'll call it "The Secr
Ages."*

*As for me, I thank God that before
Millionaire Joe Karbo left, for all to sh
secret of "The Lazy Man's Way to R
The above story, which is in his own w
his gift to you.*

PROOF!
Don't take my word for it. These are excerpts from articles in newspapers and magazines:

Time:
He only works half the year in his stunning office on California's Sunset Beach, and even when he's there he puts in short hours... In other words, Joe Karbo, 48, is the prototype for... "The Lazy Man's Way to Riches.'

Boston Herald-American:
The book has drawn hundreds of letters from persons who have profited by it...

Los Angeles Herald-Examiner:
An unpretentious millionaire, Joe Karbo of Huntingdon Harbor is a vibrant, living testimonial to his intellectual, pragmatic conviction.

Money Making Opportunities:
Maybe Joe Karbo has the secret. Don't you think you owe it to yourself to find out what it is all about?... I just finished it – and I'm off on a vacation myself. Get the idea?

Sworn Statement:
"On the basis of my profes
relationship as his accountant. I c
that Mr. Karbo's net worth is mor
one million dollars."

Stuart A.

YCD/

Chartsearch Ltd.,
11 Blomfield Street,
London EC2M 7AY

You may be full of beans, but what have I got to lose? Send me the Lazy M
Way to Riches. *But don't deposit my cheque or postal order for at least 31 days afte
in the mail.* If I return your material – for any reason – within that time, return
uncashed cheque or postal order to me.

☐ On that basis, here's my £10
☐ Please charge my credit card.

A/C Number (Access/Visa/Diners/Ame
Name
Address

Code
Signed Date
(Please Print Clearly)

Please allow
14-21 days
for delivery

*I*n t
worth
genera
indust
in Ja
that's
Nigel
Com
ensco
Comm

The

The C
year i
staged
vagan
was t
my w

Th
of its
event
atten
The s
made
from
media
all c
consi
satell
impo
comp

Th
Vega
the S
Hotel
were
build
which

C
exhib
and
heart
takin

Shepherd's View

Nigel Shepherd, boss of Commodore US, explained his recipe for Commodore's future success to our globe trotting reporter.

By Peter Chandler

*I*n this business, shows are always worth a look since they provide a general gathering of the big wigs of our industry. The CES Show in Las Vegas in January was no exception, and that's where I managed to track down Nigel Shepherd, General Manager of Commodore North America, ensconced in the splendour of Commodore's stand.

The Venue

The CES Exhibition is held twice a year in the USA. The summer show is staged in Chicago and the winter extravaganza takes place in Las Vegas. It was to the latter venue that I wended my way this year.

The Las Vegas show is the largest of its kind in the world and this year's event was no exception with a record attendance of over 100,000 visitors. The show is open only to trade visitors, made up largely of representatives from retailers, manufacturers and the media, pouring in from the USA and all over the world. Exhibitors consisted mainly of audio, video, satellite, photographics and most importantly from my point of view, computer companies.

There were four venues: the Las Vegas Hilton, the Convention Centre, the Sahara Hotel and the Riviera Hotel. The home computer companies were all based in the West Hall, a huge building which is just one of many which form the Convention Centre.

Nigel Shepherd

Commodore was there in force and exhibited its products from a massive and very impressive stand. It was a heartening sight to see Commodore taking such an aggressive approach at the largest show of its kind in the world. Commodore launched three C64/128 products at the show: the 1581 3½" disk drive, 1764 RAM Expansion card and the 1351 mouse. A number of software companies were exhibiting from the stand including Byte to Byte, Quantum and Anakin Research.

The Man Himself

Nigel Shepherd, a man of presence, very charming and charismatic, is the General Manager of Commodore US and North America. He reports directly to Tom Rattigan, President and Chief Executive Officer of Commodore USA. The other individual in the sales and marketing hierarchy who also reports direct to the President is Harold Speyer, based in Frankfurt, Germany and responsible for European operations.

Nigel Shepherd is Scots by birth and Australian by commerce and has been involved with Commodore since 1977. Initially as an Australian Commodore distributor, Commodore later set up an Australian subsiduary and in 1979 Nigel Shepherd became the General Manager for the Asia Pacific Region (all countries from Australia to Hong Kong). In January 1986, he moved to the US to take over North American responsibilities.

Tripartite Aims

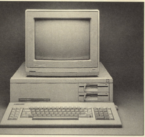
Nigel Shepherd sees Commodore as active in three sections of the computer industry.

Firstly, he sums up the C64/128 as the "classic definition of the home computer". His authoratative view is that 90% of all C64/128 purchasers are first time buyers, also many 128 buyers are people upgrading from a C64.

He also sees Commodore playing an important role in the large educational market in the US particularly in the primary school sector known in the States as K1 to K12. To back this up Nigel also reminded me that in the USA, Germany and Australian markets Commodore are leaders with the C64/128 in home computers. He sees the C64/128 as a common product line which will be around in 1990 and Commodore will continue to support the machines with peripherals software etc.

The much appraised Amiga machine, only recently launched, is seen by Nigel as the future of Commodore both in the home and business markets.

Being Frank, Nigel commented that: "probably the single largest criticism aimed at the Amiga is that the consumer is unsure whether or not the machine is for the home or is a desk top computer – a computer too highly priced to be accepted as a home computer and the lack of productivity software makes it difficult to accept it as a business machine."



CBM's IBM clone

Commodore's answer to this criticism is to launch three different versions of the Amiga and attack both home and business markets in terms of price and quality.

Nigel explained that the first version, the Amiga 1000, has fantastic user loyalty and it will be followed in the next few months by two new Amigas the 500 and the 2000 to expand the product line.

Nigel explained the thinking behind this strategy. He envisages that the C64/128 will be purchased as a family machine by first time buyers with a main use for children aged five to 12 years old. The machine is not too expensive but Commodore cannot be sure that the family will continue to use it. The answer to upgrading combined with continued brand loyalty is the Amiga 500 – the low cost version, described by the enthusiastic General Manager as "the ultimate home computer". On top of this the high demand for computer learning will continue and there is still a great demand for productivity software. The buyer who has grown up with a C64 or even a Spectrum, and is looking for a second purchase will appreciate better sound, graphics and top class games – Amiga technology lends itself to this market.

2000 Amiga

The 2000 Amiga will be a desk top or business computer and will also be the home overlap machine. Nigel Shepherd believes that "the home is a location". Although traditionally used for learning and entertainment, many small businesses are run from domestic locations as cottage industries. The 2000 will lend itself both to the home/office and true business application.

As we go to press, both the 500 and the 2000 are scheduled for launch in the Hanover Fair in Germany at the end of March.

Nigel also sees the Amiga gaining acceptance in tertiary education. He claims that it is ideal for universities as its price combined with its sound and graphics capabilities are not found elsewhere. He quickly pointed out that the Apple Mac has neither the sound or colour of the Amiga and also stressed that neither the Mac or the Atari have MS DOS Capability.

Purely for Business

Commodore's third section of interest in the computer market at the moment is inevitably the business end due to the Amiga's PC AT, XT and MS DOS compatability. Commodore has also launched the PC10 and 20. The PC10 was only recently launched in the US so it's still early days for these machines.

Waxing Philosophical

Nigel Shepherd explained the Commodore philosophy in the following terms. "Commodore will continue to design and manufacture machines that are competitive and will enable both Commodore and retailers to make money. We will continue to be in the MS DOS market place. There will always be a home market and Commodore's original forte is serving that market. Commodore is moving up market to desk top publishing and corporate type machines. We are committed to today's and to future market places."

He added: "The difference between today and two years ago is that now a machine can be suitable for all of the markets – home, personal and business – all in one box whereas before there were three distinct machines. Commodore has one major advantage – the Amiga chip set."

Asked specifically about Commodore's UK outfit, Nigel replied: "Commodore North America has been through tough times in the last 18 months and like Commodore UK, had to rationalise the business and start all over again." However, Nigel believes that the corner has now been turned. He sees Commodore UK consolidating and building in this country. Absence of major promotion was evident in the past but the company has fought for survival and we will now see a much more aggressive approach. Nigel Shepherd is confident that Commodore will return to being a major factor in the UK marketplace.

Your Commodore certainly hopes so and we'd like to thank Nigel Shepherd for taking time to express his view of Commodore North America.

Your key to communications!

SPECIAL OFFER — FREE MODEM WITH YOUR FIRST YEARS SUBSCRIPTION

FREE Electronic Mail . . . International Telex . . . 10 National Chatlines (Interactive Bulletin Boards) . . . 70,000 users across the UK . . . Teleshopping . . . Multi-User Interactive Stragey Games . . . B.T. Gold Link

Instant computer news . . . Hardware and software reviews . . . Technical features . . . Hints and tips . . . On-line business advice and features

FREE and discounted quality software to download direct to your micro – **24 hours a day**

300,000 pages of information on the huge Prestel database

for just 20p a day

PRESTEL

PRESTEL is a trademark of British Telecommunications

Micronet 800 – The ultimate peripheral

Micronet 800
8 Herbal Hill, London EC1R 5EJ
Telephone: 01-278 3143

To: Micronet 800, 8 Herbal Hill, London EC1
Please send me a brochure on Micronet 800

Name____________________

Address____________________

____

Telephone No.____________________

Age________ Micro____________________

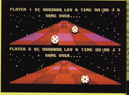
Sport on Channel 64

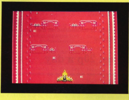
Futuristic sports games are all the rage at the moment. Try your hand at these out-of-this-world titles.

By Tony Hetherington

Sport in the future (according to the software houses) is to be fast, furious and will usually involve a steel ball. There obviously won't be any grass left in the world as not a blade is in sight as an average of 1.8 humans battle or race droids, robots and gravcraft in purpose built stadia, planets and tracks.

Futuristic sports games are inevitably influenced by science fiction films, notably *Rollerball* and *Death Race 2000*, and are often developed from existing sports to bolster flaging telecast ratings.

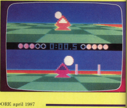

PLAYER 1 SÇ 0003660 LEV A TIME 00:00 J 6
GAME OVER....
PLAYER 2 SÇ 0000000 LEV A TIME 00:00 J 7
GAME OVER....



Racing Destruction

Hewson's *Alleykat* leads off the future racers as you compete in a bizzare set of challenges known as the Alleykat races. Written by Uridium author, Andrew Braybrook, the racer must compete in contests such as the Moot Open, Astro Classic, Galaxad Open and Mad-Max Smash. He pilots a custom built convertable racer that can swap from high speed, slimline single racer mode to a slower twin laser craft for maximum destructive power. The races are run over a variety of planet surfaces that range from the fragile shatterock and the leafy Arboris to the indestructabl hardwall which will destroy a racer on impact.

The object of the game is to amass points by winning races and prize money so that you can enter more racers to gain more points. Points are won by completing the race (an achievement in itself), by shooting the laser firing robot gravcraft that are thrown in to liven things up and by



acquiring bonus points that depend on the race type. In time trials bonus points are linked to your time, in endurance racers it's surviving that matters and in destruction racers you must destroy the landscape.

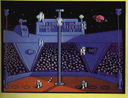
On the Ball

Gremlin's *Trailblazer* is, by comparison, a far simpler game in which you must bounce a ball down a track that hurtles out of the screen at you at breakneck speed. Again staying on the track is a major task in itself without your opponents efforts to push you off into oblivion. Bouncing from square to square you must plan your route along the careering platform avoiding the traps that slow you down, reverse your controls or send you plummeting out of the contest. Then you're ready to gently push your opponent over the edge to gain those crucial seconds to win the race.

Ballblazer (Activision) sets two Rotofoils in competition with each other as they race around a bevelled pitch chasing a steel ball. Their aim is to fire the ball into one of two moving goals.

In a timed game the foils that are controlled by either human or droid pilots can catch or fire the ball using their protective forcefields. The outcome is decided on points with a goal being worth more if it is scored from a distance. A fast and furious game that's incredibly addictive to play.

The same could also be said of Odin's *Hypa-Ball* which features the battle for the Super Cup between two three man teams, the Hawks and the Vipers. Before the match you can choose your players from the 10 man squad to be your jetpowered strike one and two and Earthbound grounder. After a quick appearance by the cheerleaders the players take their positions either side of the central pole on which the goal globe travels on its relentless path up and down making goals even harder to get.



Thanks to a force field network the players are trapped in zones in between which the ball bounces and rebounds until captured by a player. However he has only two seconds (otherwise he concedes a penalty) to pass the ball or shoot at goal.

After 10 gruelling minutes of play the result is reported in the popular newspaper the Echo.

Bouncing Out

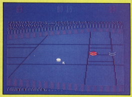
Room 10 is an unlikely spin off from CRL's *Tau Ceti* and is found in the Gal-corps leisure complex. Described as a mixture of Ballblazer and Pong the game features a split screen battle two giant bats to knock a ball behind their opponent to score points.

Knocking a ball into a goal is the aim of Argus Press Software's *Xeno* and is a futuristic development of shove halfpenny football. The two contestants must fire their xeno craft to intercept and knock the ball into the goal to score in front of a capacity crowd.

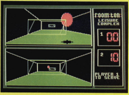
Finally, the bizarre *Bounces* from Beyond defies description as two armour clad knights, called Eric and Ashley fire a steel ball at each other and into holes in the roof to score match winning points.

Touchline

Hewson: *56B Milton Trading Estate, Milton, Abingdon, Oxon OX14 4RX.* ***Tel:*** *0235 832939.*
Activision: *23 Pond Lane, Hampstead, London NW3 2PN.* ***Tel:*** *01 431 1101.*



Gremlin: *Alpha House, 10 Carver Street, Sheffield S1 4FS.* ***Tel:*** *0742 753423.*
Odin and Beyond: *First Floor, 74 New Oxford Street, London WC14 1PS.* ***Tel:*** *01 240 8838.*
CRL: *9 Kings Yard, Carpenters Road, London E15 2HD.* ***Tel:*** *01 533 2918.*
Argus Press Software: *Victory House, Leicester Place, London WC2H 7NB.* ***Tel:*** *01 439 0666.*



Basic Memory

Programming in Basic can be a headache especially if you start running out of space. These routines should ease the situation.

By Allen Webb

The 64 has a full compliment of 64K of RAM, but the designers, in their infinite wisdom, made only about 38K available to Basic. For those able to use machine code, the RAM behind the ROMs is easily used but to most others, it's forbidden fruit. There is nice lump of 4K between the ROMs, however, which can be used. Basic keeps track of storage of variables in a collection of zero page pointers. These pointers, along with their starting values, are listed in Table 1.

Pointer Variations

The values of these pointers are changed as program lines or variables are added or removed. By setting these pointers to the RAM between the ROMs, we can have a second variable area. Listing 1 gives a short routine which will do this task for you. The routine lives in the cassette buffer so that it doesn't pinch any memory. The routine has three entry points:

SYS 830: This sets up the table which saves the pointer values to some default values pointing to the spare RAM. This table is switched in when you want to use the extra RAM and is updated when you return to the normal RAM. This command effectively performs CLR on the extra RAM. Since using this command when the extra RAM is active messes things up, it detects which RAM is in use and acts accordingly. Calling it when normal RAM is active gives the required result. Using it with the extra RAM active simply results in a flashing border as a warning and nothing else. As far as I can see, CLR will act correctly on the extra variables when they are active.

SYS 833: This switches in the extra RAM. The border turns red to warn you about it.

SYS 836: This switches back to normal RAM. The border is set the light blue to show it.

Attempting to activate a variable set when that set is current may corrupt the pointer tables. Consequently, the routines won't let you take such action.

Once you have the extra RAM switched in, the operating system updates the pointers as required. So that the extra variables are protected, the pointer values are remembered each time you switch to normal variables.

Listing 2 gives a simple demo to show how the routine works. Line 10 performs CLR on the extra RAM and switches in. Since FRE uses the variable pointers, you will see that it works correctly on both sets of RAM. The routine shows you that two variables sets of variables with the same names can be used.

One word of warning. You must not perform actions which change the pointers or use software which depend on them when the extra RAM is in use – always switch the normal RAM back in first. Such operations include adding or deleting program lines and using assemblers which use the variable pointers to assist storage.

Alternative Process

An alternative method of adding to your available memory is the use of random access on disk to provide virtual memory. Some serious

PROGRAM: LISTING 1

```
70  2000 FORL=0TO9:CX=0:FORD=0TO
    15:READA:CX=CX+A:POKE830+L*1
    6+D,A:NEXTD
82  2010 READA:IFA<>CXTHENPRINT"
    ERROR IN LINE";2040+(L*10):S
    TOP
0F  2020 NEXTL:END
5A  2040 DATA76,71,3,76,146,3,76
    ,184,3,173,208,2,240,26,162,
    0,1449
20  2050 DATA173,32,208,141,209,
    2,160,0,140,32,208,200,208,2
    50,232,208,2403
6E  2060 DATA245,173,209,2,141,3
    2,208,96,160,0,185,122,3,153
    ,168,2,1899
CE  2070 DATA185,134,3,153,188,2
    ,200,192,13,208,239,96,3,192
    ,3,192,2003
D4  2080 DATA3,192,0,208,0,0,0,2
    08,3,8,3,8,3,8,0,160,804
C7  2090 DATA0,0,0,160,173,208,2
    ,240,3,76,76,3,160,0,185,45,
    1331
00  2100 DATA0,153,188,2,185,168
    ,2,153,45,0,200,192,13,208,2
    39,169,1917
38  2110 DATA255,141,208,2,169,2
    ,141,32,208,96,173,208,2,208
    ,3,76,1924
59  2120 DATA76,3,160,0,185,45,0
    ,153,168,2,185,188,2,153,45,
    0,1365
6F  2130 DATA200,192,13,208,239,
    169,0,141,208,2,169,14,141,3
    2,208,96,2032
```

Table 1

Pointer locations	Function	Starting value
45,46	Start of variables	2051
47,48	Start of arrays	2051
49,50	End or arrays	2051
51,52	Bottom of strings	40960
55,56	Top of variables	40960

programs use this approach to provide HELP information without reducing the memory available to the main program. The Listing 3 provides a general routine which will store and recall blocks of up to 255 bytes on disk. To those of you who aren't in the know, the disk is split into 35 tracks, each comprising of a number of sectors. The number of sectors varies from 17 to 21 depending on the position of the track. Each sector holds on block or 255 bytes.

The program uses a menu system to provide five options. The first option reserves the specified sectors and fills each with a zero byte (@). This is because a zero byte is used as a sentinel to indicate the end of a string. This reservation (or allocation) operation is nullified if you use the validate instruction, so beware!

Option 2 saves a string at the required location. Since you may want to input string of up to 255 bytes, a special input routine (lines 750 to 1030) is used. All you do is type in the string using cursor keys and DEL to edit it. The string must end with an asterisk. When the string is complete, press back arrow to process it. The sectors on the disk are numbered sequentially so that track one holds sectors zero to 20, track two holds sectors 21 to 41 etc. Since tracks are of variable length, the routine from lines 1420 to 1470 is needed to calculate the relevant track/sector from the number of the data block.

Option 3 loads and prints a specified data block. If you want to extract data in your own programs, you should reproduce lines 580 to 680, lines 1420 to 1470. If you're a careful programmer, you should also use the error checking routine (lines 1070 to 1100).

Option 4 prints a map of the disk contents. Allocated but unused sectors are shown as "@". Those containing data blocks are shown as "*". The final option simply allows you to format a disk.

Data saved using this program does not appear on the directory since it is written direct to the disk. If, in fact, you use the track which holds the start of the directory (track 18), and try to load the directory, you will get an interesting result!

PROGRAM: LISTING 2

```
2F   10 SYS830
3A   20 PRINT"[CLR]CLEAR AND ACTI
     VATE PROTECTED VARIABLES"
EE   30 SYS833:CLR:PRINT"WE NOW H
     AVE"FRE(1)" BYTES FREE"
70   40 PRINT"[DOWN]NOW SET UP TW
     O VARIABLES:"
5A   50 A$="PROTECTED STRING":Z=1
     .234567
FC   60 PRINT"[DOWN]A$="A$"  Z="Z

63   70 SYS 836:CLR
CC   80 PRINT"[DOWN4]CLEAR AND AC
     TIVATE NORMAL VARIABLES"
09   90 PRINT"WE NOW HAVE"65536+F
     RE(1)" BYTES FREE"
BC   100 PRINT"[DOWN]NOW SET UP T
     WO VARIABLES:"
E1   110 A$="NORMAL STRING":Z=9.8
     76543
C8   120 PRINT"[DOWN]A$="A$"  Z="
     Z
A1   130 PRINT"[DOWN]PRESS A KEY
     TO SEE BOTH SETS"
B6   140 GETI$:IFI$=""THEN140
0E   150 SYS833:PRINTA$,Z
70   160 SYS836:PRINTA$,Z:PRINT
9C   180 FOR D=1TO200:NEXT
5A   190 LO=LO+1:IFLO<10THEN150
43   200 GOTO20
```

PROGRAM: LISTING 3

```
3A   1 REM***********************
     *******
2F   2 REM* RANDOM ACCESS TEXT HA
     NDLER *
6F   3 REM*       A + M  1986
         *
37   4 REM***********************
     *******
C0   10 PRINTCHR$(14)
89   20 DEF FNA(T)=ABS((T<18)*20+
     (T>17ANDT<25)*18+(T>24ANDT<3
     1)*17+(T>30)*16)
76   30 B$="[S*40]"
64   40 A$="ENTER TEXT TO BE SAVE
     D. TERMINATE THE[SPC3]TEXT W
     ITH *"
77   50 A$=A$+" THEN PRESS [LARRO
     W] TO PROCESS"
DB   60 CU$="[DOWN26]":CR$="[RIGH
     T10]"
DB   70 POKE53281,12:POKE53280,12
     :PRINTCHR$(144)CHR$(147)
0C   80 Y=5:X=6:GOSUB1140:PRINT"[
     SR]ANDOM [SA]CCESS [ST]EXT [
     SU]TILITY"
7E   90 X=8:Y=Y+2:GOSUB1140:PRINT
     "**********************"
9D   100 Y=Y+1:GOSUB1140:PRINT"*
     1. ALLOCATE BLOCKS *"
5A   110 Y=Y+1:GOSUB1140:PRINT"*
     2. SAVE BLOCKS[SPC5]*"
02   120 Y=Y+1:GOSUB1140:PRINT"*
     3. READ BLOCKS[SPC5]*"
0F   130 Y=Y+1:GOSUB1140:PRINT"*
     4. SCAN DISK[SPC7]*"
74   140 Y=Y+1:GOSUB1140:PRINT"*
     5. FORMAT DISK[SPC5]*"
87   150 Y=Y+1:GOSUB1140:PRINT"**
     ********************"
E7   160 PRINTCHR$(5):Y=Y+2:X=13:
     GOSUB1140:PRINT"SELECT OPTIO
     N":PRINTCHR$(144)
82   170 GETI$:IFI$<"1"ORI$>"5"TH
     EN170
D5   180 ONVAL(I$)GOTO220,440,580
     ,1180,1510
31   190 REM
CE   200 REM *** ALLOCATE AND ZER
     O SECTORS ***
5D   210 REM
E7   220 INPUT"[CLR]START TRACK";
     T1
0D   230 IFT1<1THEN220
70   240 INPUT "FINISH TRACK";T2
E7   250 IFT1>T2 OR T2>35 THEN 24
     0
44   260 OPEN15,8,15
33   270 OPEN2,8,2,"#"
71   280 :  FOR T=T1 TO T2
B8   290 :      FORS=0 TO FNA(T)
62   300 :      PRINT#15,"B-A"0;T;
     S
1A   310 :      PRINT#15,"B-P"2;1
1D   320 :      PRINT#2,"@"
69   330 :      PRINT#15,"B-W"2;0,
     T,S
8A   340 :      GOSUB1070
D8   350 :      Y=22:GOSUB1140:PRI
     NT"[SPC19]"
38   360 :      Y=22:GOSUB1140:PRI
     NT"TRACK"T" SECTOR"S
58   370 :      NEXT S
3D   380 :  NEXT T
2E   390 FORD=1TO1000:NEXT D
05   400 CLOSE15:CLOSE2:GOTO70
14   410 REM
77   420 REM *** INPUT AND SAVE T
     EXT ***
20   430 REM
8E   440 GOSUB750
6E   450 OPEN15,8,15
F9   460 OPEN2,8,2,"#"
C1   470 GOSUB1420
CE   480 PRINT#15,"B-P"2;1
56   490 X=0:Y=22:GOSUB1140:PRINT
     "[SPC19]"
E6   500 X=0:Y=15:GOSUB1140:PRINT
     "WRITING MESSAGE"MN:PRINT "T
     O TRACK"T" SECTOR"S
DA   510 PRINT#2,I$
3C   520 PRINT#15,"B-W"2;0,T,S
01   530 GOSUB1070
1F   540 CLOSE2:CLOSE15:FORD=1TO1
     000:NEXT D:GOTO70
A7   550 REM
14   560 REM *** READ TEXT ***
B3   570 REM
A4   580 PRINTCHR$(147):OPEN15,8,
     15
55   590 OPEN2,8,2,"#":P=1
A3   600 INPUT"MESSAGE NO";MN
50   610 GOSUB1420
EC   620 PRINT"[DOWN]TRACK.."T,"S
     ECTOR.."S
16   630 PRINT#15,"B-P"2;P
45   640 PRINT#15,"B-R"2;0,T,S
66   650 GET#2,O$:IFO$="@"THEN680

C5   660 PRINTO$;:P=P+1:PRINT#15,
     "B-P"2,P
9A   670 GOTO650
CC   680 CLOSE2:CLOSE15
43   690 X=8:Y=22:GOSUB 1140:PRIN
     T"[RVSON]PRESS ANY KEY TO CO
     NTIUE"
26   700 GETI$:IFI$=""THEN700
48   710 GOTO70
5D   720 REM
9D   730 REM *** INPUT A STRING O
     F TEXT OF UP TO 255 CHARS **
     *
69   740 REM
A1   750 PRINTCHR$(147);:CH=0:DE=
     30:SA=1024+120
41   760 PRINTA$:PRINTB$
1D   770 PRINT"[HOME,DOWN3]";
63   780 GETI$:IFI$<>""THEN810
69   790 A=PEEK(SA+CH):POKESA+CH,
    A+128:FORD=1TODE:NEXT
23  800 POKESA+CH,A: FORD=1 TO D
    E:NEXT D:GOTO780
9A  810 IFI$="[LARROW]"THEN900
6F  820 IFI$=CHR$(13)THEN780
CD  830 IF (I$=CHR$(157)ORI$=CHR
    $(20))ANDCH>0THENCH=CH-1:PRI
    NTI$;:GOTO780
FA  840 IF (I$=CHR$(157)ORI$=CHR
    $(20))ANDCH=0THEN780
24  850 IFI$="[UP]"ANDCH>40THENC
    H=CH-40:PRINTI$;:GOTO780
27  860 IFI$="[DOWN]"ANDCH<215TH
    ENCH=CH+40:PRINTI$;:GOTO780
17  870 IFI$="[HOME]"THENCH=0:PR
    INTI$;:GOTO780
83  880 IFCH<255THENCH=CH+1:PRIN
    TI$;:GOTO780
B9  890 POKE 53280,2:I$="":POKE5
    3280,12:  GOTO780
C7  900 I$="":CH=SA
28  910 C=PEEK(CH):IFC=42THEN960

76  920 IF(C>31ANDC<64)THENCV=C:
    GOTO950
CE  930 IF C<26 THEN CV=C+64:GOT
    O950
48  940 IF C>64 ANDC<91THENCV=C+
    128:GOTO950
18  950 I$=I$+CHR$(CV):CH=CH+1:G
    OTO910
CF  960 PRINT:X=0:Y=12:GOSUB1140
    :PRINT"[WHITE,SY]OUR TEXT IS
    :":PRINTI$
A0  970 PRINT"[BLACK,DOWN,SO]K T
    O PROCESS? Y/N"
C7  980 GETZ$:IFZ$=""THEN980
2A  990 IFZ$<>"Y"THEN750
83  1000 I$=I$+"@"
5A  1010 INPUT"[DOWN2]MESSAGE NU
    MBER";MN
10  1020 PRINTCHR$(147)
84  1030 RETURN
```

```
9B  1040 REM
04  1050 REM *** CHECK ERROR CHA
    NNEL ***
A7  1060 REM
B4  1070 INPUT#15,EN,EM$,ET,ES
4A  1080 Y=23:X=0:GOSUB1140:PRIN
    T"[SPC18]"
B4  1090 Y=23:X=0:GOSUB1140:PRIN
    TEN;EM$,ET;ES
DE  1100 RETURN
D5  1110 REM
36  1120 REM *** POSITION CURSOR
     ***
E1  1130 REM
F5  1140 PRINT"[HOME]"LEFT$(CU$,
    Y)TAB(X);:RETURN
0D  1150 REM
43  1160 REM *** SCAN AND DISPLA
    Y BAM ***
19  1170 REM
E3  1180 INPUT"[CLR]START TRACK"
    ;T1
E5  1190 IFT1<1THEN1180
54  1200 INPUT "FINISH TRACK";T2

9C  1210 IFT1>T2 OR T2>35 THEN 1
    200
90  1220 PRINT"[HOME,SPC13,SS,SE
    ,SC,ST,SO,SR]"
AD  1230 PRINT"[SPC5]0[SPC9]1[SP
    C9]2 [ST,SR,SA,SC,SK]"
F7  1240 PRINT"[SPC5]01234567890
    1234567890
DB  1250 OPEN15,8,15:OPEN2,8,2,"
91  1260 :  FORT=T1 TO T2:PRINTT
    AB(3)"  ";
DB  1270 :          FORS=0 TO FNA(T)

32  1280 :          PRINT#15,"B-P"2;
    1
C4  1290 :          PRINT#15,"B-R"2;
    0,T,S
30  1300 :          GET#2,O$:IFO$<>"
```

```
    @"THENO$="*"
1A  1310 :         PRINTO$;
0C  1320 :         NEXT S
C0  1330 :  PRINT LEFT$(CR$,21-F
    NA(T));T
71  1340 :  NEXT T
2B  1350 CLOSE2:CLOSE15
32  1360 X=8:Y=22:GOSUB 1140:PRI
    NT"[RVSON]PRESS ANY KEY TO C
    ONTIUE"
1B  1370 GETI$:IFI$=""THEN1370
27  1380 GOTO70
FC  1390 REM
56  1400 REM *** CONVERT MESSAGE
     NUMBER TO TRACK AND SECTOR
08  1410 REM
87  1420 IF MN<=357 THEN T=INT(M
    N/21)+1:S=MN-(T-1)*21:RETURN

AD  1430 IF MN>357 AND MN<=490 T
    HEN TR=18: TL=20: NS=357: GO
    TO 1460
DE  1440 IF MN>490 AND MN<=605 T
    HEN TR=25: TL=18: NS=490: GO
    TO 1460
61  1450 TR=31: TL=17: NS=605
B5  1460 RE=MN-NS
04  1470 T=INT(RE/TL): S=RE-TL*T
    : T=T+TR:RETURN
42  1480 REM
5C  1490 REM *** FORMAT DISK ***

6E  1500 REM
84  1510 PRINTCHR$(147)
3A  1520 INPUT "DISK NAME";NA$
05  1530 INPUT "ID";ID$
C1  1540 FI$="NO:"+NA$+","+ID$
B3  1550 INPUT"[DOWN2,SA,SR,SE]
    [SY,SO,SU] [SS,SU,SR,SE]";I$

7E  1560 IF I$="Y"THENOPEN15,8,1
    5,FI$:CLOSE15
E8  1570 GOTO70
```

AMAZING NEW 'TOTAL BACKUP' CARTRIDGE FOR COMMODORE 64 AND 128 (IN 64 MODE)

NEW ACTION REPLAY V.3 FROM DOSOFT
UNSTOPPABLE 'TOTAL BACKUP' CARTRIDGE

OUR NEW INNOVATIVE HARDWARE AND SOFTWARE COMBINATION
GIVES YOU MORE POWER, MORE FEATURES, MORE FUN!!

Action Replay V.3 is now more powerful, has more features and will back up more programs than any competing cartridge! It handles the latest protected games!

Just plug it into the expansion port then press the Magic Button! Our new hardware design makes this absolutely unstoppable. Now you are in complete control. Tape to tape. Tape to disk. Disk to disk. Disk to tape. No special knowledge is required. It tells you exactly what to do. It's so friendly– and it's a lot of fun too!

Become invulnerable! Action Replay V.3 now has a SPRITE KILLER. Play weird games? The unique SPRITE MONITOR lets you save sprites from one game and load them to another! The mind boggles!

Nothing else offers all these features at this price!

■ Mega-Freeze
Freeze and save ANY working program—the Magic Button is unstoppable—unlike other cartridges. Also it is now undetectable by software!

■ Independent
All programs reload without cartridge—and at turbo speed—tape or disk.

■ Extra Fast
Make all backups at Turbo Speed—much faster than rival cartridges. Dual speed Tape Turbo is up to 3 times faster than commercial Turbos 10 times faster than Commodore.

■ Super Compact
Intelligent compacting techniques minimise program size into single files. Save 3 or more per disk side.

■ MultistageSaves
Transfers MORE multistage loaders from tape to disk than any other. And all parts Turbo load—another feature unique to Action Replay.

■ So Easy to Use
Action Replay V.3 is a delight to use. All functions described on screen. No user knowledge is required.

■ SpriteControl
Unique Sprite Monitor lets you disable them. Save them! Change them!! Customise your games!!!

■ Picture Save
Unique! Save ANY Multicolour Picture, including title screens. Compatible with Blazing Paddles, Koala, Graphic Slideshow etc. Built-in Slideshow for tape users.

■ Disk Fastloader
Superb bonus feature loads five times faster. Takes up NO memory.

■ Code Inspector
Look at whole memory—program, registers, etc. Everything you need.

■ Compatible
Fully compatible with Commodore 64, 64C, 128 and 128D in 64 mode, 1541, 1541C, 1570, 1571 and Enhancer Drives, CBM compatible tape recorders, FastDOS, and Turbo ROM—can the others say that???

£29.99 GET MORE FOR LESS!
Buy Action Replay with DiskMate in ONE cartridge ONLY £39.99

Action Replay and DiskMate are also available from Datel Electronics

THERE'S NO STOPPING ME NOW!
D
MK3
ACTION

DiskMate Cartridge V.2
This is the way Commodore should have their DOS. Single keystroke commands e.g. LOAD and RUN straight from directory, and much, much more! Works with all drives: 1541, 1570 and 1571.
• 2 minute complete Backup • Very fast disk functions • Invisible • Toolkit • 10 second Format • Powerful 'Floating' Monitor • SAVE "@0:" bug cured • Takes up NO memory • Unstoppable reset

£14.99 TERRIFIC VALUE
Buy DiskMate with Action Replay in ONE cartridge ONLY £39.99

Graphics Slideshow
View pix from games, graphic packages or loading screens singly or in sequence. 16 pictures per disk. Turboload. Disk only.
LOOKING GOOD AT £4.95
SPECIAL OFFER!
Enhancement and Slideshow on one disk ONLY £11.95

100% SUCCESS? WE ASK: WHO'S KIDDING WHO?
Action Replay V.3 will back up ANY program which ANY other cartridge can—and much more! It also has unmatchable features. For instance, 'Freeze Frame' uses more disk space, saves SLOWER, has a SLOWER tape loader and has NO built-in disk fastloader, NO picture, NO Sprite, NO restart features, yet costs £10 more!!! So, come on, who's kidding who? If Action Replay V.3 doesn't live up to our claims, return it within 7 days of receipt and you can have your money back!

Enhancement Disk
Get even more from Action Replay with this Bonus Disk to back up the new non-standard multi-stage loaders.
GREAT VALUE AT £7.95
Our cartridges carry a twelve month guarantee against mechanical failure.

How to get your DoSoftware
Please send cash/cheque/P.O. with order for fast despatch (SAE only for full details). Send off now to:
DoSoft (Dept YC), 2 Oakmoor Ave, Blackpool, FY2 0EE
UK Postage included. Europe add £0.75, or £2 if order includes Blank Disks. Overseas add £1.50 for Airmail, or £5.50 if order includes Blank Disks.

DoSoft
You'll Do it Better with DoSoft

SUPER SOFTWARE SALE
Buy NOW and SAVE! SAVE! SAVE!

The DoSoft Collection
UNBEATABLE OFFER The latest versions of MegaTransfer, MegaUtility, MegaTape and Protopirite ALL on One Disk
HALF PRICE £12.50 WOW!

DoSoft Super Disk Kit
AS ABOVE but with 12 Xidex Precision Boxed Disks. A great start to get your programs on disk at a giveaway price!
SAVE! SAVE! SAVE! £19.99

Mega MegaTape Savings
OUR FAMOUS Tape-to-Tape utility for one Datassette at an unbeatable price.
BUY NOW £5 BRILLIANT!

Xidex Precision Disks
From the WORLD'S LEADING SUPPLIER—12 Double Sided, Double Density 5¼ Disks complete with sleeves, labels, tabs and FREE high impact plastic storage box.
TWELVE FOR ONLY £8.50!

DISK TO DISK • DISK TO TAPE • TAPE TO TAPE • TAPE TO DISK •

HARDWARE TRANSFERS MULTI-PARTS • DUMPS HI-RES SCREENS •

• FAST DISK UTILITIES • LOADERS • 2-MIN DISK COPY • FAST DISK FILE COPY • FAST FORMAT •

Games Reviews

There are some fast and furious games this month and some more leisurely titles for you to dip into.

CLASSIC SNOOKER

Here's a chance for budding Jimmy Whites to try and emulate their green baize heroes and all from the comfort of their own home. Classic Snooker has enough options to keep even the most devote fan quiet during the odd hour where, due to some unfortunate error in the programming schedules, there isn't actually any of the real stuff on the box.

There are three skill levels and you can choose to play either against a friend or the computer. Control of the game is simplicity itself. Position the cueball in the 'D' if necessary, select the angle of the shot, decide what, if any, spin you want to impart on the cueball and finally select the power required. If you pot a red, you are prompted for a colour and this is simply a matter of moving the cursor over your choice. Details of the scores, current break and highest break to date are displayed below the table. There is an edit mode included in the program so you don't have to play a full game if you don't want to or you can set up and practice all those fancy trick shots.

The only problem with the game, and unfortunately it's a major one, is that the balls are far too active when hit. You only have to break into the pack at half speed and you are treated to balls whizzing all over the table in the most amazing flaunting of Newton's Laws of Motion. You certainly have more than enough time to chalk your cue between shots.

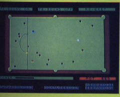
All this is a pity because it totally ruins the playability of what is otherwise a well presented game. A brave effort but one that has sadly miscued. **G.R.H.**

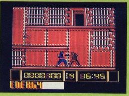
Touchling

Title: *Classic Snooker.* ***Machine:*** *C64.* ***Supplier:*** *Anco, 35 West Hill, Dartford, Kent DA1 2EL.*
Originality: *1/10.* ***Graphics:*** *6/10.* ***Playability:*** *4/10.* ***Value:*** *4/10.*

KNUCKLEBUSTERS

By the year 2030, more than one in three of the adult population was in prison after years of riots and civil disobedience. Overcrowding was overcome by the simple





expedient of using chemistry or the surgeon's knife to remove any offending part of mind or body. This in turn produced thousands of socially useful androids who were used to patrol the less savoury sections of the city and who had instructions to kill on sight any escaping prisoner. Not as you might imagine by the simple method of blowing their brains out, but rather by hand to hand combat which at least afforded the prisoner a fighting chance. But who am I to argue as withot such far fetched plots as these, computer games would be so much the poorer?

As it happens, one such prisoner was trying to escape (I bet that surprised you). You play the part of Deke in this latest beat-em-up from Melbourne House. In order to gain your freedom, you must travel through six zones of the city, hitting or avoiding the androids as you see fit. The zones include the cell block, guard area, prison wall, city, down town and the outer wall. Available actions are run left and right, jump and drop, punch and kick. There are five different types of android to encounter as well as potentially useful items hidden behind doors and oil barrels. Al this must be done against the clock as you managed to sabotage the prison computer causing the entire city to self destruct. As a hint as to how much time you have got, it may be co-incidental that Ron Hubbard's sound track lasts for 17 minutes.

And that's all there is to it. The graphics are so-so, the gameplay dreadful. Save your money. **G.R.H.**

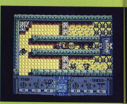
Touchline

Title: *Knucklebusters.* ***Machine:*** *C64.* ***Supplier:*** *Melbourne House, 60 High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.*
Originality: *3/10.* ***Graphics:*** *6/10.* ***Playability:*** *3/10.* ***Value:*** *3/10.*

DANDY

Try this storyline for size. One or two players working as a team rush like mad through 15 dungeons, knocking the stuffing out of as many nasty, evil monsters as possible and pausing only to pick up treasure, keys and the odd bite to keep your strength up. Sound somewhat familiar? Yes, it's Gaun ... oops Dandy, a Gauntlet clone from Electric Dreams.

The two characters are Thor and Sheba, two not very nice characters, all brawn and no brain. They can withstand a considerable amount of damage before even they succumb to the forces of evil. Unfortunately, the vast hordes of nasties are intent on cutting you to ribbons, a slice at a time. What is worse, these creatures of dark seem to come in an unlimited supply thanks to the fact that there are monster generators scattered liberally around each dungeon. If you can destroy every creature on a particular screen, you can also destroy the generators so that they plague you no longer.



Food is only one of the vital goodies for pick up on your travels, restoring as it does your battle weary body. Keys are just as important as they are required to allow you access to other parts of the dungeon. Beware as they can be destroyed by shooting them and if you are not careful in the thick of battle, you may well find yourself cut off! Spells can be found and these have the random effect of killing, disorientating or paralysing the enemies. Treasure has no real function apa from being something to make your journey worthwhile. an emergency, you can trade your treasure for energy. The are teleports to be used and completion of a set of dungeon gives you a clue to solving a riddle.

All the backgrounds are bright and colourful and the are plenty of creatures crawling round the screen at an given point but the overall effect is to make the screen loo very messy. Compare this to Gauntlet where the screens a a lot simpler but look a lot better for it. Not a bad game, b missing that certain spark that makes it a great one. **G.R.**

Touchline

Title: *Dandy.* ***Machine:*** *C64.* ***Supplier:*** *Electric Dreams, Carlton, Crescent, Southampton SO1 2EW.*
Originality: *6/10.* ***Graphics:*** *6/10.* ***Playability:*** *7/10.* ***Valu*** *7/10.*

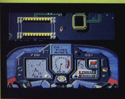
RED MAX

All you have to do to complete the game and save th Astroworld is to deactivate 27 fission mines on the surfac find the lift and turn on eight backup nuke-core coolin systems in the engineering area, shut down four power plan and finally re-animate nine crew members in the hibernatio complex! This shouldn't be a problem as you're riding R Max!

The Astroworld is one of a group of anti-gravity orb sent out to escape the Sun as it began an unexpected Sup Nova cycle. Safely past the Sun the mission went badl wrong when members of the Renegade Death Lords lande and sabotaged the power plants. The alarms sounded an now you must ride Red Max to the rescue.

The game plays like a sequel to Mastertronic's The Las V8 as you drive your bike around the planet's surface in th top half of the screen while monitoring controls in th bottom half.

The planet surface is packed with traps to hinder an destroy your efforts. These include lase fences and gree biological slime as well as the buildings that destroy you o



contact. My favourite screens are in the underground caverns in which you must drive through lakes and rivers that try to drag you along with the current.

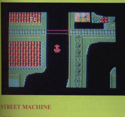
Red Max is yet another highly addictive budget game that drives you back for another game, again and again.

T.H.

Touchline

Title: Red Max. ***Supplier:*** *Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.* ***Machine:*** *C64.* ***Price:*** *£1.99.*

Originality: *6/10.* ***Graphics:*** *7/10.* ***Playability:*** *7/10.* ***Value:*** *9/10.*



STREET MACHINE

Yet another racing simulation game. You control a high-powered turbo charged ultimate automobile although you would not think it to look at the screen which depicts an overhead view of you and the other seven cars as you drive round a scrolling track. The cars look like souped down Dinkys.

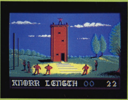
Your race is split into three sections – normal conditions, nightime and icy. Control is straightforward. Accelerate, decelerate, left, right and brake. The usual objective is to get round the course as fast as you can but there is no indication of how well you were doing before you wrote off your vehicle. Even a simple 'You have travelled x miles' on a high score table would help considerably.

Major crashes result in your car exploding and game over time. Minor bumps and general wear and tear can be fixed although it costs you time. A two page menu is presented showing all the various bits of your car and the amount of damage that they have accrued. Anything that is more than 80% damaged must be fixed. This involves moving the cursor to the right a bit and waiting. Damage is repaired with time and you are limited as to how much time you have available. This part of the game is dull in the extreme – it is just a case of looking down the list for high numbers. The name of the part is irrelevant.

This game is neither original nor addictive. It would have been reasonable if it had come out in 1983 but now, it looks very dated. In the computer game Grand Prix, Street Machine barely makes it over the starting line. **G.R.H.**

Touchline:

Titles: *Street Machine.* ***Supplier:*** *Software Invasion.* ***Price:*** *£7.95.* ***Originality:*** *2/10.* ***Graphics:*** *5/10.* ***Playability:*** *5/10.* ***Value:*** *3/10.*



BLOOD 'N GUTS

Decathlon barbarian style is the subject of the latest game from Swedish software house American Action. The game that promises all of the violence and brutality you've ever dreamed about features 10 ancient contests in which the loser literally loses his head (thanks to a handy on podium guillotine!)

You can select your athlete from the motley collection of Knorr, Hawk, Nop and Dog who does battle against either a human or computer opponent in challenges where the ancient art of joystick waggling is crucial to victory.

The contestants are tested to the full by events that examine their strength, accuracy and constitution in front of a critically violent crowd.

During the contest they compete in a tug of war where the loser ends up in a river, the tower jump where a successful leaper must land on his head and the polefight over a ravine when the loser takes a dive!

A barbarian in stocks froms the live target for the human hit event in which the player must hurl rocks at his nose, arms and legs. In the axe throwing the barbarians get a chance to throw axes at each other and in the cat throwing a poor moggy hurtles through the air and lands dangerously close to a hungry looking crowd.

My favourite event is the beer drinking in which our heroes must quaff three barrels of beer without spilling a single drop. A mixture of timing and waggling are required to drain the barrel and deliver the victory belch before your opponents cleared the froth. Finally, three rounds of arm wrestling end the contest with a seagull delivering the final blow to the loser.

Each event is supported with "fun" graphics such as a cross section of a barbarians head so that you can control the flow in the beer drinking and inserts of the players during the mountain walk to counteract any loss of balance.

Overall the game is good fun to play despite it's raw appearance and makes a welcome change from the slopes, fields and tracks of the more serious sports simulations.

T.H.

Touchline

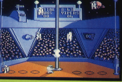
Title: *Blood 'n Guts.* ***Supplier:*** *American Action, Box 10090, 200 43 Malmo, Sweden.* ***Machine:*** *C64.*
Originality: *8/10.* ***Graphics:*** *6/10.* ***Playability:*** *9/10.* ***Value:*** *8/10.*

HYPA-BALL

It's the day of the Odin Super Cup and a titanic clash between the Hawks and Vipers. You captain the Hawks in the ultimate team game in the Universe – Hypa-Ball.

Before the match can begin you must choose your team from the pool of 10 players knowing that the computerised vipers are just as eager to snap up the stars. You can judge a players abilities from his strength, speed and agility ratings as you scroll along the likes of Alex Grunt, Fredo Flange and Stu Gobwinge.

After a few disastrous games when you're slaughtered in the 10 minute matches, you'll begin to see which are the best players as the computer will pick these ones. However as you get first pick you should soon be in with a chance.



The Hypa-Ball stadium is split into two halves by a central pole along which the goal ball relentlessly moves up and down at a constant rate. At either edge of the screen the pitch is bounded by a force field that teleports the steel playing ball into the other half.

After a quick twirl from the cheerleaders the players take their position. The strike ones and twos hover on either side of the pole and are restricted to that half of the field, whereas the grounder can move where he wants to as long as he keeps his feet on the ground. The match begins as the ball is fired into play.

Joystick controls move one strike and the grounder at any one time. This takes a while to get used to but soon you'll be chasing ball. Once you catch it you have to think quickly as you've only got 2.5 seconds to get rid of it otherwise you'll concede a penalty and a certain goal.

Goals are scored by firing the ball at the goal but since it's a moving target this isn't easy. In a 10 minute match against a good computer opponent your concentration must be total as the slightest lapse will let him in to score.

A fast and furious, futuristic sports game supported by super sounds and speedy gameplay.

T.H.

Touchline

Title: *Hypa-Ball.* ***Supplier:*** *Odin, 74 New Oxford Street, London WC1A 1PS.* ***Machine:*** *C64.*
Originality: *8/10.* ***Graphics:*** *8/10.* ***Playability:*** *9/10.* ***Value:*** *8/10.*

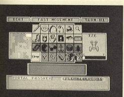
ROBOT RASCALS

Robot Rascals is the latest game to be released by Electronic Arts (through Ariolasoft) and is a game that's half computer game and half card game!

Basically, the game is a multi-player treasure hunt with a hand of cards deciding what the players are looking for. Four cards are dealt as the program is loaded in. Then the players select one of the 10 robots that would each be at home in Electronic Art's classic game M.U.L.E. Although they are visibly different, there doesn't seem to be any difference in their strengths or abilities.

Each turn, each players gets to move his robot around the alien world of Laustenfownd seeking out their selected artefacts. Moving through rocks or trees costs more energy than strolling through the plains. Either way this energy is deducted from the robots turn allocation. When all the energy has gone the turn is over. As well as moving a robot can scan for one of the 24 items that range from a denim disk to a digital donut. The robot then spins around (the quicker the spin the closer you are to the object) and finally points in the direction you need to go in. Collect all four objects and return home (in the centre of Laustanfawnd) and you've won the game.

Unfortunately, it isn't that simple as the other players are out to stop you. There's another pack of cards, the luck cards, that can force you to show your hand to the others, allow you to swap one of your cards for somebody else's or get everyone to swap with the descriptive "pass the trash



card". All this wheeling and dealing is necessary as some cards (and the objects they represent) are better than others such as the Super Shield and Velocity Vitamin that add to your robot's powers whereas the Energy Eater and Action Anchor slow you down. There's even a killer card that stops you from winning unless you can pass it on to someone else. This card gets passed around a lot.

The mischief doesn't end with cards as you can also get your robot to go and mug the other players by ramming them and the stealing what you want but you can also use energy to build shields to protect yourself from muggers.

Finally just as you thought you had things under control the game alters one of its global factors such as slowing down all movement or increasing the energy and scuppers your plans.

A fun game for all the family that is best played with the maximum four players to allow maximum sculldduggery. Believe me this can get vicious as people have been known to drop objects that I've wanted at the bottom of lakes just to postpone my victory celebrations but don't worry I'll get revenge.
T.H.

Touchline

Title: *Robot Rascals.* ***Supplier:*** *Electronics Arts (Ariolasoft), 68 Long Acre, London WC2E 9JH.* ***Machine:*** *C64 disk.* ***Price:*** *£16.95.*
Originality: *8/10.* ***Graphics:*** *7/10.* ***Playability:*** *9/10.* ***Value:*** *7/10.*

LIGHT FORCE

Piloting a lone Lightforce fighter craft, here is yet another scenario giving you the chance to put the wrongs of the Universe to right. This time, the object of your mission is revenge as you attempt to wipe out an alien force that has seized a Terran-settled system on the edge of the galaxy. Yes folks! It's another shoot-em-up.

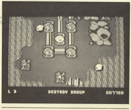
Why is it that whenever there is any sort of trouble, you are the only person around capable of sorting it out? This time, the 'trouble' comes in the form of a few thousand alien ships and ground defences spread over such divergent landscapes as jungles, asteroid belts and ice-planets.

Despite the unoriginal storyline, Lightforce plays very well indeed. The graphics, while not quite as stunning as the Spectrum version, are still noteworthy. The game itself is basically one of learning the patterns of the airborne aliens whilst at the same time, manoeuvring yourself into a position whereby you can blast the ground targets. Your task is made more tricky as these need several hits to destroy them. They are vital though. Take out four control centres and you earn yourself a most welcome extra life. Apart from your twin lasers, there are other special weapons to be found and activated as you continue your aerial Rambo act.

Faster Than Light, the company producing Lightforce has managed the one ingredient that makes shoot-em-ups stand out from the crowd. The game is incredibly addictive. Couple that with the on screen effects and Lightforce becomes an essential purchase for anyone who enjoys a fast blast.
G.R.H.

Touchline:

Title: *Lightforce.* ***Supplier:*** *Faster Than Light, Sedgley Road East, Tipton, West Midlands DY4 7UJ.* ***Machine:*** *C64.* ***Price:*** *£9.95.* ***Originality:*** *7/10.* ***Graphics:*** *8/10.* ***Playability:*** *9/10.* ***Value:*** *9/10.*

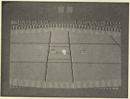


Xeno

Developed from a game played by platinum miners, back in the 23rd century, Xeno was originally a game with few rules and considerable violence. The basic idea was a fairly traditional one – try to hit a puck into your opponent's goal more times than he managed to do the same to you. If the puck or you happened to hit the opponent, tough luck!

In today's sanitised version, the game has become a huge spectator sport, the rules have been tidied up somewhat and champions become legends overnight. Xeno is your chance to become one of the sporting heroes of the galaxy.

The game is a sort of space age ice hockey. Each player controls a disk and takes it in turn to fire it anywhere on the lozenge shaped rink, the ultimate objective being to knock the puck into your opponent's goal. You can try and hit the



puck direct, knock your opponent's disk out of the way or try to block his shot. The game is played over four quarters and the person with the highest score is the winner.

Playing Xeno is simplicity itself – you simply move a small arrow around the pitch, press fire and your disk travels in the appropriae direction. The games can effectively become user defined as there are a number of variables that you can fiddle with: one or two players, the length of each quarter, the amount of time between shots and a handicapping system for the computer. In practice, the default values work as well as any others and lead to a fast and furious game although not one in which you will be beaten out of sight by the computer.

Xeno is a well implemented, simple game that is great fun to play. **G.R.H.**

Touchline:

Title: *Xeno.* ***Supplier:*** *A'n'F, Victory House, Leicester Place, London WC2H 7NB.* ***Tel:*** *01 439 0666.* ***Machine:*** *C64.* ***Price:*** *£8.95.* ***Originality:*** *6/10.* ***Graphics:*** *6/10.* ***Playability:*** *9/10.* ***Value:*** *6/10.*

THE DOUBLE

Every football manager's dream is to achieve the 'double', by winning both the league and FA Cup in one season. This achievement has only been done five times in the history of English football but here you can try and make it six with this new football simulation game from Scanatron.

Being a football nut myself I can honestly say that this is by far the most realistic game of its kind I have come across. All the usual gameplay features are included with this type of game, but this particular one has many better features then its rivals.

Included among the options are ones that allow you to employ scouts to report on any team or player from any division and a physiotherapist to help nurse your injured players. As well as coping with the teams problems you are asked to deal with the running of ground improvements, sackings, wages and even estimating your attendance. Underestimating the crowd can result in terrace battles whilst over estimating can result in huge policing bills and lecture from your chairman.

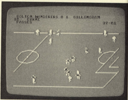
Except for cup matches, watching games is optional and if your side is having a particularly poor spell then you may wish to watch another game from another division. The simulations are rather lengthy and take about 15 minutes in all but commentary of the game helps identify the quality of your players.

After each game you are given the scores, scorers and attendance figures for all matches. The attendance figures and playing squads were selected from the 1985-86 season and add a very up to date dimension to the game.

Overall 'The Double' is an exceptionally realistic game and an absolute must for any football fan but it is at times rather slow and time consuming. **S.K.**

Touchline:

Name: *The Double.* ***Price:*** *£10.95.* ***Machine:*** *C64.* ***Supplier:*** *Johnson Scanatron Ltd.* ***Tel:*** *0934 22044/417789.* ***Originality:*** *4/10.* ***Realism:*** *9/10.* ***Playability:*** *6/10.* ***Value:*** *9/10.*



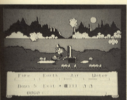
CHAMELEON

In what Electric Dreams describe as a "surreal" arcade adventure, you are Chameleon. Made from Man and Flux, the fabric of limbo, you must enter the four realms of Fire, Earth, Air and Water and do battle with the demons that now rule there. These demons were created by an evil man to master the powers of nature and so wreak havoc on to the Earth with freak storms, blizzards and dust storms.

Using your flux you can match the demons and defeat them in combat while repairing the damage caused by the tainted flux.

During your quest you must journey through these strange realms and seek out the tainted flux that can be found only in a certain place and a specific time of day. Luckily, you are fitted with warning buzzes that sound when you meet one of the criteria, then it's merely a matter of fighting off the demon onslaught until you can progress to the next realm.

The game features a similar mock 3D display as found in Gremlin's Way of the Tiger as the Chemeleon travels past an assortment of energy draining pools and holes and



background deserts, pyramids, trees and mountains.

Constant attacks from the demon flames, rockslabs, twisters, blizzards and dustballs drains your flux energy lifeforce which can be replenished by collecting the sparklers that are left if you blast the Super Demons.

Underneath this surreal coat of realms, flux and Limbo lies a surprisingly easy, shallow and ordinary arcade adventure. **T.H.**

Touchline

***Title:** Chameleon.* ***Supplier:** Electric Dreams, 31 Carlton Crescent, Southampton SO1 2EW.* ***Tel:** 0703 229694.*
***Machine:** C64.*
***Originality:** 6/10.* ***Graphics:** 5/10.* ***Playability:** 7/10.* ***Value:** 6/10.*

HEARTLAND

The strangest things can happen when you read a book that you found in the attic. This one was all about an overweight wizard that saved a magic land from the evil antics of the Warlock Midan. As you near the end of the book you realise that the last six pages are missing! Then to your horror you find yourself in the land you were reading about and dressed in the wizard's outsize clothes and armed only with a self repeating top hat.

Your mission is to search the strange platforms and portals of the Heartland for the missing pages so that the story (and Heartland) has a happny ending. However Midan knows of your presence and has sent his minions to get you. These consist of the spitting wizards and the indestructable gooches that chase you even after you've blasted them into a pile of bones.

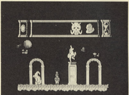
Your mission is further hampered by the energy draining stars and bubbles that float above the platforms and six dark pages that detail a different end to the book involving lots of GBH for you and the Heartland.

Help is at hand in the more powerful weapons that you can find such as swords and fireballs as well as other stars that give you temporary immunity and a bed that transports you from one scene to another. Despite this the hand of Midan isn't far away and gets even closer every time one of his minions or spells touch you until his face appears at the top of the screen ending your game.

Heartland is an excellent arcade adventure featuring some exceptional graphics particularly of the crumbling minions as they disperse into a pile of bones. **T.H.**

Touchline

***Title:** Heartland.* ***Supplier:** Odin, First Floor, 74 New Oxford Street, London WC14 1PS.* ***Machine:** C64.*
***Originality:** 7/10.* ***Graphics:** 9/10.* ***Playability:** 7/10.* ***Value:** 8/10.*



SKY RUNNER

By the 21st Century man was spread throughout the galaxy and at last the governments had found a drug to control him.

This was the result of years of research and countless failures as previous drugs had left guinea pigs in a brainless daze. Then on a single planet called Niabmoloc they actually found it growing on trees. Seventy per cent of the planets trees had fruit containing the drug Sky.

Fleets of Sky Runners riding their Sky Bikes were despatched to harvest the drug protected by the laser firing towers that were built to protect them.

Although necessary (normal policing methods didn't work) control drugs were still illegal. You are part of the Runner Squad that was formed to sabotage the Sky running on the forested world.

As you're paid by results you set off to trash as many bikers as possible. The game begins as your skimmer lands on the planet.

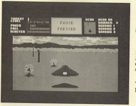
Your first problem is to take out the laser towers that protect the Sky collecting bikers. With your single skimmer you must out gun the towers by blasting them in high speed attack runs. Only then can you land and drop your first of three bikes.

Charging through the trees (that are as deadly as the towers if you crash into them) you must track down and destroy the Sky Bikers but you must take care not to destroy your fellow runner squad men.

Unfortunately, even the eight different threat or skill levels do nothing to save a game that is bland and reminiscent of a four year old Spectrum game! **T.R.H.**

Touchline

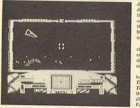
Title: *Sky Runner.* ***Supplier:*** *Cascade Games, Harrogate, HG1 5BG.* ***Machine:*** *C64.*
Originality: *4/10.* ***Graphics:*** *6/10.* ***Playability:*** *5/10.* ***Value:*** *5/10.*



STARGLIDER

Starglider, the game that features vector graphics arcade action, comes in a box with a 64 page novel, poster and key guide and won every possible accolade in its previous versions, is at last available on the C64.

The Star Glider in question isn't the craft that you fly by peering at its on screen controls but giant birds that lead to the downfall of the planet Novenia. These birds migrated through space to Novenia and were fried by the planets Sentinel "zap anything" defence system until an attack of conservation reprogrammed the Sentinels. Unfortunately, they also let in the Star Glider shaped Ergon attack fleet that devastated the defenceless planet. Luckily, you were on a nearby moon and have found an ancient airbourne ground attack vehicle (AGAV) and have gone to the rescue.



There's no great strategic aim to be fulfilled as your job is simply to destroy all you can before they finally get you. You find you can use the planet's refuel, rearm and repair facilities that should improve your chances.

Using a combination of keyboard and joystick controls you must fly your AGAV and do battle with a collection of alien craft that include the Star Wars inspired walkers and stompers, tanks, mines, missile launchers and he flapping Star Gliders. Most take more than one shot to kill and some such as the stompers can only be destroyed by firing a missile that you must guide to the target through a separate display.

An excellent game that has been ruined by poor programming. **T.H.**

Touchline

Title: *Starglider.* ***Supplier:*** *Rainbird, 1st Floor, 74 New Orford Street, London WC1A 1PS.* ***Machine:*** *C64.* ***Price:*** *£14.95.*
Originality: *8/10.* ***Graphics:*** *7/10.* ***Playability:*** *4/10.* ***Value:*** *6/10.*

10th FRAME

Ten pin bowling is the name of the game in this latest sports simulation from the Access/US Gold stable. 10th Frame allows up to eight players to have a go at knocking over as many skittles as possible on either a league or one off basis.

For the uninitiated, ten pin bowling involves rolling a huge ball down an alley as you attempt to knock over 10 skittles. You get two attempts to do this. If you succeed in knocking them all down with only one ball, this is known as a strike. Take two balls and it becomes a spare. The secret of a high score is to make sure of getting your spares.

In order to launch a ball, you must first select an aiming point and position your man on the lane. Keeping the fire button pressed will start a bar moving up a scale as you determine the speed of your release. Two small markers determine the safe upper and lower limits for an accurate throw. The bar then slides quickly down the right hand side of the scale and you must press again to stop on one of the three markers – straight, slight hook and maximum hook. Miss your press and your ball is likely to make an early roll into the nearest gutter.

Graphically, the game is a little disappointing. The effects of the skittles falling down is well done but the lane is small – one fifth the width of the screen. The worst part is the sliding scale. Yellow on orange proved very hard to see, especially under artificial light.

10th Frame is a highly accurate simulation of 10 pin bowling but lacks a little in addictive qualities. **G.R.H.**

Touchline:

Title: *10th Frame.* ***Supplier:*** *US Gold, Units 2/3, Holford Way, Holford, Birmingham B6 7AX.* ***Machine:*** *C64.* ***Price:*** *£9.95.* ***Originality:*** *8/10.* ***Graphics:*** *6/10.* ***Playability:*** *7/10.* ***Value:*** *7/10.*

THE FINAL CARTRIDGE II ®

START 1987 WITH THE GREATEST UTILITY EVER!
OVER 50,000 ALREADY SOLD WORLDWIDE!

- ★ **DISK TURBO**
  6 times faster disk access — loading and saving
- ★ **TAPE TURBO**
  10 times faster — compatible with standard turbos

- ★ **KEYBOARD EXTRAS**
  Pokes and Syscalls in Hex. Type command operates your printer as a typewriter

- ★ **BASIC 4.0 COMMANDS**
  like Dload, Dsave, Dappend, Catalog, etc.
- ★ **KEYBOARD EXTRAS**
  with Auto, Renum (incl. Goto and Gosub), Find, Help, Old, etc.

FREEZER

- ★ **MENU DRIVEN**
  16 SUB MENUS
  Colour changes
  4 resets
  Centronics/serial screendumping
  Print vector setting
  Reverse printing
  Tape to disk, Back up
  Disk to disk, Back up
  Disk to tape, Back up
  Back ups are packed files on tape or disk, including their own fast loader and starter
- ★ **GAME KILLER**
  Kills sprite to sprite and or sprite to background collision
- ★ **COMFORTABLE EXTENDED M.L. MONITOR**
  INCLUDING:
  Relocated load, Scrolling up and down,
  Bankswitching, printing
  MONITOR DOES NOT RESIDE IN RAM!
  INCLUDES DISK DRIVE MONITOR
- ★ **FREEZER SWITCH**

- ★ **ADVANCED CENTRONICS INTERFACE**
  Compatible with all the wellknown centronics printers and Commodore printer programs. Prints all the Commodore graphics and control codes (important for listings).
  Including screen-dump facilities. Prints Low-Res, Hi-Res and Multicolour. Full page! Even from games and paint programs, like Doodle, Koala Pad etc. Searches automatically for the memory address of the picture.

- ★ **RESET SWITCH**
  Resets all protected programs

- ★ **PREPROGRAMMED FUNCTION KEYS**
  Run, Load, Save, Catalog, Disk commands, List (removes all list protections)

- ★ **24K EXTRA RAM FOR BASIC PROGRAMS AVAILABLE**
  Two new commands "Memory read", "Memory write". They move 192 bytes with machine language-speed anywhere in the 64K Ram of the CBM 64. Can be used with strings and variables.

£39

STOCKISTS
COMPUTER CENTRE
(Hornchurch)
174 High Street,
Hornchurch,
Essex
Tel: 0424 75613

MEGATEK COMPUTERS
221 Tottenham Court Rd.,
London W1
Tel: 01-323 4698

HI VOLTAGE
53-59 High Street,
Croydon,
Surrey
Tel: 01-686 6362

MEEDMORE LTD.
28 Farriers Way Ind. Estate,
Netherton,
Merseyside
Tel: 051-521 2202

SOFT CENTRE
2 Bruntsfield Place,
Edinburgh
Tel: 031-229 3484

Or direct from:
H&P COMPUTERS UK
9 Hornbeam Walk,
Witham,
Essex CM8 2SZ
Tel: (0376) 511471
Trade enquiries welcome

Up to date Info: C64/C128

The Printerinterface

Runs with all popular software. Guaranteed. Make sure the one you buy can be relied on to do the same.

92000/G, now only: £59.99

Printerbuffer

A must for business use. Speed your computer systems by up to 95%. Runs immediately with all your existing softzware.

99032, 32KByte: £70.00
99064, 64KByte: £90.00

Lowcost V24/RS232

Your C64/C128 already has a built in serial interface! All you need is a driver program and this interface to provide the correct voltage levels for standard RS232 devices.

88002: £35.00

Intelligent V24/RS232

With its own processor and a 64KByte buffer this simple to use device allows high data rates. Can even receive data while your computer is running other programs.

98064, 64KByte: £115.00

Soundbox

Most games have great sound - but not from your C64 or C128. Soundbox - ready to plug in HI-FI amplifier with built in loud speaker. Complete music enjoyment. Low price.

95000: only £30.00

LC-Display

Small alphanumeric add-in display. Use for cash registers, display machines states or a thousand other applications. Connects to user port.

81000, 2x16 characters: £150.00
81001, 2x40 characters: £200.00

Ask your Dealer for other great products. If you cannot get a product locally we shall be pleased to deliver to you.

International Distributers:
Belgien: Brother 24651946, Info Univers 52210384 * Finnland: Fredex 80324044 * France: Neol 88623752 * Germany: Wiesemann&Theis 0202505077 * Island: Thor 3541681500 Italy: Matem 457580309 * Netherlands: D&P 23310153 * Austria: Zahrer 222347671 Schweden: UG 34053400 * Switzerland: Weber 19302008 * USA: Tectrans 8182853121

FCC SYSTEMS LIMITED

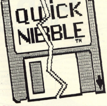
THE OLD ARMOURY
COURT BARTON
CREWKERNE
SOMERSET
TA18 7HP

TEL: CREWKERNE (0460) 73442
PRESTEL MAILBOX 046073442

DEALER ENQUIRIES MOST WELCOME

COMPUTATILL LT

77-79 Chadderton Way, Oldham, OL9 6DH. Tel: 061-652 8006
SOLE U.K. DISTRIBUTOR FOR THE FOLLOWING PRODUCTS

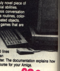


DISC BACK-UP UTILITY £39.95

AMIGA WORLD

SUBSCRIPTIONS AVAILABLE AIRMAIL SPEED AT SURFACE MAIL COST. £27.00 p.a.

> *"Very highly recommended by me is* **Conversation With A Computer,** *from Jenday Software, a set of games and conversation written in Amiga™ Basic, and shipped with the source code provided. It is entertaining, amusing, thought provoking, and just plain fun. If you have any interest in programming in BASIC on the Amiga this is a* **must have** *for the examples."*
> —MATTHEW LEEDS
> *Commodore Microcomputers*



Conversation With A Computer is a truly novel piece of software that really shows off Amiga's special abilities. You'll carry on an entertaining voice-synthesis conversation with your computer. There are wild graphics routines, colorful screen displays, sound effects and animated objects. Amiga will challenge you to three separate games that are guaranteed to pickle your brain. NOW INCLUDES AN INTRODUCTION TO THE C LANGUAGE!

SOURCE CODE

Conversation With A Computer is 2,000 lines of Microsoft's amazing Amiga Basic. You can list the Source code on your screen or printer. The documentation explains how it all works. It's a complete programming course for your Amiga.

£29.95

Prices include V.A.T. & postage

Please make cheques, P.O.'s & M.O.'s payable to COMPUTATILL LTD.
Trade Enquiries Invited

Cut-Price Disks—Lowest Yet!

from only £14.99 for 25 disks delivered to your door

Cash 'n Carry prices on disks from Direct Disk Supplies

Offer 1—5.25" 'Universal' HIgrade disks

to suit all drives SSSD, SSDD, SSDD, DSDD & DSQD 48 or 96tpi (40/80)

Disks are packed in 25's, complete with envelopes, label sets and write protect tabs. Nothing wasted on fancy brand names, just plain good value you can rely on!

£ 14.99	25 disks
£ 26.99	50 disks
£ 49.99	100 disks
£ 96.99	200 disks
£119.99	250 disks
£219.99	500 disks

- ★ Full spec HIgrade disks, made to 60% clipping level
- ★ Life-time no quibble warranty
- ★ Hub-rings on 5.25" disks
- ★ Label sets & envelopes included
- ★ No extras – VAT & delivery included.

ALL PRICES INCLUDE VAT
& DELIVERY TO YOUR DOOR! –
NO HIDDEN EXTRAS

Coloured 'Universal' disks at lowest prices!

HIgrade Rainbow Coloured disks Offer 2

Use coloured disks to code your files. Buy our rainbow pack of 5 different coloured 'Universal' disks. Without doubt the best value in quality and price.

£ 18.99	25 disks
£ 35.99	50 disks
£ 69.99	100 disks
£129.99	200 disks
£149.99	250 disks
£279.99	500 disks

3.5" HIgrade disks

(single or double sided 135tpi)
Life-time Warranty & fully certified

Offer 3

Single sided	or Double sided	Qty
£ 39.99	£ 49.99	25 disks
£ 75.99	£ 85.99	50 disks
£139.99	£159.99	100 disks
£259.99	£299.99	200 disks
£319.99	£365.99	250 disks

Same day despatch – at no extra cost

Offer 4 *Save money by using both sides*

Reversible Media Life

floppy disks complete with 2 notches and two index holes. Again, packed in complete sets of 25 disks.

£ 18.99	25 disks
£ 35.99	50 disks
£ 69.99	100 disks
£129.99	200 disks
£149.99	250 disks
£279.99	500 disks

Direct Prices for Printer Ribbons

Offer 5

Top quality British printer ribbons in 6 packs

Printer	Group	6	12	24
Brother HR15/25/35	696SC	£14.53	£25.51	£42.75
Brother HR15/25/35	696MS	£23.11	£39.58	£67.10
Cannon PW1080A	223	£24.43	£42.71	£72.56
Diablo Hytype II	567MS	£14.08	£24.71	£41.51
Epson LX80	454	£16.50	£29.95	£49.97
Epson FX/MX/RX80	273	£23.39	£39.99	£67.93
Epson FX/MX/RX100	320	£33.23	£56.93	£96.31
Juki 6100	561SS	£11.43	£19.98	£29.84
Juki 6100	562MS	£18.33	£29.64	£54.54
Ricoh 1300/1600	691MS	£17.07	£29.92	£50.40
Shinwa CP80	698MS	£27.25	£46.75	£79.38

MS = Multistrike
SC = Standard Correctable
SS = Single Strike

Ribbons available for most other printers. Please ask

BOX CLEVER!

Cheapest Storage Boxes

Offer 6

Library Boxes — 10 disks		
Vision-10 etc (clear front)	£ 8.99	6 boxes
SEE-10 (Strongest Box!)	£12.99	6 boxes
Lockable Boxes — smoked perspex top		
5.25" 50 disk	£10.99	
5.25" 100 disk	£13.99	
3.5" 40 disk	£10.99	
3.5" 80 disk	£13.99	

Offer 7

3M—The BRAND leaders

at CASH 'N CARRY prices

If it's quality, reliability and security then it's 3M. Direct Disk Supplies always give the best price. In fact it's so special that the minimum quantity is 20 disks.

SSDD-48tpi	744	20 disks	£24.99
DSDD-48tpi	745	20 disks	£28.99
DSDD-96tpi	747	20 disks	£35.99

Remember VAT & Delivery are included – No extras from DDS

How to Order

1. DIAL-A-DISK on 01-979 7811, and give your ACCESS or VISA number and expiry date.
2. Send your cheque etc. to Direct Disk Supplies Ltd.
3. Official Orders. Bona-fide orders from Universities, Colleges, Schools, Charities, etc. are very welcome.

Access VISA

DIAL-A-DISK
Order Hotline
☎ 01-979 7811
Answering service for out of hours orders

Direct Disk Supplies Ltd.

Dept AB, FREEPOST, 129 High Street, Hampton Hill, Middlesex TW12 1BR

Cribbage

If you've ever played cribbage then you'll know just what an addictive game it is and if you haven't then try our Plus/4 version of the game

By Hugh McGhee

Crib is one of the most popular pub card games in this country, but have you ever considered trying to beat your computer instead of battling against the champ down at your local? Now's your chance, if you've got a Plus/4.

Instructions

It is assumed that the player knows how to play cribbage. The rules are exactly those given in *Hoyle's Rules of Games*. Since some aspects of scoring points very from region to region, the points scored in this version will be reiterated in this introduction. The following points should thus be noted.

1) Due to the layout of the cards X is used to represent a 10.

2) Input is handled by means of a joystick in port two. When asked to play or discard a card, simply move the marker which appears above the cards to the required position and press the fire button. When entering your points,moving the joystick < right > and < left > increases and decreases the points counter respectively. Once again pressing fire enters your response. The program is protected against attempts to discard or play the same card twice. Attempts to claim too many points produce an error message. The Plus/4 always claims the correct number of points for itself but, if you don't claim all your points, the Plus/4 will steal them.

3) Each player is dealt six cards and must discard two cards into the crib. The Plus/4 plays a simple strategy choosing its best four cards after consideration of the two cards it is discarding. The cards are shuffled after every hand but only cards are shuffled out of the pack to save time. The program differentiates between dealer and non-dealer. The player who doesn't have the crib always receives the first card.

4) The Plus/4 cuts the cards for the initial crib. The lowest card wins. Note that in this game the ace always counts as one. Illegal combinations are not allowed so two aces of spades, for example, will not be displayed. Ties however, such as both players cutting a two of different suits, are permitted, in which case the cut will be performed again.

5) The first player to obtain 121 points or more wins.

6) Note that in the run up the Plus/4 will check your cards if you say you can't go. This is the only time the Plus/4 examines your cards but it does not cheat. Any discovery of an ability to play after entering 'can't go' will produce an error message, as will an attempt to play a card that would result in a total excess of 31. The Plus/4 does not play a strategy in the run up except that it will always make the total 31 if it can. It will not, however, always make the total 15 even if it can.

7) The ending of a go in the run up has proved the most tricky operation in practice. If the player plays last the Plus/4 does not know that the player cannot go unless the total is 31 or the last card has been played. Otherwise the player must enter 'can't go' before entering the last point.

Points are scored as follows:

A) Two points for any pairs, six points for three cards of a kind and 12 points for four cards of a kind.
B) Two points for any combination of cards totalling 15, counting picture cards as 10.
C) For any run of three or more cards, count one point for each card in the run.
D) For obtaining a total of 15 or 31 in the run up, score two points.
E) For playing the last card in any go in the run up, score one point.
F) For a flush of four cards in your hand, score four points. Note there are no points for a flush or four in the crib.
G) For a flush of five, either in your hand or in the crib, score five points.
H) If the starter card is a jack, and it is your crib, add two points when counting your hand in the main game.
I) If you have a jack either in your hand or in the crib of the same suit as the starter card, count one point.

8) The game is played on the high resolution screen to facilitate the different background colours.

Variables

The array CA$(m,n) has four rows and

14 columns. Columns one to 13 hold hold the denominations of the cards from ace through to king. The zero element of each row holds the suit for that row. The suits are, in order, spades, hearts, clubs and diamonds.

The 13 cards shuffled out of the pack for each hand are placed in the SD$(m,n) array. This has two rows of 13 columns, row zero holding the denomination of the cards and row one their respective suits.

The array C$(m,n) has four rows and six columns. This holds the initial six cards dealt to each player. The Plus/4's denominations and suits are in rows zero and one respectively, the denominations and suits of the player's cards are in rows two and three respectively.

The array F$(m,n) is used after the discard has taken place. It has six rows of five columns and is the major card array used in the game. The first four elements in rows zero, two and four hold the denominations of the four cards in the Plus/4's hand, player's hand and the crib respectively. The associated suits are stored in the first four elements of rows one, three and five. At the commencement of the main game the fifth element of each relevant row will be occupied by the denomination and suit of the starter card, which is used by all hand.

The face values for the deck of cards are stored in the array P%(m,n) row zero holding the values one (for the ace) to 13 (for the king), whereas row one holds the values one to 10 (for the purpose of counting 15s).

The respective values of the shuffled cards are placed in the array S%(m,n) after shuffling. The values are transfered to C%(m,n) after dealing the cards and are finally stored in the V%(m,n) array after the discard. The arrays S%(m,n) and V%(m,n) have exactly the same format as the S$(m,n) and F$(m,n) arrays described above.

The array R%(m,n) is used by the sorting routine for run checks. The unsorted cards are placed in row one and after transfer by the sorting routine into row zero. That row is sorted into ascending order.

The arrays M%(m) and Y%(m) are row vectors each containing four elements. These arrays are used in the run up, and, a non-zero element indicates a played card. As is general in this program, any variable prefixed by the letter M indicates a value used by the Plus/4, whereas variables associated with the player are prefixed with a Y.

The major scalar variables are as follows:

MP—	Plus/4's points
YP—	Player's points
TP—	Used in run up to indicate number of cards played in the current go.
T—	Used in total the points in the points count routine. Also used in the run up to hold the total face values in the current go.
PO—	Used in the main game to hold the total points count being the sum of T above and the result of checks for flushes, jacks etc. Also used to hold points scored in the run up as T is otherwise engaged.
ML—	Flag used to indicate who played the current card in the run up. If ML is one then the PLus/4 played last, and if ML equals two the player did.
IC—	Flag used in the run up to indicate whether or not the Plus/4 can play a card. The Plus/4 is able to play a card whilst IC is equal to one and unable to go if equal to zero.
YC—	Serves the same purpose as IC for the player.
MG, YG—	These two variables hold the number of cards played in the run up by the Plus/4 and the player respectively.
WC—	Signifies who holds the crib. If set to one then the Plus/4 has the crib and if set to two the player has the crib.

PROGRAM: CRIBBAGE

```
1000 DEF FNA(Z)=INT(RND(1)*Z)+1
1010 GOSUB3360:GOSUB4390
1020 GOSUB3710:GOSUB3470
1030 DO
1040 :GOSUB3770
1050 :GOSUB4060:GOSUB3860:GOSUB1
900
1060 :IFMP>120ORYP>120THEN1080
1070 :GOSUB1100:GOSUB3470
1080 LOOPUNTILMP>120ORYP>120
1090 GOTO4530
1100 TP=4:R=2:W=9:Q$=SD$(0,12):S
$=SD$(1,12):GOSUB2470
1110 FORA=0TO4STEP2
1120 :F$(A,4)=Q$:F$(A+1,4)=S$:V%
(A,4)=P%(0,12):V%(A+1,4)=P%(1,12
)
1130 NEXT
1140 IFWC=2THEN1210
1150 A=2:PO=0:GOSUB1320:IFYP>120
THEN1300
1160 B=40:R=18:S=24:C=0:GOSUB333
0
1170 S$="FOR ME":A=0:PO=0:GOSUB1
430:IFMP>120THEN1300
1180 A=0:W=0
1190 FORR=16TO37STEP7:S$=F$(5,A)
:Q$=F$(4,A):GOSUB2470:A=A+1:NEXT
1200 S$="IN THE CRIB FOR ME":A=4
:PO=0:GOSUB1490:WC=2:GOTO1270
1210 S$="FOR ME":A=0:PO=0:GOSUB1
440:IFMP>120THEN1300
1220 B=40:C=0:R=0:S=6:GOSUB3330
1230 A=2:PO=0:GOSUB1310:IFYP>120
THEN1300
1240 A=0:W=18
1250 FORR=16TO37STEP7:S$=F$(5,A)
:Q$=F$(4,A):GOSUB2470:A=A+1:NEXT
1260 EP=9:A=4:PO=0:GOSUB1370:WC=
1
1270 IFWC=1THENR=18:S=24:ELSER=0
:S=6
1280 B=40:C=0:GOSUB3330:B=14:R=9
:S=9:GOSUB3330
1290 B=5:R=10:S=14:GOSUB3330:B=1
6:R=15:S=R:GOSUB3330
1300 RETURN
1310 IFF$(A,4)="J"THENPO=PO+2
1320 B=1:Q$=F$(A+1,0)
1330 FORC=1TO4
1340 IFF$(A+1,C)=Q$THENB=B+1
1350 NEXT
1360 IFB=4ANDF$(A+1,4)<>Q$THENPO
=PO+4:ELSEIFB=5THENPO=PO+5
1370 FORB=0TO3
1380 IFF$(A,B)="J"ANDF$(A+1,B)=F
$(A+1,4)THENPO=PO+1:B=4
1390 NEXT
1400 FORB=0TO4:R%(0,B)=V%(A,B):R
%(1,B)=V%(A+1,B):NEXT
1410 GOSUB1600
1420 PO=PO+T:GOTO2710
1430 IFF$(0,4)="J"THENPO=PO+2
1440 B=1:Q$=F$(A+1,0)
1450 FORC=1TO4
1460 IFF$(A,C)=Q$THENB=B+1
1470 NEXT
1480 IFB=4ANDF$(A+1,4)<>Q$THENPO
=PO+4:ELSEIFB=5THENPO=PO+5
1490 FORB=0TO3
1500 IFF$(A,B)="J"ANDF$(A+1,B)=F
$(A+1,4)THENPO=PO+1
1510 NEXT
1520 FORB=0TO4:R%(0,B)=V%(A,B):R
%(1,B)=V%(A+1,B):NEXT
1530 GOSUB1600:PO=PO+T
1540 IFPO=0THENQ$="NO POINTS "+S
$:GOTO1560
1550 Q$=STR$(PO):IFPO>1THENQ$=Q$
+" POINTS "+S$:ELSEQ$=Q$+" POINT
 "+S$
1560 CHAR,7,12,Q$
1570 FORA=1TO2000:NEXT
1580 IFPO>0THENSOUND1,930,18:MP=
MP+PO:R=36:S=9:P=MP:GOSUB3350
1590 B=29:R=12:S=R:C=7:GOSUB3330
:RETURN
1600 B=0:GOSUB3240:T=0:A=1
1610 FORB=0TO3:IFR%(0,B)+1=R%(0,
B+1)THENA=A+1:NEXT
1620 IFA=5THENT=5:GOTO1750
1630 IFR%(0,0)+1=R%(0,1)ANDR%(0,
1)+1=R%(0,2)ANDR%(0,2)+1=R%(0,3)
THENT=T+4
1640 IFR%(0,0)+1=R%(0,1)ANDR%(0,
1)+1=R%(0,2)ANDR%(0,2)+1=R%(0,4)
THENT=T+4
1650 IFR%(0,0)+1=R%(0,1)ANDR%(0,
1)+1=R%(0,3)ANDR%(0,3)+1=R%(0,4)
THENT=T+4
1660 IFR%(0,0)+1=R%(0,2)ANDR%(0,
2)+1=R%(0,3)ANDR%(0,3)+1=R%(0,4)
THENT=T+4
1670 IFR%(0,1)+1=R%(0,2)ANDR%(0,
2)+1=R%(0,3)ANDR%(0,3)+1=R%(0,4)
THENT=T+4
1680 IFT=4THEN1750:ELSEIFT>4THEN
1720
1690 FORB=0TOTP-2:FORC=B+1TOTP-1
:FORD=C+1TOTP
1700 IFR%(0,B)+1=R%(0,C)ANDR%(0,
C)+1=R%(0,D)THENT=T+3
1710 NEXTD,C,B
1720 FORA=0TOTP-1:FORB=A+1TOTP
1730 IFR%(0,A)=R%(0,B)THENT=T+2
1740 NEXTB,A
1750 A=0
1760 FORB=0TOTP:A=A+R%(1,B):NEXT
1770 IFA=15THENT=T+2:GOTO1890:EL
SEIFA<15THEN1890
1780 IFTP<4THEN1830
1790 FORA=0TO1:FORB=A+1TO2
1800 FORC=B+1TO3:FORD=C+1TO4
1810 IFR%(1,A)+R%(1,B)+R%(1,C)+R
%(1,D)=15THENT=T+2
1820 NEXTD,C,B,A
1830 FORA=0TOTP-2:FORB=A+1TOTP-1
:FORC=B+1TOTP
1840 IFR%(1,A)+R%(1,B)+R%(1,C)=1
5THENT=T+2
1850 NEXTC,B,A
1860 FORA=0TOTP-1:FORB=A+1TOTP
1870 IFR%(1,A)+R%(1,B)=15THENT=T
+2
1880 NEXTB,A
1890 RETURN
1900 CHAR,10,12,"           RUN UP.
..":FORA=1TO1645:NEXT:CHAR,18,12
,"        "
1910 CHAR,30,12,"TOTAL:"
1920 EP=0:T=0:MG=0:YG=0:IC=1:YC=
1:TP=0:ML=WC
1930 R=37:S=12:P=T:GOSUB 3350:C=
0
1940 R=18:S=R:Q$="[c A][s C][s C
][c S]":GOSUB3340:R=19:S=21:Q$="
[s B]  [s B]":GOSUB3340
1950 R=22:S=R:Q$="[c Z][s C][s C
][c X]":GOSUB3340:R=1:S=20:P=0:G
OSUB3350
1960 R=23:S=R:Q$="PTS.":GOSUB334
0:C=6:R=18:S=R:Q$="CAN'T":GOSUB3
340
1970 C=7:R=19:S=R:Q$="GO":GOSUB3
340
1980 DO
1990 PO=0
2000 IFML=1ANDYC=1THENGOSUB2540:
GOTO2060
2010 IFML=2ANDIC=1THENGOSUB2120:
GOTO2060
2020 IFML=1ANDYC=0ANDIC=1THENGOS
UB2120:GOTO2060
2030 IFML=2ANDIC=0ANDYC=1THENGOS
UB2540:GOTO2060
```

```
2040 IFIC=0ANDYC=0ANDEP=0THENPO=
1:ONMLGOSUB2260,2710
2050 EP=0:T=0:TP=0:IC=1:YC=1:CHA
R,37,12,"  ":P=T:R=37:S=12:GOSUB
 3350
2060 LOOPUNTILMG+YG=8ORMP>120ORY
P>120
2070 C=6:R=18:S=19:B=5:GOSUB3330
2080 C=16:R=7:S=7:B=23:GOSUB3330
2090 R=16:S=R:GOSUB3330
2100 B=32:C=7:R=12:S=R:GOSUB3330
2110 RETURN
2120 IFMG=4THEN2450
2130 IFT>4ANDT<15THEN2310:ELSEIF
T>20THEN2360
2140 DO:A=FNA(4)-1:LOOPUNTILM%(A
)=0
2150 W=0:S$=F$(1,A):Q$=F$(0,A)
2160 R=(A+2)*5+(A*2)+6:GOSUB2470
:S=7:P=MG+1:GOSUB3350
2170 TP=TP+1:MG=MG+1:M%(A)=1
2180 T=T+V%(1,A):R=37:S=12:P=T:G
OSUB3350
2190 R%(1,TP)=V%(0,A)
2200 ML=1
2210 IFMG+YG=8OR(MG=4ANDYC=0)THE
NPO=PO+1:IC=0:YC=0:EP=1
2220 IFT=15THENPO=PO+2
2230 IFT=31THENPO=2:IC=0:YC=0:EP
=1
2240 IFTP>1THENGOSUB2970:ELSEIFP
O=0THEN2290
2250 IFPO=0THENCHAR,8,12,"NO POI
NTS FOR ME":GOTO2290
2260 IFPO>0THENSOUND1,930,18:MP=
MP+PO:P=MP:R=36:S=9:GOSUB3350
2270 Q$=STR$(PO):IFPO=1THENQ$=Q$
+" POINT FOR ME":ELSEQ$=Q$+" POI
NTS FOR ME"
2280 CHAR,7,12,Q$
2290 FORA=1TO1645:NEXT
2300 RETURN
2310 A=5:B=3
2320 DOWHILEB>=0
2330 IFT+V%(1,B)=15ANDM%(B)=0THE
NA=B:EXIT:ELSEB=B-1
2340 LOOP
2350 IFA<5ANDRND(1)>.5THEN2150:E
LSE2140
2360 A=5:B=0:C=5
2370 DOWHILEB<4
2380 IFT+V%(1,B)=31ANDM%(B)=0THE
NA=B:EXIT
2390 IFT+V%(1,B)<32ANDM%(B)=0THE
NC=B
2400 B=B+1
2410 LOOP
2420 IFA<5THEN2150:ELSEIFC<5THEN
A=C:GOTO2150
2430 CHAR,8,12,"I CAN'T GO
"
2440 FORA=1TO1645:NEXT
2450 IC=0:IFYC=0ANDML=1ANDEP=0TH
ENPO=1:EP=1:GOTO2260
2460 RETURN
2470 COLOR0,2
2480 CHAR,R-2,W,"[s O][c Y][c Y]
[c Y][s P]":CHAR,R-2,W+6,"[s L][
c P][c P][c P][s @]"
2490 FORY=W+1TOW+5:CHAR,R-2,Y,"[
c H]    [c N]":NEXT
2500 IFS$="[s S]"ORS$="[s Z]"THE
NCOLOR1,3,5
2510 CHAR,R-1,W+1,S$:CHAR,R+1,W+
5,S$:CHAR,R,W+3,Q$
2520 IFS$="[s S]"ORS$="[s Z]"THE
NCOLOR1,1
2530 COLOR0,6,5:RETURN
2540 IFYG=4THEN2950
2550 CHAR,8,12,"YOU TO PLAY
"
```

```
2560 Q$="V":X=9:Y=17:C=9:D=37:S=
7
2570 GOSUB4630:IFX=9THEN2900:ELS
EC=(X-2)/7-2
2580 IFY%(C)<>0THEN2890
2590 IFT+V%(3,C)>31THEN2880
2600 R=X:S=16:P=YG+1:GOSUB3350
2610 TP=TP+1:Y%(C)=1:YG=YG+1
2620 R%(1,TP)=V%(2,C)
2630 T=T+V%(3,C):R=37:S=12:P=T:G
OSUB3350
2640 ML=2
2650 IFYG+MG=8OR(YG=4ANDIC=0)THE
NPO=PO+1:EP=1
2660 IFT=15THENPO=PO+2
2670 IFT=31THENPO=2:IC=0:YC=0:EP
=1
2680 IFTP>1THENGOSUB2970
2690 IFTP>1ORPO>0THENGOSUB2710
2700 RETURN
2710 CHAR,8,12,"ENTER NO. OF POI
NTS ":IFEP=9THENCHAR,28,12,"IN C
RIB"
2720 F=99:R=1:S=20:P=0:GOSUB4630
:F=0
2730 CHAR,8,12,"
  ":IFEP=9THENCHAR,28,12,"
  "
2740 IFP=POTHEN2830:ELSEIFP>POTH
EN2820
2750 R=PO-P:Q$="I CLAIM"+STR$(R)
+" ":IFR>1THENQ$=Q$+"POINTS":ELS
EQ$=Q$+"POINT"
2760 CHAR,8,12,Q$
2770 FORA=1TO1645:NEXT
2780 CHAR,8,12,"
  "
2790 YP=YP+P:MP=MP+R
2800 P=MP:R=36:S=9:GOSUB3350:SOU
ND1,930,18:IFMP>120THENYP=0:RETU
RN
2810 GOTO2840
2820 CHAR,8,12,"I MAKE IT LESS!"
:SOUND1,20,70:FORA=1TO1645:NEXT:
GOTO2710
2830 YP=YP+PO
2840 IFPO>0THENSOUND1,930,18:R=3
6:S=15:P=YP:GOSUB3350
2850 FORA=1TO500:NEXT
2860 CHAR,1,20,"0 "
2870 RETURN
2880 CHAR,8,12,"TOTAL OVER 31!":
FORA=1TO1645:NEXT:GOTO2550
2890 CHAR,8,12,"THAT'S CHEATING!
!":FORA=1TO1645:NEXT:GOTO2550
2900 A=0:B=5:DOWHILEA<4
2910 IFY%(A)=0ANDT+V%(3,A)<32THE
NB=A:EXIT:ELSEA=A+1
2920 LOOP
2930 IFB=5THEN2950
2940 CHAR,8,12,"OH YES YOU CAN!!
":FORA=1TO1645:NEXT:GOTO2550
2950 YC=0:IFIC=0ANDML=2ANDEP=0TH
ENPO=1:EP=1:GOTO2710
2960 RETURN
2970 IFTP=2THEN3140
2980 B=1:GOSUB3230:L=0:D=1
2990 FORC=BTOTP-1
3000 IFR%(0,C)+1<>R%(0,C+1)ANDR%
(0,C)<>R%(0,C+1)THEND=1:GOTO3030
3010 IFR%(0,C)<>R%(0,C+1)THEND=D
+1
3020 IFD>2THENL=D
3030 NEXT
3040 IFL=TPTHEND=L:GOTO3130
3050 IFL=0THEN3140
3060 DO
3070 B=TP-L+1:GOSUB3230:D=1
3080 FORC=BTOTP-1
3090 IFR%(0,C)+1=R%(0,C+1)THEND=
D+1
```

```
3100 NEXT
3110 IFD>2ANDD<>LTHENL=D:GOTO307
0
3120 LOOPUNTILD<3ORD=LORB>TP-2
3130 IFD=LTHENPO=PO+L:RETURN
3140 L=1:C=TP:B=TP-1
3150 DO
3160 IFR%(1,B)=R%(1,C)THENL=L+1:
B=B-1
3170 LOOPUNTILB<1ORB<TP-3ORR%(1,
B)<>R%(1,C)
3180 IFL=1THEN3220
3190 IFL=2THENPO=PO+2
3200 IFL=3THENPO=PO+6
3210 IFL=4THENPO=PO+12
3220 RETURN
3230 FORC=BTOTP:R%(0,C)=R%(1,C):
NEXT
3240 DO
3250 D=0
3260 FORC=BTOTP-1
3270 IFR%(0,C)<=R%(0,C+1)THEN330
0
3280 R=R%(0,C):R%(0,C)=R%(0,C+1)
3290 R%(0,C+1)=R:D=D+1
3300 NEXTC
3310 LOOPUNTILD=0
3320 RETURN
3330 Q$="":FORA=1TOB:Q$=Q$+" ":N
EXT
3340 FORA=RTOS:CHAR,C,A,Q$:NEXT:
RETURN
3350 CHAR,R,S,RIGHT$(STR$(P),LEN
(STR$(P))-1):RETURN
3360 DIM F$(5,4),C$(3,5),C%(3,5)
,R%(1,8),M%(3),Y%(3)
3370 DIM V%(5,4),CA$(3,13),SD$(1
,12),P%(1,12):VOL7
3380 CA$(0,0)="[s A]":CA$(1,0)="
[s S]"
3390 CA$(2,0)="[s X]":CA$(3,0)="
[s Z]"
3400 FORA=0TO3
3410 RESTORE4870
3420 FORB=1TO13
3430 READCA$(A,B)
3440 NEXTB,A
3450 FORA=0TO3:Y%(A)=0:M%(A)=0:N
EXT
3460 RETURN
3470 FORC=0TO12
3480 DO:A=INT(RND(1)*4):B=INT(RN
D(1)*13)+1:LOOPUNTILCA$(A,B)<>""
3490 SD$(0,C)=CA$(A,B):SD$(1,C)=
CA$(A,0)
3500 IFB<10THENP%(1,C)=B:ELSEP%(
1,C)=10
3510 P%(0,C)=B:CA$(A,B)=""
3520 NEXT
3530 GOSUB3400:A=0
3540 IFWC=1THEN3630
3550 FORC=0TO10STEP2
3560 C$(0,A)=SD$(0,C):C$(1,A)=SD
$(1,C)
3570 C%(0,A)=P%(0,C):C%(1,A)=P%(
1,C)
3580 C$(2,A)=SD$(0,C+1):C$(3,A)=
SD$(1,C+1)
3590 C%(2,A)=P%(0,C+1):C%(3,A)=P
%(1,C+1)
3600 A=A+1
3610 NEXT
3620 GOTO3700
3630 FORC=0TO10STEP2
3640 C$(2,A)=SD$(0,C):C$(3,A)=SD
$(1,C)
3650 C%(2,A)=P%(0,C):C%(3,A)=P%(
1,C)
3660 C$(0,A)=SD$(0,C+1):C$(1,A)=
SD$(1,C+1)
3670 C%(0,A)=P%(0,C+1):C%(1,A)=P
%(1,C+1)
3680 A=A+1
3690 NEXT
3700 RETURN
3710 CHAR,6,10,"[c A][s *][s *][
s *][s *][s *][s *][s *][s *][s
*][s *][s *][s *][s *][s *][s *]
[s *][s *][s *][s *][s *][s *][s
 *][s *][s *][s *][s *][s *][s *
][s *][s *][s *][s *][c S]"
3720 FORY=11TO13:CHAR,6,Y,"[s B]

[s B]":NEXT
3730 CHAR,6,14,"[c Z][s *][s *][
s *][s *][s *][s *][s *][s *][s
*][s *][s *][s *][s *][s *][s *]
[s *][s *][s *][s *][s *][s *][s
 *][s *][s *][s *][s *][s *][s *
][s *][s *][s *][s *][c X]"
3740 CHAR,31,9,"ME :"+STR$(MP)
3750 CHAR,30,15,"YOU :"+STR$(YP)
3760 RETURN
3770 A=0:W=18
3780 FORR=2TO37STEP7
3790 Q$=C$(2,A):S$=C$(3,A):GOSUB
2470
3800 FORY=0TO6:CHAR,R-2,Y,"[c +]
[c +][c +][c +][c +]":NEXT
3810 A=A+1
3820 NEXT
3830 FORY=9TO15:CHAR,0,Y,"[c +][
c +][c +][c +][c +]":NEXT
3840 IFWC=1THENCHAR,7,9,"MY CRIB
":ELSECHAR,7,15,"YOUR CRIB"
3850 RETURN
3860 CHAR,10,12,"DISCARD TWO CAR
DS        ":L=0:P=2
3870 Q$="V":X=2:Y=17:C=2:D=37:S=
7
3880 GOSUB4630:C=(X-2)/7
3890 IFC$(2,C)<>""THEN3920
3900 SOUND1,20,70:CHAR,8,12,"YOU
 CAN'T DISCARD IT TWICE"
3910 FORR=1TO1645:NEXT:CHAR,8,12
,"                          ":GO
TO3870
3920 F$(4,P)=C$(2,C):F$(5,P)=C$(
3,C):C$(2,C)="":SOUND 1,930,12
3930 V%(4,P)=C%(2,C):V%(5,P)=C%(
3,C)
3940 L=L+1:P=P+1:IFL<2THEN3870
3950 A=0
3960 FORB=0TO5
3970 IFC$(2,B)=""THEN4010
3980 F$(2,A)=C$(2,B):F$(3,A)=C$(
3,B)
3990 V%(2,A)=C%(2,B):V%(3,A)=C%(
3,B)
4000 A=A+1
4010 NEXT
4020 B=14:R=18:S=24:C=0:GOSUB333
0:W=18:A=0
4030 IFC$(2,0)=""ANDC$(2,1)=""TH
EN4050
4040 FORR=16TO37STEP7:Q$=F$(2,A)
:S$=F$(3,A):GOSUB2470:A=A+1:NEXT
4050 RETURN
4060 CHAR,10,12,"PLEASE WAIT I'M
 THINKING"
4070 B=0:TP=3:BT=0
4080 FORX=0TO2:FORY=X+1TO3
4090 FORP=Y+1TO4:FORL=P+1TO5
4100 R%(0,0)=C%(0,X):R%(0,1)=C%(
0,Y):R%(0,2)=C%(0,P):R%(0,3)=C%(
0,L)
4110 R%(1,0)=C%(1,X):R%(1,1)=C%(
1,Y):R%(1,2)=C%(1,P):R%(1,3)=C%(
1,L)
4120 GOSUB3240
4130 IFR%(0,0)+1=R%(0,1)ANDR%(0,
1)+1=R%(0,2)ANDR%(0,2)+1=R%(0,3)
THENT=4:ELSET=0
4140 IFT>0THENGOSUB1750:ELSEGOSU
B1690
4150 F=0:MG=1:FORPO=0TO5
4160 IFPO=XORPO=YORPO=PORPO=LTHE
N4180
4170 IFMG=1THENR=PO:MG=2:ELSES=P
O
4180 NEXTPO
4190 IFC%(0,R)=C%(0,S)THENF=2:GO
TO4230
4200 IFABS(C%(0,R)-C%(0,S))<3THE
NF=1
4210 IFC%(1,R)+C%(1,S)=15THENF=F
+2
4220 IFC%(1,R)+C%(1,S)=5THENF=F+
1
4230 IFWC=1THENT=T+F:ELSET=T-F
4240 IFT>BTTHENBT=T:POKE208,R:PO
KE209,S
4250 NEXTL,P,Y,X
4260 IFBT=0THENR=0:S=1:ELSER=PEE
K(208):S=PEEK(209)
4270 F$(4,0)=C$(0,R):F$(5,0)=C$(
1,R)
4280 F$(4,1)=C$(0,S):F$(5,1)=C$(
1,S)
4290 V%(4,0)=C%(0,R):V%(5,0)=C%(
1,R)
4300 V%(4,1)=C%(0,S):V%(5,1)=C%(
1,S)
4310 A=0:FORB=0TO5
4320 IFB=RORB=STHEN4360
4330 F$(0,A)=C$(0,B):F$(1,A)=C$(
1,B)
4340 V%(0,A)=C%(0,B):V%(1,A)=C%(
1,B)
4350 A=A+1
4360 NEXT
4370 B=13:C=0:R=0:S=6:GOSUB3330
4380 RETURN
4390 A=RND(-TI):COLOR4,6,5:COLOR
0,6,5:COLOR1,1
4400 Q$="CUT FOR CRIB":GRAPHIC 1
:SCNCLR
4410 CHAR,1,1,Q$:CHAR,28,1,Q$
4420 CHAR,1,23,Q$:CHAR,28,23,Q$
4430 CHAR,19,1,"ME":CHAR,19,23,"
YOU"
4440 DO:A=INT(RND(1)*4):B=INT(RN
D(1)*13)+1
4450 :C=INT(RND(1)*4):D=INT(RND(
1)*13)+1:LOOPUNTILA<>CORB<>D
4460 R=20:W=4:Q$=CA$(A,B):S$=CA$
(A,0):GOSUB2470
4470 W=14:Q$=CA$(C,D):S$=CA$(C,0
):GOSUB2470
4480 IFB<DTHEN4500:ELSEIFB>DTHEN
4510
4490 CHAR,19,12,"TIE":FORA=1TO30
00:NEXT:CHAR,19,12,"   ":GOTO444
0
4500 CHAR,17,12,"MY CRIB":WC=1:G
OTO4520
4510 CHAR,16,12,"YOUR CRIB":WC=2
4520 GOSUB4720:SCNCLR:RETURN
4530 COLOR0,3,1:COLOR4,3,1:COLOR
1,3,5:GRAPHIC0,1
4540 IFMP>120THENCHAR,7,6,"[130]
YOU HAVE LOST...OF COURSE![132]"
4550 IFYP>120THENCHAR,8,6,"[130]
BEATEN...AND BY A HUMAN![132]"
4560 GOSUB4720
4570 CHAR,8,12,"A N O T H E R
 G A M E ?"
4580 CHAR,8,14,"YES
     NO"
4590 Q$="[UPARROW]":X=9:Y=15:C=9
:D=32:S=23
4600 GOSUB4630
4610 IFX=9THENSOUND1,930,12:RUN
```

```
4620 SOUND1,930,12:FORA=1TO250:N
EXT:GRAPHIC0,1:NEW:END
4630 IFF<99THENCHAR,X,Y,Q$:ELSEG
OSUB3350:IFP<10THENCHAR,2,20," "
4640 DO:A=JOY(2):LOOPUNTILA=3ORA
=7ORA=128
4650 IFF<99THENCHAR,X,Y," "
4660 IFA=128THENRETURN
4670 IFA=3ANDF<99THENX=X+S:IFX>D
THENX=C
4680 IFA=7ANDF<99THENX=X-S:IFX<C
THENX=D
4690 IFA=3ANDF=99THENP=P+1:IFP>3
0THENP=0
4700 IFA=7ANDF=99THENP=P-1:IFP<0
THENP=30
4710 GOTO4630
4720 RESTORE
4730 FORA=1TO76
4740 IFA=19ORA=37THENRESTORE4800
4750 IFA=27ORA=55THENFORB=1TO30:
READC:NEXT
4760 READB,C,D:SOUND1,B,C:SOUND2
,B-2,C
4770 FORP=1TOD:NEXT
4780 NEXT
4790 RETURN
4800 DATA739,12,1,755,12,1,770,1
2,1,864,22,1,770,12,1,864,22,1,7
70,12,1,864,42
4810 DATA245,864,12,1,881,12,1,8
89,12,1,897,12,1,864,12,1,881,12
,1,897,22,1,854
4820 DATA12,1,881,22,1,864,67,1,
834,12,1,810,12,1,798,12,1,834,1
2,1,864,12,1,897
4830 DATA26,1,881,12,1,854,12,1,
834,12,1,881,52,1,864,12,1,881,1
2,1,889,12,1,897
4840 DATA12,1,864,12,1,881,12,1,
897,22,1,864,12,1,881,22,1,897,1
2,1,864,12,1,881
4850 DATA12,1,897,22,1,864,12,1,
881,22,1,897,12,1,864,12,1,881,1
2,1,897,22,1
4860 DATA854,12,1,881,22,1,864,9
8,1645
4870 DATAA,2,3,4,5,6,7,8,9,X,J,Q
,K

READY.
```

MICROSNIPS LTD
37 SEAVIEW ROAD,
WALLASEY, MERSEYSIDE
L45 4QN 051-630 3013

C64C Connoisseur Pack	£234.95
C128D inc DS 1571 Drive	£499.95
C128D inc 1900M Monitor	£625.00
1571 Drive for 128	£269.95
1541C Drive 64/128	£199.95
1901C Hi-Res Col-Monitor	£339.95
1900M Mono Monitor (128)	£149.95
Thomson/C64 Colour Monitor	£239.95
Music Expansion System	£139.95
Sound Sampler C64/128	£29.95
C64/128 Motherboard	£19.95
Action Replay	£24.95
Freeze Frame III B	£39.95
Expert Cartridge	£31.50
Citizen 2 colour C64/128 Printer	£44.50
Silver Reed Daisywheel inc C64/128 Connexion	£139.95
Citizen 120D Printer inc Commodore Interface	£299.95
MPS801 Ribbon	£6.99
MPS803 Ribbon	£3.99
120D Ribbons	£3.99
1000 Sheets Fanfold	£8.99
2000 Sheets Fanfold	£15.99
5¼" Lockable Disk Box (Holds 100)	£10.95
Disk Nibbler	£4.99
C64/128 Printer Lead	£3.99
Centronics Lead + Software	£19.95
1701/1901 Dust Cover	£8.95
C64/VIC Dust Cover	£5.99
C128 Dust Cover	£7.99
Dolphin DOS (Specify 68 or 128)	£68.50

Wide range of leads, cables, software and accessories.
SEND FOR FULL LIST QUOTING YOUR COMMODORE

ORDER BY PHONE WITH CREDIT CHARGE

if it's released — we stock it — please phone us
OPEN SIX DAYS

MAIL ORDER Cheques/P.O. payable to: **MICROSNIPS**
(Overseas-Quote) UK-add 5p in £ postage
(24 hour Ansaphone)

I.C.P.U.G.

the Independent Commodore Products Users Group

is the largest and most friendly Computer Club in the country.

- Over 70 local groups with regular meetings
- Superb Newsletter — 80 plus pages of reviews, news and information every two months
- Free Software Library
- Help and Advice
- 24 disks of public domain Amiga software (verified by ICPUG's Mike Todd) available to members on supply of disk and payment of p&p.
- Discount Scheme
- We support all Commodore Machines old and new: PET, VIC20, 64, 16, +4, 128 and Amiga . . .
- Subscription only £10 per year (U.K.)
  Joining Fee add £1.00

If you are seriously interested in using or programming any Commodore computer, then joining ICPUG is a must!

For full details, send a stamped, addressed envelope to:-

ICPUG Membership Secretary,
Jack C. Cohen,
30, Brancaster Road,
Newbury Park,
ILFORD,
Essex. IG2 7EP.

MICROCOMPUTER SUPPLIES — **OFFICIAL COMMODORE AMIGA DEALER**

COMPUTERS	
THE COMMODORE AMIGA + Full On-site maintenance	PHONE
Sidecar for Amiga	PHONE
Commodore 64C Connoisseur's Pack with NEOS Mouse	199.00
Commodore 128	207.00
Commodore 128D Built-in 1571 Disk Drive	439.00
Commodore 128D Built-in 1571 Disk Drive + Mono Mon	489.00
PRINTERS	
Citizen 560P two colour 40col Dot Matrix	43.48
Citizen 120D Dot Matrix 120cps & NLQ frict/trac	181.74
Commodore MPS1000 Dot Matrix 100cps & NLQ fric/trac	219.00
Star NL10 with C64/128 Interface 120cps & NLQ f/t	220.00
MONITORS	
Commodore 1901 14" Colour Monitor for C64/128	263.00
Philips 8533 14" Med Res Colour Mon for C128 incl lead	245.00
Philips BM7502 Green Monitor for C64/128 incl lead	72.00
MISCELLANEOUS	
Commodore 1541C Disk Drive	159.00
Commodore 1571 Disk Drive	226.00
Cent Interface for C64/128	26.04
Cent Interface for C64/128 with 8k buf & graphics	51.30
RS232 Interface for C64/128 with disk software	49.95
Commodore 64 Power Supply	23.00
Commodore 1530 Cassette Recorder	31.00
Surge Protector 13 Amp Plug (Adapter £13)	10.39
The Final Cartridge II	33.91
NEOS Mouse Cheese with cassette for C64	21.73
Horasoft 80/40 Column Switch for C128	11.26
Amiga DOS Reference Manual (NO VAT) (p&p £2)	24.95
C64 Official Programmer's Ref Guide (NO VAT) (p&p £2)	7.95
C128 Official Programmer's Ref Guide (NO VAT) (p&p £2)	21.95
Printer Ribbons	P.O.A.
SOFTWARE	
AMIGA Software	PHONE
GEOS for C64/128 - deskTop geoPaint geoWrite etc	42.61
GEOS Disk to upgrade to V1.3	7.82
GEOS Fontpack 1 with 20 Fonts	19.12
GEOS Deskpack	20.86
GEOS Writer's Workshop	30.43
Microclerk 128 Accounts/Spreadsheet/Typing/Filing	85.00
Pocket Wordstar Word Processor (CP/M)	43.00
Superbase 128 Programable Database	52.00
Superscript 128 Word Processing	64.00
Tasword 64 40/80 Column Word Processor - Tape	15.61
Tasword 64 40/80 Column Word Processor - Disk	17.35
VizaWrite 64 Word Processor on Cartridge	60.00
VizaWrite classic 128 Word Processor with Spell Check	69.00
VizaStar 128 Spreadsheet & Database	86.91
VizaStar XL4 Spreadsheet & Database for C64	59.00
VizaStar XL8 Spread & Dbase + Extra Graphics for C64	69.00
DISKS (Examples)	
5.25" SS/DD Precision (10)	7.74
5.25" DS/DD Precision (10)	8.69
3.5" DS/DD Goldstar (10)	28.00

DELIVERY: 4 day £8 Next day £12 Software & small items FREE Make cheques payable to

ADD 15% VAT TO ABOVE PRICES

DELTA PI PROCESS INTERFACE FOR COMMODORE 64/128

8 Analogue Inputs (12 bit) & 32 Digital Input/Output lines	199.00

Delta Pi Software Ltd

8 Ruswarp Lane, Whitby, N. Yorks, YO21 1ND. Tel: 0947 600065 (9am - 7pm).

Diskit 4

To continue our special series for disk users, we bring you a routine which will foil those would be hackers from stealing your thunder.

By Les Allan

How often have you written a useful utility or program routine, given it to a 'friend' only to discover at a later time that somebody else has 'gone in' and taken the credits. Annoying isn't it!

Also there are a certain number of users that take delight in corrupting software by changing the text routines etc.

This program routine provides the user with the facility to scramble code thus making the would be hacker's job that much more difficult as the scrambled code disguises any text.

Getting It In

Make sure that sufficient room exists on the disk prior to 'booting' up 'PRG.SCRAMBLER'; occasionally one extra disk block is used on the saved file. Press any key on the keyboard to enter the scrambler code, enter the filename of the program to be scrambled and press RETURN to start the sequence.

The program is then loaded, scrambler and saved back to disk as '-FILENAME' where filename is the name of the program.

The routine adds 70 bytes to the saved code so the only limitation on this routine is that the original program must exist between $0801 and $CF8F. Even if 202 blocks are used there still may be sufficient room on the disk. As I am sure you are aware, each block is allocated 256 bytes but all may not be used.

Once the save process is completed the program exists in memory as the finished product and can be confirmed as successful by entering RUN.

The program must be typed in exactly as listed and saved prior to running. Error trap routines are included to ensure that the data as read is correct. The program, when run, stores the relevant code at a temporary address of $800 and when prompted relocates the working program to Basic ($0801) and saves the program to disk.

76

PROGRAM: SCRAMBLER BOOT

```
A0  10 M1=32768:M2=34672:CH=0
97  11 PRINTCHR$(144)CHR$(147)
C3  12 POKE52,120:POKE56,120:POKE
    53280,15:POKE53281,12
94  13 PRINT
8F  14 PRINTSPC(8)CHR$(18)"[SU,S*
    22,SI]
26  15 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
B4  16 PRINTSPC(8)CHR$(18)"[S-,SP
    C4]DATA  STATEMENT[SPC3,S-]
3C  17 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
E5  18 PRINTSPC(8)CHR$(18)"[S-]
    TO MEMORY  ROUTINE  [S-]
4A  19 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
22  20 PRINTSPC(8)CHR$(18)"[S-,SP
    C5]BY LES ALLAN[SPC5,S-]
50  21 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
6C  22 PRINTSPC(8)CHR$(18)"[SJ,S*
    22,SK]
A0  23 PRINT:PRINTCHR$(155)
42  24 PRINT" THIS ROUTINE READS
    THE DATA STATEMENT,"
80  25 PRINT
17  26 PRINT" CONVERTS FROM  HEX
    TO BINARY AND POKES"
82  27 PRINT
C4  28 PRINT" CODE BACK  TO THE
    AREA OF MEMORY FROM"
84  29 PRINT
19  30 PRINT" WHICH  IT  WAS  PRE
    VIOUSLY  GENERATED."
59  31 PRINT:PRINT
D0  32 READCODE$
B8  33 LB=ASC(RIGHT$(CODE$,1))-48
    :IFLB>9THENLB=LB-7
CF  34 HB=ASC(LEFT$(CODE$,1))-48:
    IFHB>9THENHB=HB-7
32  35 PRINTSPC(5)CHR$(5)"READING
     MEMORY BLOCK ...";M1:PRINTCH
    R$(145);
28  36 POKEM1,HB*16+LB:M1=M1+1:CH
    =CH+HB+LB:IFM1<M2THEN32
DB  37 IFCH=28964THEN39
13  38 PRINT"CHECK SUM ERROR - CH
    ECK DATA STATEMENTS!":PRINTCH
    R$(19):END
EC  39 PRINT"  HIT RETURN TO SAVE
     COMPLETED PROGRAM"
D1  40 GETKEY$:IFKEY$<>CHR$(13)TH
    EN40
5C  41 SYS34567
10  42 :
CE  43 ::::::::::::::::::: DATUM S
    TATEMENTS ::::::::::::::::::
16  44 :
AD  45 DATA 00,08,08,00,00,9E,32,
      30,36,31,00,00,00,20,44,E5
6C    46 DATA A9,0C,8D,20,D0,8D,21,
      D0,EA,A9,36,85,01,4C,2B,0E
B7    47 DATA 01,A2,00,BD,E0,14,9D,
      00,08,E8,E0,70,D0,F5,20,44
AF    48 DATA E5,A9,0C,8D,20,D0,8D,
      21,D0,A9,00,85,FB,A9,08,85
C2    49 DATA FC,A0,01,B1,FB,49,AC,
      91,FB,AD,20,D0,49,03,8D,20
0C    50 DATA D0,C8,D0,EF,E6,FC,A5,
      FC,C9,D0,D0,E7,A9,00,8D,00
6A    51 DATA 08,A9,37,85,01,20,60,
      A6,20,8E,A6,4C,AE,A7,EE,EE
F8    52 DATA 47,4C,7C,FE,B3,4E,4E,
      3E,3C,21,29,3C,2F,23,4E,4E
7D    53 DATA 3D,2D,3C,2F,23,2C,22,
      2B,3C,4E,4E,B3,6E,DF,66,6B
0D    54 DATA 6E,F7,C8,56,47,4C,7C,
      FE,B3,4E,16,FD,B3,6E,B8,66
3A    55 DATA 68,6E,F7,C8,56,47,4C,
      7C,FE,B3,4E,16,FD,B3,6E,97
AA    56 DATA 66,69,6E,F7,C8,56,47,
      4C,7C,FE,B3,4E,04,FD,2C,37
7E    57 DATA 4E,03,FD,22,2B,3D,4E,
      2F,22,22,2F,20,4E,04,FD,B3
79    58 DATA 6E,73,67,66,6E,F7,C8,
      56,47,4C,7C,FE,B3,4E,16,FD
9F    59 DATA B3,6E,2F,67,67,6E,F7,
      C8,56,47,4C,7C,FE,A4,AE,16
8A    60 DATA FD,A5,6E,27,67,64,6E,
      F7,54,F7,6E,16,67,65,6E,F7
96    61 DATA 4C,F5,4E,4E,3A,27,3C,
      2B,2A,4E,21,28,4E,3E,2B,21
FA    62 DATA 3E,22,2B,4E,23,2F,25,
      27,20,29,4E,28,2F,22,3D,2B
55    63 DATA 4E,4E,2D,22,2F,27,23,
      3D,4C,6E,C9,67,62,6E,F7,4C
CB    64 DATA F5,4E,4E,21,20,4E,37,
      21,3B,3C,4E,3D,21,2B,3A,39
2A    65 DATA 2F,3C,2B,4E,2B,36,3E,
      22,21,27,3A,3D,4E,4F,04,FD
06    66 DATA 4E,4E,39,28,22,22,4C,
      6E,B8,67,63,6E,F7,4C,F5,4E
2F    67 DATA 4E,3A,26,27,3D,4E,4E,
      3E,3C,21,29,3C,2F,23,4E,3C
D9    68 DATA 21,3B,3A,27,20,2B,4E,
      3D,2D,3C,2F,23,2C,22,2B,3D
F7    69 DATA 4E,2D,21,2A,2B,4C,6E,
      68,64,60,6E,F7,4C,F5,4E,4E
53    70 DATA 3A,21,4E,4E,3E,3C,2B,
      3B,2B,20,3A,4E,3A,2B,36,3A
03    71 DATA 4E,4E,2B,3C,21,23,4E,
      2C,2B,27,20,29,4E,2D,26,2F
D0    72 DATA 20,29,2B,2A,4C,6E,65,
      64,61,6E,F7,6E,54,64,7E,6E
7F    73 DATA F7,4C,F5,4E,4E,3D,27,
      23,3E,22,37,4E,3A,3C,2F,20
39    74 DATA 3D,2B,2B,3C,4E,3A,26,
      2B,4E,3E,3C,21,29,3C,2F,23
58    75 DATA 4E,3A,21,4E,2F,4E,20,
      2B,39,4C,6E,07,64,7F,6E,F7
8D    76 DATA 4C,F5,4E,4E,2A,27,3D,
      25,4E,3E,3C,27,21,3C,4E,3A
80    77 DATA 21,4E,3C,3B,20,20,27,
      20,29,4E,3A,26,27,3D,4E,4E
45    78 DATA 3E,3C,21,29,3C,2F,23,
      42,4C,6E,F6,64,7C,6E,F7,4C
09    79 DATA F5,4E,4E,2B,20,3A,2B,
      3C,4E,37,21,3B,3C,4E,3D,27
68    80 DATA 20,29,22,2B,4E,2D,26,
      2F,3C,2F,2D,3A,2B,3C,4E,2D
DD    81 DATA 21,2A,2B,4E,2F,20,2A,
      4C,6E,A9,64,7D,6E,F7,4C,F5
D7    82 DATA 4E,4E,2F,20,2A,4E,3A,
      26,2B,4E,3E,3C,21,3A,2B,2D
30    83 DATA 3A,27,21,20,4E,3C,21,
      3B,3A,27,20,2B,4E,22,21,2F
11    84 DATA 2A,3D,4E,2F,20,2A,4C,
      6E,98,64,7A,6E,F7,4C,F5,4E
0D    85 DATA 4E,3D,2F,3B,2B,3D,4E,
      3A,26,2B,4E,20,2B,39,4E,2B
84    86 DATA 27,22,2B,4E,3A,26,3B,
      3D,54,4E,49,43,2B,27,22,2B
```

```
2A    87 DATA 20,2F,23,2B,49,4C,6E,
      48,65,78,6E,F7,54,F7,54,F7
7E    88 DATA C8,5A,47,4C,6B,2B,20,
      3A,2B,3C,4E,3E,3C,21,3A,2B
4E    89 DATA 2D,3A,27,21,20,4E,2D,
      21,2A,2B,4E,2D,26,2F,3C,2F
75    90 DATA 2D,3A,2B,3C,4C,6E,59,
      65,78,6E,CF,25,4A,54,E5,25
05    91 DATA 4A,DC,4C,4C,C9,5C,5C,
      6E,2D,65,79,6E,2F,DC,A8,46
17    92 DATA 25,4A,47,6E,17,65,76,
      6E,F7,4C,FF,4E,07,FD,37,21
2C    93 DATA 3B,3C,4E,2D,21,2A,2B,
      4E,20,3B,23,2C,2B,3C,4E,27
DC    94 DATA 3D,4E,54,4E,08,FD,F3,
      07,FD,4C,55,2F,6E,E7,65,77
1C    95 DATA 6E,EF,3A,DC,5F,CA,5F,
      5B,5E,5E,54,EC,6E,D6,65,74
F7    96 DATA 6E,F7,4C,FF,4E,26,FD,
      4C,6E,A2,65,75,6E,F9,5A,5A
D6    97 DATA 5D,59,42,2F,54,F9,5B,
      5E,5A,56,42,2F,6E,B8,65,72
4C    98 DATA 6E,F0,5A,5E,57,58,6E,
      03,FD,25,EE,6E,6E,CE,6E,6E
20    99 DATA 2F,6E,E0,6E,04,FD,3A,
      6E,E5,55,CE,6E,6E,80,FF,FD
50    100 DATA 80,FF,FD,80,FF,FD,80
      ,FF,FD,80,17,FD,CC,6E,D3,7E
F1    101 DATA 7F,F3,7E,6F,86,8E,1E
      ,BE,98,CC,6E,D3,52,7D,F3,52
7E    102 DATA 6D,86,8E,AA,BE,98,22
      ,52,6D,80,33,FD,FF,FE,FE,4E
6F    103 DATA 2B,20,3A,2B,3C,4E,3E
      ,3C,21,29,3C,2F,23,4E,20,2F
B0    104 DATA 23,2B,4E,51,4E,4E,7F
      ,0B,10,FD,FF,F3,10,FD,6B,6E
19    105 DATA 80,72,FD,2B,20,3A,2B
      ,3C,4E,3E,3C,21,29,3C,2F,23
80    106 DATA 4E,20,2F,65,66,6E,6E
      ,F0,5C,5E,5B,5F,6E,03,FD,CC
AC    107 DATA 6E,D3,73,66,F3,C9,6C
      ,86,8E,37,BE,9B,22,C9,6C,C7
89    108 DATA 58,E8,6F,CC,6E,D3,6E
      ,66,F3,6E,66,86,8E,1E,BE,9B
C1    109 DATA 4E,2A,88,C7,62,E3,4E
      ,BE,E3,4F,BE,C7,6E,EB,95,C7
62    110 DATA 66,E8,92,CE,6F,DF,95
      ,27,4E,FF,95,C3,4E,BE,27,6D
D2    111 DATA E3,4E,BE,A6,BE,81,88
      ,92,CB,92,A7,BE,BE,89,C7,6E
9E    112 DATA E3,6E,66,C7,59,E8,6F
      ,4E,0E,C8,4E,E0,C8,22,C0,C9
6F    113 DATA 80,FF,FD,80,C0,FD,CC
      ,6E,E0,C9,6C,D3,3E,7E,9E,6B
D4    114 DATA 4E,BC,91,86,8E,9B,4E
      ,8A,91,9E,95,A7,63,9E,77,A7
86    115 DATA 7A,8E,68,A0,C9,6C,22
      ,06,7D,80,C9,6C,C0,C9,6C,F3
80    116 DATA C6,6C,4E,BC,91,22,22
      ,6D,C7,66,C4,C6,4E,D4,91,C3
37    117 DATA C9,6C,CC,C7,CE,6C,4E
      ,D3,91,C7,6E,4E,BB,91,E0,95
57    118 DATA E0,5D,6F,EA,92,E2,5A
      ,6F,CE,6E,D7,6E,66,FF,95,A6
80    119 DATA AE,1E,8E,98,CC,6E,D3
      ,7E,6F,F3,6F,66,86,8E,01,BE
32    120 DATA 98,C7,5B,EB,6F,C7,6E
      ,E8,95,C7,66,E8,92,CE,1E,DF
C0    121 DATA 95,27,4E,FF,95,A6,BE
      ,99,88,92,CB,92,A7,BE,8E,81
F1    122 DATA 80,C9,6C,C7,43,E3,C6
      ,6C,C3,C9,6C,CC,C6,CE,6C,4E
D7    123 DATA D3,91,C7,6F,E8,45,C7
      ,66,EB,42,76,C7,1E,03,5D,6F
B3    124 DATA C4,C7,6E,03,5A,6F,C6
      ,C7,45,4E,B6,91,22,08,90,6E
BA    125 DATA 0C,FD,4F,66,6F,6E,F7
      ,A9,46,5F,5A,59,47,54,F9,5B
40    126 DATA 5D,5C,56,5E,42,5F,5B
      ,54,F9,5B,5D,5C,56,5F,42,5F
2C    127 DATA 5C,6E,2B,66,6C,6E,F7
      ,C8,56,47,4C,7C,FE,B8,AE,16
C4    128 DATA FD,A7,6E,07,66,6D,6E
```

```
      ,F7,C8,56,47,4C,7C,FE,B3,4E
CA    129 DATA 16,FD,B3,6E,E3,66,6A
      ,6E,F7,C8,56,EB,E0,E3,E8,EB
A2    130 DATA 75,D9,DB,DD,DA,E8,03
      ,FD,49,EB,56,F6,E3,76,4C,E9
4E    131 DATA 03,08,B2,3B,1E,A7,4C
      ,E9,42,DD,6E,EA,49,E8,56,EB
A0    132 DATA FF,76,EB,E3,03,08,9B
      ,3B,1E,CB,AF,0E,42,E7,66,CB
E8    133 DATA 3B,66,CA,3B,42,EB,6E
      ,10,42,E3,6E,17,4B,EA,5A,10
10    134 DATA A2,6E,7A,10,46,CB,3B
      ,A2,E8,66,CB,3B,23,3B,04,0D
CA    135 DATA 17,4E,17,22,3B,3B,0C
      ,42,E8,66,EB,E3,42,DC,6E,EA
B3    136 DATA C8,88,4D,CB,65,4D,A7
      ,45,4C,05,05,AC,A7,A4,AC,AC
EA    137 DATA 32,9E,9C,9A,9D,AC,03
      ,FD,0E,AC,11,B1,A4,31,08,AE
21    138 DATA 44,4C,F5,7C,59,E0,0B
      ,AE,05,9A,29,AD,0E,AC,11,DC
9E    139 DATA 88,31,AC,A4,44,4C,DC
      ,7C,59,8C,E8,49,05,A0,21,BC
79    140 DATA 7C,21,8D,7C,05,AC,29
      ,57,05,A4,29,50,0C,AD,1D,57
1F    141 DATA E5,EB,3D,57,01,BC,7C
      ,E5,AF,21,8C,7C,64,7C,43,4A
F0    142 DATA 50,09,50,65,7C,7C,4B
      ,05,AC,21,AC,A4,05,98,29,AD
75    143 DATA BC,CC,0A,BC,22,0A,E0
      ,02,08,42,42,A2,00,BD,6D,0E
F8    144 DATA 9D,10,01,E8,D0,F7,A2
      ,34,BD,D4,0E,9D,00,03,E8,D0
FC    145 DATA F7,EA,EA,A2,FF,9A,A9
      ,50,85,2D,3B,E9,01,85,FE,A9
12    146 DATA 15,85,2E,E9,00,85,FF
      ,A9,2A,85,FC,A9,0E,85,FD,AD
A5    147 DATA 21,D0,85,FB,4C,52,01
      ,00,00,00,00,00,00,00,08,08
5B    148 DATA 00,00,9E,32,30,36,31
      ,00,00,00,A2,00,BD,1D,08,9D
7E    149 DATA A7,02,E8,E0,59,D0,F5
      ,4C,A7,02,A9,36,85,48,C6,FC
26    150 DATA A5,FC,C9,FF,D0,02,C6
      ,FD,60,60,48,AD,20,D0,49,03
30    151 DATA 8D,20,D0,C6,FE,A5,FE
      ,C9,FF,D0,02,C6,FF,60,60,A0
AA    152 DATA 00,B1,FC,C9,FD,D0,18
      ,EA,EA,EA,20,30,01,B1,FC,AA
86    153 DATA 20,30,01,B1,FC,91,FE
      ,20,3D,01,CA,D0,F8,F0,05,91
45    154 DATA FE,20,3D,01,A6,FC,CA
      ,86,FC,E0,FF,D0,02,C6,FD,A5
2F    155 DATA FE,C9,1F,A5,FF,E9,08
      ,B0,C8,A5,F8,8D,20,D0,A9,37
68    156 DATA 85,01,20,60,A6,20,8E
      ,A6,A2,1F,BD,10,01,9D,00,08
D1    157 DATA CA,D0,F7,A9,FD,4C,34
      ,03,4C,AE,A7,EE,EE,EE,EE,EE
EA    158 DATA A9,00,85,FB,85,FD,A9
      ,80,85,FC,A9,08,85,FE,A0,00
E5    159 DATA B1,FB,91,FD,C8,D0,F9
      ,E6,FC,E6,FE,A5,FC,C9,A0,D0
10    160 DATA EF,A5,BA,AA,A9,20,BA
      ,FF,A9,0D,A2,55,A0,87,20,BD
AA    161 DATA FF,A9,01,85,2B,A9,08
      ,85,2C,A9,2B,A2,08,A0,0F,20
FF    162 DATA D8,FF,4C,66,FE,50,52
      ,47,2E,53,43,52,41,4D,42,4C
1E    163 DATA 45,52,EE,EE,EE,EE,EE
      ,EE,EE,EE,EE,EE,EE,EE,EE,EE
9E    164 :
9F    165 :
26    166 ::::::::::::::::::::::::::
      :::::::::::
E9    167 :  PROGRAM SCRAMBLER BY L
      ES ALLAN  :
CC    168 :
                  :
CE    169 :  20 ATKINSON DRIVE  NEW
      PORT  IW  :
2A    170 ::::::::::::::::::::::::::
      :::::::::::
```

Commodore 64 Productivity Software Winners

Superbase is the most powerful Database System ever developed for 8 bit computers. Why? Because not only can you access its commands from menus but you can string them together with BASIC commands to form your own complete programs. Superbase can import data from and export to other programs via sequential files. In addition the C-128 version will load together with the Superscript word processor to create a completely integrated office system.

Commodore 64 disk
NOW ONLY **£49.95!**

Superbase
The Programmable Database for your
Commodore 64

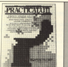
DISK SOFTWARE
SuperScript
FROM THE MAKERS OF WORDSTAR
SOPHISTICATED AND
POWERFUL WORD PROCESSING

Superscript gives you everything you need for professional word processing in one easy-to-use package. Its menu command structure puts you immediately at ease, with no complicated commands to memorise, yet Superscript combines business-style editing, spell checking, calculator, row and column arithmetic and full mail merge facilities. The phrase glossary feature enables you to store whole passages of text, or command sequences and recall them with a single key.

Commodore 64 disk
NOW ONLY **£39.95!**

PractiCalc II combines a fast, easy-to-learn spreadsheet with database and word processing functions all in one powerful program. Set the width of each column individually on a spreadsheet up to 100 columns wide by 250 rows deep. With PractiCalc II you can sort information numerically or alphabetically, and carry out searches through columns or rows. Using its built-in word processing you can prepare impressive financial reports and documents with the utmost ease.

Commodore 64 disk
NOW ONLY **£39.95!**



For the Commodore 64 128
PICASSO'S REVENGE

Picasso's Revenge comes complete with light pen, powerful graphic software and print utility. Enjoy hours of fun creating computer art and graphics. Simply point the pen at the screen and add the colour as you go! Draw in 15 different colours using 8 brush widths. Choose from 35 textures or define your own. Zoom in for detailed work. Picasso's Revenge is compatible with most popular matrix printers and will also print colour pictures created with other graphics packages.

Commodore 64 disk **£29.95**

Superbase is recognised as the leading database system for Commodore computers, with more than 100,000 users of 10 national language versions worldwide. Now Dr Bruce Hunt has produced the first in-depth guide to using the Superbase system, from first steps through to advanced programming techniques. The wealth of hints, tips and practical examples makes Superbase: The Book required reading for anyone working or contemplating working with Superbase.

194 pages **£11.95**

Superbase
THE BOOK
Dr Bruce Hunt

Disk Software
Super
TYPE
Simple step by step trainer for mastering your computer keyboard.

Now you can acquire and perfect valuable keyboard skills in the comfort of your own home with Supertype. Supertype is not just a typing tutor, but a professional keyboard trainer. Supertype will teach you and your family how to type in a way which can be applied to any keyboard, without expensive typing classes or travel. Go from tap-tap to type-type with Supertype!

Commodore 64 tape	**£14.95**
Commodore 64, Atari XL/XE disk	**£15.95**

Super Diskdoc is the ultimate Commodore disk utility program, and the best protection there is for your valuable data. Zoom in on the bytes on your disk, interpret them in hex, ascii or plain English, make any changes you want, then replace them. The benefit of Super Diskdoc is the extra security it brings you. You know that in the event of an accident to your data, you have the best tool available to repair the damage.

Commodore disk **£19.95**

Disk Software
Super
DISKDOC
Integrated Disk Utility Toolkit for your
Commodore Computer

THE PROFESSOR

An in-depth self-tutorial for the Commodore 64 on a two-sided disk. This menu-driven tutorial covers every aspect of your C-64 – BASIC, keyboard, sound, music, simple and advanced graphics.

Quizzes test your comprehension at the end of many lessons! On-screen illustrations, sound effects and full-colour interactive graphics make learning easy and interesting. The PROFESSOR is your ONLY choice for an all-in-one, thorough tutorial about the Commodore 64!

Commodore 64 disk
£11.95

Available from your local dealer or directly from
Precision Software Ltd. 6 Park Terrace,
Worcester Park, Surrey KT4 7JZ
Telex 8955021 Precis G
01-330 7166

Precision
Software

ORDER FORM Mail to: Precision Software Limited, 6 Park Terrace,
Worcester Park, Surrey KT4 7JZ

Please send me ____________

Add £1.40 per item postage and packing

☐ Cheque enclosed ☐ Visa ☐ Access/Mastercard

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ (Credit Card Number)

Expiry Date ________ Signature ________

Name ____________

Address ____________

Post Code ____________

C16 Games

Specially for our C16/Plus/4 readers, we bring you a selection of the latest entertainment software for your computer.

By Paul Eves

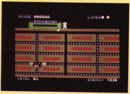
DIAMOND MINE

Diamond Mine is one of those games that is difficult to get to grips with at the start, but for some reason you have to keep having 'just one more go'.

The idea is to guide your pipe through the mine to reach the diamonds. You have to avoid contact with the walls and bugs, otherwise you lose that much pipe and you have to start all over again. On each level, the length of pipe you have to start with gets less and less, this is shown at the top left of the screen.

Movement of the pipe is one of those infuriating types of control. Once you start to move, you cannot stop. Therefore you not only have to be accurate, you must also have quick reflexes.

Although this looks a very simple game, there is quite a lot of hidden strategy involved in actual play. Pick the shortest route to a diamond, not the easiest, for example.



Although the graphics are simple, most of the screen is comprised of wall, I quite liked them. Overall, a difficult game to master but well worth the effort.

Touchline

Title: *Diamond Mine.* ***Company:*** *Blue Ribbon Software Ltd, CDS House, Beckett Road, Doncaster, South Yorks.* ***Price:*** *£1.99.*
Originality: *5/10.* ***Playability:*** *7/10.* ***Graphics:*** *7/10.* ***Value:*** *7/10.*

MAGICIANS CURSE

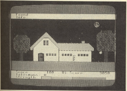
Gremlin Graphics has produced one of the better games for the C16/Plus/4 for some time, with Magicians Curse.

'Long ago, this land was inhabited by an evil magician. The land is now uninhabited etc.', so the inlay informs you. It's surprising how many evil magicians used to exist.

The prime object is to search this land of 48 screens and secure for yourself a golden statue. Before you achieve this goal however, you must also collect seven talismans. These can be found in various places just lying around.

Whilst you are busy running from screen to screen, your energy is quite understandably getting less and less. To counteract this, you need to either drink some potion, or eat some food. A couple of the locations will need a key to gain entry, whilst the underground caverns will need some light source to navigate.

Naturally, it is not quite this simple. There are the odd vampire bats lurking around, and falling apples to dodge. Be



careful which potions you eat, one of them is poisoned (find the antidote quick).

Considering the limitations in programming the C16, this is quite a good game. I especially liked the animation of the hero, no flicker to be seen anywhere. Also the stars twinkling in the night sky is pleasing. Well done Gremlin.

Touchline

Title: *Magicians Curse.* ***Company:*** *Gremlin Graphics, Alpha House 10 Carver Street, Sheffield, S1 4FS.* ***Price:*** *£6.95.*
Originality: *4/10.* ***Playability:*** *6/10.* ***Graphics:*** *7/10.* ***Value:*** *7/10.*

DIAMOND MINE II

Having completed Diamond Mine, you have now invested all your new found wealth into opening an even bigger mine. Diamond Mine II is virtually the as its predecessor except that there are a couple of variations.

In this version you have an assistant that keep your winch motor going. This time you can suck the nasties up into your pipe, however after a time they will re-appear, so watch out.

If you try to cross over your path, or go back the same way, a life is lost. You can however retract your pipe by pressing the return key. This feature of the game makes it a lot better to play than the original. You now have the ability to plan your tactics a lot better. After the 10th level the screens become 'invisible', making your taks that much harder.

Touchline

Title: *Diamond Mine II.* ***Company:*** *Blue Ribbon Software Ltd, CDS House, Beckett Road, Doncaster, South Yorks.* ***Price:*** *£1.99.*
Originality: *5/10.* ***Playability:*** *8/10.* ***Graphics:*** *7/10.* ***Value:*** *7/10.*

PINPOINT

For those of you that have seen Marble Madness, Pinpoint will hold no mystery. The concept is the same. You have to reach the white flag with your spinning top. Having achieved this, you go on to the next level.

Anco has here produced a game that should be very popular. I say should be, but I have my reservations. The main problem, is that the game is just too difficult to play and enjoy fully. Control of the top is via the joystick, and you need to be very precise in your movements.

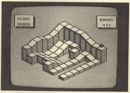
There are the usual steep slopes to climb, and chasms to leap. The downward slopes need to be tackled very slowly otherwise you lose your top off the edge. Understandably, sound is somewhat lacking, and I fear you will soon tire of the 'dit, dits' everytime you lose a top.

The inlay card informs you that there are 10 levels of difficulty, but I must confess to only reaching the fourth one before abondoning the play. The graphics are fairly good, being the two colour variety.

Lovers of Marble Madness and Spindizzy will obviously love this one, as for the rest of you, I have doubts.

Touchline

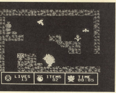
Title: *Pinpoint.* ***Supplier:*** *Anco Software, 4 Westgate House, Spital Street, Dartford, Kent.* ***Price:*** *£5.95.*
Originality: *5/10.* ***Playabililty:*** *4/10.* ***Graphics:*** *6/10.* ***Value:*** *6/10.*



SPIKY HAROLD

Firebird has come up with some real winners in the past, but I don't think that Spiky Harold will be one of them. It's a nice enough game, but I think it lacks that inexplainable quality of 'moreishness'.

The idea is that you have to help Harold collect as much grub as possible, to help him hibernate for the winter. The grub in question consists mainly of apples, grapes, pineapples, (What no nuts?) and wine. (Beware: not too much).



You have to visit various caverns to collect the said grub, each is filled with nasties of varying types. All the nasties have one thing in common, that is, they kill you on contact. This isn't too big a problem seeing as you start off with 19 lives.

The animation of the nasties is done very well. My only gripe is the 'Character Detect' routine. It takes some time before you can really judge safe distances.

In your wanderings you will, from time to time, come across a coin. Picking this up will give you one extra life. Just one point, the weatherman has predicted a severe frost in the next 24 hours. This would obviously kill our Harold, so you must succeed in your task before the time runs out.

Spiky Harold, is basically a platform game, which we either love or hate. Overall not a bad attempt.

Touchline

Title: *Spiky Harold.* ***Company:*** *Firebird, 74 New Oxford Street, London WC1A 1PS.* ***Price:*** *£.1.99.*
Originality: *4/10.* ***Playability:*** *5/10.* ***Graphics:*** *6/10.* ***Value:*** *7/10.*

DANGERZONE

There is no escaping the fact that some people enjoy the idea of blasting anything that moves. It must be an inbuilt desire that humans suffer from. Dangerzone lets you do just that.

As test pilot for the XT/99 Fighter come reconnaisance ship, you have to blast your way through 20 levels of asteroid belts. The higher the level, the faster they come at you. There are also the odd wave of alien craft to beat as well, so you need to keep your mind on your flying or else.

The scrolling is definitely smooth, and on the higher levels fast as well. My only real criticism, is that you can only move in one of two directions (up or down).

Your ship is equipped with rapid fire lasers. However constant use of this facility soon depletes your weaponary, so use this with caution.

Flying without firing will increase your fire-power but watch out. The action is fast and furious, but I feel that a couple of hours play is more than enough of this one.

Touchline

Title: *Dangerzone.* ***Company:*** *Codemasters, 1 Beaumont Business Centre, Beaumont Close, Banbury OX16 7RT.*
Originality: *3/10.* ***Playability:*** *6/10.* ***Graphics:*** *6/10.* ***Value:*** *5/10.*

ASTRO PLUMBER

You can be forgiven for thinking that you have seen this game before. The truth is, you have. I know this one better as Super Pipeline and Super Pipeline II by Tasket on the 64.

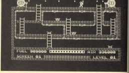
I am not putting this down though. It's a very good clone. You are the maintenance man just arrived from Earth. Your job is to repair the leaking air pipes that serve Colony II on the moon. (The underground caverns are inhabited by the usual nasties that have to be avoided. To aid you in this task you are wearing a jet pack, which I couldn't quite master.

You use your Plasma laser to repair the pipes. But excessive use drains your supply, so use with caution. You can leave a screen without completing all repairs, but when you return to that screen, the leaks have re-appeared.

You can use the air tanks on the surface of the moon to replenish your supply, but unfortunately you cannot use the jet pack whilst on the surface. When the pressure indicator for the level you are on shows full, you will be awarded a bonus score, and you then progress to the next round.

Touchline

Title: *Astro Plumber.* ***Company:*** *Blue Ribbon Software Ltd, CDS House, Beckett Road, Doncaster, South Yorks.* ***Price:*** *£1.99.*
Originality: *5/10.* ***Playability:*** *5/10.* ***Graphics:*** *7/10.* ***Value:*** *7/10.*



feel that a
is one.

Beaumont
7RT.
/10. ***Value:***

e seen this
e better as
on the 64.
ood clone.
arth. Your
lony II on
ted by the
n this task
te master.
ipes. But
tion. You
but when
ared.
moon to
ot use the
indicator
warded a
ound.

ware Ltd,
ks. ***Price:***

0. ***Value:***

***SCORCHING IDEAS FROM HI-TECH* TRILOGIC**
MADE SPECIALLY FOR YOUR
COMMODORE 64/128

BACK-UP! TRANSFER! CONVERT!
ANY PROGRAM TO TAPE OR DISK WITH THIS

the expert CARTRIDGE

NOW WITH BUILT IN E.S.M.!

- **TAPE TO DISK**
- **DISK TO TAPE**
- **DISK TO DISK**
- **TAPE TO TAPE**

ONLY £37.50

Easy to use plug-in system that outperforms all other similar products.

- Programs are saved in one file
- Freezes and saves programs to disk or tape
- Now handles some Multipart programs
- Programs compacted to reduce diskspace used
- You can save 3 or more programs per disk
- Reloads most programs in less than 30 seconds (disk)
- The cartridge is not needed for loading back
- Cartridge uses RAM and disk-based software
- Instant upgrading. Only £2.00 exchange disk/tape
- Use the machine code monitor to cheat, gain extra lives or restart the program, etc, etc.

The Expert & ESM transfers even 'Expert Proof' games. Including games no other similar cartridge can handle.

THE ORIGINAL EXPERT IS STILL AVAILABLE FOR £31.95
DOES ALL BUT 6 GAMES!

ESM ADD-ON
AVAILABLE FOR
ONLY £7.95!

MAKES YOUR OLD EXPERT EQUAL TO THE NEW EXPERT + ESM.
INCLUDES FREE UP GRADE DISK

NEW FOR 87

OTHER HI-TECH TRILOGIC PRODUCTS

The Sound Splitter

FOR YOUR COMMODORE 64 & 128

- Enhance the amazing sounds from your C64 & 128.
- Great with games — especially 'shoot em down' ones.
- Marvellous with music programs.
- Brilliant with basic programs.
- Super two-channel stereo effect, through your Hi-Fi or stereo.

SEND S.A.E.
FOR DETAILS OF EITHER

- FAST MAIL ORDER SERVICE
- PROMPT DESPATCH
- ALL PRICES FULLY INCLUSIVE PLUS 10 DAY MONEY BACK GUARANTEE ON ALL BACK-UP DEVICES.

ORDERING: WRITE OR 'PHONE /
PAYMENT BY CASH CHEQUES PAYABLE TO TRILOGIC /
POSTAL ORDER OR ACCESS EXPORT ADD £1.00 EXTRA
PAYMENT IN STERLING ONLY PLEASE

All prices include VAT & P&P

FREE CATALOGUE – SEND 18p STAMP

TRILOGIC

MAIL ORDER Dept YC
29 HOLME LANE BRADFORD BD4 0QA
CALLERS 329 TONG STREET
BRADFORD BD4 9QY Tel (0274) 684289

SPECIFY DISK OR TAPE

Please send equipment as ordered

Name ....

Address ....

....

....

Complete this coupon with your name/address etc. and attach to your order and payment/cheque
Post off to Trilogic Dept YC, 29 HOLME LANE BRADFORD BD4 0QA

The OXFORD BRIDGE Program

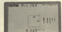
An Exciting New Rubber/Duplicate Bridge Simulation for the Commodore 64/128

The Oxford Bridge Program is an excellent all round bridge simulation for beginners and experienced players alike. If you have never played before, you will enjoy learning this fascinating game at your own pace, with the computer playing both as your partner and as opponents. Alternatively, you can play with one two or three other people, the computer then filling in just the missing hands. If you are a club player, you will find the program an excellent tool to sharpen your game between duplicate sessions. You can practice your bidding system with your regular partner, play and replay interesting hands against computerised opponents and compare your score with that of your rivals' using the unique duplicate mode. For all players The Oxford Bridge Program is packed with features and enhancements. Once you start playing you will never want to put it down!

FEATURES INCLUDE:

1. Computerised bidding, contract play and defence.
2. Any number of players; computer will partner and/or oppose.
3. Rubber and duplicate bridge modes.
4. Full scoring capability.*
5. Review of card play.
6. Hand replay and contract selection.
7. Storage and retrieval of hands from disk/tape.
8. Ability to set up problem hands.
9. Easy to use with clear colour display.
10. Printer option.

** Full duplicate scoring – disk version only.*



Send Cheque or Postal Order for £29.95 (tape) or £34.95 (disk) to:

THINKING GAMES
19 NEWTON ROAD,
FAVERSHAM, KENT ME13 8DZ
TEL: (0795) 534708

POOLSWINNER

THE ULTIMATE POOLS PREDICTION PROGRAM

- **MASSIVE DATABASE** Poolswinner is a sophisticated Pools prediction aid. It comes complete with the largest database available – 22000 matches over 10 years. The database updates automatically as results come in.
- **PREDICTS** Not just SCOREDRAWS, but AWAYS, HOMES and NO SCORES.
- **SUCCESSFUL** SELEC guarantee that Poolswinner performs significantly better than chance.
- **ADAPTABLE** Probabilities are given on every fixture – choose as many selections as you need for your bet. The precise prediction formula can be set by the user – you can develop and test your own unique method.
- **SIMPLE DATA ENTRY** All team names are in the program. Simply type in the reference numbers from the screen. Or use FIXGEN to produce fixture list automatically (see below).
- **DISC/MICRODRIVE COMPATIBLE** Tapes supplied with conversion instructions.
- **PRINTER SUPPORT** Full hard copy printout of data if you have a printer.

POOLSWINNER
SELEC

Boxed, with detailed instruction booklet

PRICE £15.00 (all inclusive)

NOW AVAILABLE

FIXGEN 86/7

AT LAST: No more struggling for hours to get the fixture list into the computer. FIXGEN has been programmed with all English and Scottish fixtures for 1986/7. Simply type in the date, and the full fixture list is generated in seconds. Fully compatible with Poolswinner. Yearly updates available.

POOLSWINNER with FIXGEN £16.50 (for both)

COURSEWINNER V3

THE PUNTERS COMPUTER PROGRAM

COURSEWINNER
SELEC

NOT JUST A TIPSTER PROGRAM, Coursewinner V3 can be used by experts and occasional punters alike. You can develop and test your own unique winning system by adjusting the analysis formula, or use the program in simple mode. Coursewinner V3 uses statistical analysis of major factors including past form, speed ratings, course statistics, prize money, weight, going, trainer and jockey form etc, etc. It outputs most likely winners, good long odds bets, forecasts, tricasts etc. The database includes vital course statistics for all British courses. You can update the database – never goes out of date.

PRICE £15.00 (all inclusive) includes Flat AND National Hunt versions.

ALL PROGRAMS AVAILABLE FOR: AMSTRAD CPCs, AMSTRAD PCWs (ADD £3.00), All BBCs, All SPECTRUMS, COMMODORE 64/128, ATARI (48K +), SINCLAIR QL.
Supplied on tape (simple conversion to disc) – except PCW (on 3" disc) and QL (on microdrive)

Send Cheques/POs for return of post service to . . .

VISA phone 24 hrs

selec SOFTWARE

phone 24 hrs

37 COUNCILLOR LANE, CHEADLE, CHESHIRE. ☎ 061-428 7425

(Send for full list of our software)

---

commodore

128 64C

■ Commodore 128D computer	£499
■ Commodore 128 computer	£249
■ NEW 512K expansion RAM	£149
■ Commodore 1571 disk drive	£269
■ MPS 1000 fast NLQ printer	£269
■ 1901C colour monitor	£335
■ 64C computer	£195
■ 1541C disk drive	£195
■ 64C Connoisseur Collection	£245

PRICES INCLUDE VAT, BUT ADD £5 FOR DELIVERY (OVERNIGHT £10)

COMMODORE – PC

All models include MS DOS, GW Basic, AGA Video Card, Serial & Parallel ports.

■ PC10 IBM-PC compatible 512K RAM, 2x360K floppy drive	£1095
■ PC20 IBM-AT compatible as above plus 20MB hard disk	£1495
■ PC40 IBM-XT compatible with 20 MB hard disk, 1 MB RAM, 1.5 MB floppy drive	£2395

ADD £200 FOR COLOUR MODELS
PC PRICES INCLUDE VAT, DELIVERY AND 1 YEAR ON-SITE MAINTENANCE

AMIGA

FROM £795!

■ Amiga A1000 with software, 880K 3.5" disk, mouse, 256K	£795
■ System 1: As A1000 above, plus A1081 RGB colour monitor	£995
■ System 2: As System 1, plus A1010 3.5" ext. disk drive	£1195
■ System 3: As System 1, plus A1060 Sidecar PC-compatible	£1695
■ A1081 Amiga colour monitor	£335
■ A1010 3.5" external disk drive	£269
■ A1060 Sidecar PC compatible	£759
■ A1050 add-in RAM 256K	£129

ADD £100 FOR 512K MODELS
PRICES INCLUDE VAT, DELIVERY, AND 1 YEAR ON-SITE MAINTENANCE

FREE GOLDEN KEY CARD!

with every 512K Amiga, only from Calco... stay at over 200 top hotels as often as you like for a year, and for each night's stay, just pay for breakfast and dinner!

■ Alegra 1 MB add-on RAM	£385
■ Comspec 2 MB add-on RAM	£655
■ Xebec 10 MB hard disk	£995
■ Xebec 20 MB hard disk	£1095

SELECTED SOFTWARE FOR YOUR NEW AMIGA!

■ SuperBase Personal	~~149.95~~	£129.95	■ VizaWrite DeskTop		£149.95
■ Logistix	[illegible]	154.95	■ De Luxe Paint II	[illegible]	139.95
■ Analyse	~~99.95~~	94.95	■ De Luxe Print / Video	~~99.95~~	84.95
■ Scribble II	~~99.95~~	94.95	■ De Luxe Music	~~99.95~~	94.95
■ MCC Pascal	~~89.95~~	84.95	■ Dynamic CAD	[illegible]	449.95
■ A/C Fortran	[illegible]	284.95	■ Aegis Draw Plus	[illegible]	284.95
■ Lattice C	[illegible]	124.95	■ Aegis Images	~~69.95~~	64.95
■ True Basic	~~149.95~~	139.95	■ Aegis Animator	[illegible]	114.95

VIZAWRITE Classic 128

VizaWrite Classic 128 is a much enhanced successor to the best-selling VizaWrite 64, which **THE TIMES** featured in three articles, calling it 'a creative writer's dream!' **VizaWrite Classic** is certainly the **best** wordprocessor we've yet seen on any computer, ever! Written specially for the 128, **VizaWrite Classic** makes maximum use of the speed, memory and 80-column display, showing your document **exactly as it will be printed**, with a 30,000 word disk dictionary, massive **55K text area**, proportional **printer support** plus **built-in NLQ fonts** for CBM/Epson type printers, easy-to-use **'pull-down'** menus, **full function** calculator, **'newspaper style'** columns, **mail merge**... and much, much more!

■ VizaWrite 'Classic' 128	[illegible]	£79.95	■ VizaStar 128	[illegible]	£99.95
■ VizaWrite 64 'Professional'	[illegible]	£39.95	■ VizaStar 64 XL8	[illegible]	£79.95
■ VizaWrite 64 (cartridge)	[illegible]	£69.95	■ VizaStar 64 XL4	[illegible]	£69.95

UNBEATABLE SUPERBASE & SUPERSCRIPT BARGAINS!

■ SuperBase 128	~~99.95~~	£57.95	■ SuperBase 64 & Plus/4	[illegible]	£37.95
■ SuperScript 128	~~89.95~~	£64.95	■ SuperScript 64	~~69.95~~	£47.95
■ SuperBase: The Book		£11.95	■ SuperBase Starter 64	[illegible]	£19.95

SELECTED SOFTWARE FOR YOUR COMMODORE 128

■ Pocket Planner 128	Easy to use spreadsheet with 40/80 col mode		£49.95
■ Swiftcalc 128	Spreadsheet from Timeworks, UK edition	[illegible]	54.95
■ MicroClerk 128	All-in-one business system from Commodore	[illegible]	94.95
■ Accountability	Sales/Purchase/Nominal accounts package		99.95
■ PetSpeed 128	The Basic 128 compiler, from Oxford Systems	~~49.95~~	44.95
■ Super C 128	Complete C language, with extensions	~~59.95~~	34.95
■ Cobol 128	The complete COBOL package from Abacus		34.95
■ Hack Pack 128	All-in-one Programmer's Toolkit & Ram-Disk		39.95
■ RamDos 128	Lightning fast Ram-Disk for 512K expansion RAM		34.95
■ BrainBox IEEE	Supports PET/IEEE disks & printers etc. (128 or 64)		79.95
■ Anatomy of the 128	The 500 page insider's guide to the 128	[illegible]	11.95
■ Matrix 128	Run 64 programs on your 128 – in 128 mode!	~~49.95~~	44.95

Oxford BASIC 64

The ultimate utility pack for your 64... a full Programmer's Toolkit (FIND, DUMP, CHANGE, MERGE, RENUMBER) **plus ultra-fast Basic compiler plus program optimiser, analyser & compresser! £34.95**

Oxford PASCAL 128

A full J&W Pascal compiler with both interactive mode (90K user area) & disk compiler mode (120K)... graphics & sound extensions... and both stand-alone and modular run-time options! ~~49.95~~ **£44.95**

SOFTWARE BARGAINS FOR YOUR COMMODORE 64!

■ SuperType 64	Professional touch-typing trainer, disk or tape	[illegible]	£14.95
■ Geos 64	Desktop for the 64 – cheaper than an Amiga!		49.95
■ Simon's Basic 64	Programmer's cartridge from Commodore	[illegible]	39.95
■ PetSpeed 64	The standard 64 Basic compiler from Oxford	[illegible]	19.95
■ Oxford Pascal 64	The complete J & W Pascal for your 64	~~49.95~~	34.95
■ Oxford Pascal 64 (tape)	Pascal for 64 tape users	[illegible]	19.95
■ Super C 64	Complete C language, with extensions	~~59.95~~	34.95

IF YOU WANT IT TOMORROW... CALL US TODAY! ON 01-546-7256

Prices are POST FREE & include VAT. Order by phone with your credit card, or send cheque/PO or your credit card number. Official orders welcome. We despatch same day by FIRST CLASS post. If our lines are busy, why not try our 24-hour recorded order service, on 01-541-5185. Ref. A46

VISA

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256

Diskit 5

Disk users take heart. Here we provide a handy disk routine to convert memory to data statements.

By Les Allan

There are occasions when it is desirable to convert a section of memory from machine code to a Basic program containing a re-boot and set of data instructions that represent the original machine's memory.

This program provides the user with the facility to 'read' sections of machine memory to do just that! In fact the Basic loader for this program was produced from the very same routine.

Using the Program

Start and end addresses are entered to control the range of memory to be converted. These are POKEd into the machine code routine resident at $C000 which re-locates the Basic loader and performs the operation of 'reading' each byte to provide two digit hex number in the data statement e.g.

$8000 00 90 00 90 43 42 4D 80
10 DATA 00,90,00,43,42,4D,80

This process is repeated for every byte within the range as previously specified. The completed data listing is then saved to disk as DATA and should be re-loaded prior to running to establish start of variables which begin at the end of the Basic loader.

The SYS address contained in the Basic loader is the warm start address and should be modified to that required by the nature of the area of memory being converted.

The program must be typed in exactly as listed and saved prior to running. Error trap routines are included to ensure that the data as read is correct. The program, when run, stores the relevant code at a temporary address of $8000 and when prompted relocates the working program to Basic ($0801) and saves to the program to disk.

```
PROGRAM: MEMORY BOOT

3C  10 M1=32768:M2=36096:CH=0
97  11 PRINTCHR$(144)CHR$(147)
C8  12 POKE52,120:POKE56,120:POKE
    53280,15:POKE53281,12
94  13 PRINT
8F  14 PRINTSPC(8)CHR$(18)"[SU,S*
    22,SI]
26  15 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
B4  16 PRINTSPC(8)CHR$(18)"[S-,SP
    C4]DATA  STATEMENT[SPC3,S-]
3C  17 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
E5  18 PRINTSPC(8)CHR$(18)"[S-]
    TO MEMORY  ROUTINE  [S-]
4A  19 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
22  20 PRINTSPC(8)CHR$(18)"[S-,SP
    C5]BY LES ALLAN[SPC5,S-]
50  21 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
6C  22 PRINTSPC(8)CHR$(18)"[SJ,S*
    22,SK]
A0  23 PRINT:PRINTCHR$(155)
42  24 PRINT" THIS ROUTINE READS
    THE DATA STATEMENT,"
80  25 PRINT
17  26 PRINT" CONVERTS FROM  HEX
    TO BINARY AND POKES"
82  27 PRINT
C4  28 PRINT" CODE BACK  TO THE
    AREA OF MEMORY FROM"
84  29 PRINT
19  30 PRINT" WHICH  IT  WAS  PRE
    VIOUSLY  GENERATED."
59  31 PRINT:PRINT
D0  32 READCODE$
B8  33 LB=ASC(RIGHT$(CODE$,1))-48
    :IFLB>9THENLB=LB-7
CF  34 HB=ASC(LEFT$(CODE$,1))-48:
    IFHB>9THENHB=HB-7
32  35 PRINTSPC(5)CHR$(5)"READING
     MEMORY BLOCK ...";M1:PRINTCH
    R$(145);
28  36 POKEM1,HB*16+LB:M1=M1+1:CH
    =CH+HB+LB:IFM1<M2THEN32
DA  37 IFCH=43423THEN39
13  38 PRINT"CHECK SUM ERROR - CH
    ECK DATA STATEMENTS!":PRINTCH
    R$(19):END
EC  39 PRINT"  HIT RETURN TO SAVE
     COMPLETED PROGRAM"
D1  40 GETKEY$:IFKEY$<>CHR$(13)TH
    EN40
67  41 SYS35888
10  42 :
CE  43 ::::::::::::::::::: DATUM S
    TATEMENTS :::::::::::::::::
16  44 :
18  45 DATA 00,10,08,00,00,88,41,
    82,30,A7,9E,34,37,36,30,00
61  46 DATA 00,00,56,57,DC,16,E4,
    E6,67,F0,64,63,57,68,5F,55
80  47 DATA 57,C0,62,64,65,6F,67,
    78,66,62,6D,C0,62,64,65,6F
D2  48 DATA 66,78,66,65,6D,CE,90,
    7F,66,63,60,7E,6D,CE,57,3E
36  49 DATA 5F,54,57,CE,F1,62,7E,
    75,45,C7,82,97,97,97,97,97
A5  50 DATA 97,97,97,97,97,97,97,
    97,97,97,97,97,97,97,97,97
E0  51 DATA 97,97,97,97,97,97,97,
    9E,57,C5,5F,53,57,CE,F1,62
88  52 DATA 7E,75,45,8A,77,77,77,
    77,77,77,77,77,77,77,77,77
9A  53 DATA 77,77,77,77,77,77,77,
    77,77,77,77,77,77,77,77,77
74  54 DATA 8A,57,EC,5F,52,57,CE,
    F1,62,7E,75,45,8A,77,1A,12
85  55 DATA 1A,18,05,0E,77,04,16,
    01,12,05,77,71,77,16,02,03
70  56 DATA 18,77,15,18,18,03,12,
    05,77,8A,57,B3,5F,51,57,CE
0F  57 DATA F1,62,7E,75,45,8A,77,
    77,77,77,77,77,77,77,77,77
9D  58 DATA 77,77,77,77,77,77,77,
    77,77,77,77,77,77,77,77,77
61  59 DATA 77,77,8A,57,5A,5E,50,
    57,CE,F1,62,7E,75,45,8A,77
E4  60 DATA 77,77,77,77,04,16,01,
    12,04,77,1A,12,1A,18,05,0E
83  61 DATA 77,11,05,18,1A,77,77,
    77,77,77,77,8A,57,61,5E,5F
90  62 DATA 57,CE,F1,62,7E,75,45,
    8A,77,77,77,77,77,77,77,77
E0  63 DATA 77,77,77,77,77,77,77,
    77,77,77,77,77,77,77,77,77
A2  64 DATA 77,77,77,77,8A,57,08,
    5E,5E,57,CE,F1,62,7E,75,45
20  65 DATA 8A,77,73,67,6F,67,66,
    7A,73,14,11,11,11,77,77,77
58  66 DATA 77,73,13,67,67,67,7A,
    73,11,11,11,11,77,8A,57,DF
98  67 DATA 5E,5D,57,CE,F1,62,7E,
    75,45,8A,77,77,77,77,77,77
EB  68 DATA 77,77,77,77,77,77,77,
    77,77,77,77,77,77,77,77,77
87  69 DATA 77,77,77,77,77,77,8A,
    57,E6,5E,5C,57,CE,F1,62,7E
EF  70 DATA 75,45,8A,77,77,77,77,
    00,05,1E,03,03,12,19,77,15
E0  71 DATA 0E,77,18,12,04,77,16,
    18,18,16,19,77,77,77,77,8A
25  72 DATA 57,8D,5E,58,57,CE,F1,
    62,7E,75,45,8A,77,77,77,77
6E  73 DATA 77,77,77,77,77,77,77,
    77,77,77,77,77,77,77,77,77
09  74 DATA 77,77,77,77,77,77,77,
    77,8A,57,54,5D,5A,57,CE,F1
8F  75 DATA 62,7E,75,45,90,94,94,
    94,94,94,94,94,94,94,94,94
83  76 DATA 94,94,94,94,94,94,94,
    94,94,94,94,94,94,94,94,94
A0  77 DATA 94,9C,57,5C,5D,59,57,
    CE,6D,CE,57,6D,5D,58,57,CE
63  78 DATA 75,CC,77,77,03,1F,1E,
    04,77,05,18,02,03,1E,19,12
E8  79 DATA 77,00,1F,12,19,77,1B,
    18,16,13,12,13,77,1E,19,03
49  80 DATA 18,77,1A,12,1A,18,05,
    0E,75,57,3F,5D,47,57,CE,75
B4  81 DATA 77,77,04,16,01,12,04,
    77,03,1F,12,77,00,18,05,1C
7F  82 DATA 1E,19,10,77,07,16,05,
    03,77,18,11,77,77,16,77,07
84  83 DATA 05,18,10,05,16,1A,75,
    57,C1,5D,46,57,CE,75,77,77
53  84 DATA 1E,19,77,03,00,18,77,
    07,16,05,03,04,79,77,03,1F
7E  85 DATA 12,77,14,1F,16,05,16,
    14,03,12,05,77,04,12,03,77
CC  86 DATA 77,16,19,13,75,57,93,
    5D,45,57,CE,75,77,77,03,1F
55  87 DATA 12,77,77,1C,12,05,19,
    16,1B,77,1E,04,77,77,05,12
82  88 DATA 1B,18,14,16,03,12,13,
    77,77,03,18,77,77,73,66,67
05  89 DATA 67,67,75,57,9C,5D,44,
    57,CE,6D,57,AE,5D,43,57,CE
8C  90 DATA 75,77,77,16,77,77,15,
    18,18,03,77,05,18,02,03,1E
73  91 DATA 19,12,77,77,1E,04,77,
    16,1B,04,18,77,04,16,01,12
79  92 DATA 13,77,00,1F,1E,14,1F,
    75,57,70,5C,42,57,CE,75,77
1D  93 DATA 77,05,12,1B,18,14,16,
    03,12,04,77,03,1F,12,77,77
EB  94 DATA 14,1F,16,05,16,14,03,
    12,05,77,77,16,19,13,77,1C
5E  95 DATA 12,05,19,16,1B,75,57,
    02,5C,41,57,CE,75,77,77,16
31  96 DATA 19,13,77,03,1F,12,19,
    77,1B,18,16,13,04,77,71,77
46  97 DATA 77,05,02,19,04,77,03,
    1F,12,77,1A,16,1E,19,77,07
14  98 DATA 16,05,03,75,57,30,5C,
    40,57,DC,95,7F,66,6E,60,7E
DE  99 DATA E5,61,63,F0,65,64,57,
    2F,5C,4F,57,CE,75,C6,C6,C6
27  100 DATA C6,C6,C6,C6,C6,C6,75
    ,57,F1,5C,4E,57,CE,75,77,77
57  101 DATA 11,18,1B,1B,18,00,77
    ,77,03,1F,12,77,77,04,1E,1A
E1  102 DATA 07,1B,12,77,1E,19,04
    ,03,05,02,14,03,1E,18,19,04
F7  103 DATA 77,16,19,13,75,57,83
    ,5C,4D,57,CE,75,77,77,1E,03
FF  104 DATA 77,04,1F,18,02,1B,13
    ,77,15,12,77,07,18,04,04,1E
2D  105 DATA 15,1B,12,77,03,18,77
    ,14,18,19,01,12,05,03,77,16
A2  106 DATA 1B,1B,75,57,55,5B,4C
    ,57,CE,75,77,77,03,1F,18,04
F4  107 DATA 12,77,77,1A,02,1B,03
    ,1E,7A,07,16,05,03,77,77,07
96  108 DATA 05,18,10,05,16,1A,04
    ,77,1E,19,03,18,77,18,19,12
A0  109 DATA 75,57,67,5B,4B,57,CE
    ,75,77,77,18,05,77,16,03,77
99  110 DATA 1A,18,04,03,77,03,00
    ,18,77,07,16,05,03,04,79,1E
6D  111 DATA 03,77,1E,04,77,19,12
    ,14,12,04,04,16,05,0E,75,57
0B  112 DATA 09,5B,4A,57,CE,75,77
    ,77,1F,18,00,12,01,12,05,7B
D2  113 DATA 77,77,03,18,77,1C,19
    ,18,00,77,77,03,1F,12,77,04
BF  114 DATA 03,16,05,03,77,16,13
    ,13,05,12,04,04,75,57,DB,5B
F4  115 DATA 49,57,CE,75,77,77,18
    ,11,77,03,1F,12,77,07,05,18
4D  116 DATA 10,05,16,1A,77,00,1F
    ,1E,14,1F,77,14,16,19,77,15
A1  117 DATA 12,77,16,13,13,12,13
    ,77,03,18,75,57,ED,5B,48,57
D2  118 DATA CE,75,77,77,03,1F,12
    ,77,15,18,18,03,77,11,1E,1B
71  119 DATA 12,77,18,05,77,16,04
    ,77,16,77,1B,1E,19,12,77,19
F8  120 DATA 02,1A,15,12,05,77,03
    ,18,75,57,BF,5B,77,57,CE,75
68  121 DATA 77,77,03,1F,12,77,1A
    ,16,1E,19,77,11,1E,1B,12,77
A1  122 DATA 77,77,77,77,77,77,12
    ,79,10,79,77,66,67,77,04,0E
D2  123 DATA 04,77,65,67,61,66,75
    ,57,AD,5B,76,57,DC,95,7F,66
EE  124 DATA 6E,60,7E,E5,61,63,F0
    ,64,64,57,44,5A,75,57,DC,16
0D  125 DATA E5,67,F0,16,E5,66,6D
    ,C4,75,1A,12,1A,66,75,7B,6F
74  126 DATA 7B,66,57,78,5A,74,57
    ,DC,16,E5,66,F0,16,E5,65,6D
1E  127 DATA C4,75,1A,12,1A,65,75
    ,7B,6F,7B,66,57,69,5A,73,57
CC  128 DATA DC,95,7F,66,6E,60,7E
    ,E5,61,63,F0,64,61,57,10,5A
F1  129 DATA 72,57,CE,90,7F,66,63
    ,60,7E,57,21,5A,71,57,CE,75
C3  130 DATA 77,77,66,79,77,77,77
    ,1B,18,16,13,77,1E,19,77,07
E1  131 DATA 05,18,10,05,16,1A,77
    ,11,18,05,77,14,18,19,01,12
5E  132 DATA 05,04,1E,18,19,57,F2
    ,5A,70,57,CE,6D,CE,75,77,77
AD  133 DATA 65,79,77,77,77,07,05
    ,12,04,04,77,05,12,7A,04,12
CB  134 DATA 03,77,04,00,1E,03,14
    ,1F,77,1E,11,77,05,12,06,02
CA  135 DATA 1E,05,12,13,57,94,5A
    ,7F,57,CE,6D,CE,75,77,77,64
CA  136 DATA 79,77,77,77,1B,18,16
    ,13,70,1A,12,1A,66,70,7B,6F
08  137 DATA 7B,66,57,86,5A,7E,57
    ,CE,6D,CE,75,77,77,63,79,77
14  138 DATA 77,77,1B,18,16,13,70
    ,1A,12,1A,65,70,7B,6F,7B,66
7B  139 DATA 57,5A,59,7D,57,CE,6D
    ,CE,75,77,77,62,79,77,77,77
A9  140 DATA 04,0E,04,6F,65,6F,77
    ,03,18,77,04,16,01,12,77,07
4A  141 DATA 05,18,10,05,16,1A,77
    ,07,16,05,03,04,57,63,59,7C
E8  142 DATA 57,CE,6D,CE,75,77,77
    ,77,77,77,77,77,1A,16,1E,19
77  143 DATA 77,07,16,05,03,77,73
    ,67,6F,67,66,77,7A,77,73,14
FF  144 DATA 11,11,11,57,0C,59,7B
    ,57,CE,6D,CE,75,77,77,77,77
21  145 DATA 77,77,77,1C,12,05,19
    ,16,1B,77,77,77,77,73,13,67
08  146 DATA 67,67,77,7A,77,73,11
    ,11,11,11,57,05,59,7A,57,CE
D1  147 DATA 6D,CE,75,77,77,77,77
    ,77,77,77,15,18,18,03,77,77
71  148 DATA 77,77,77,77,73,67,6F
    ,67,66,77,7A,77,73,64,11,11
1F  149 DATA 11,57,FB,59,79,57,CE
    ,6D,CE,75,77,77,61,79,77,77
28  150 DATA 77,14,05,02,19,14,1F
    ,77,14,18,13,12,77,03,18,77
67  151 DATA 04,16,01,12,77,1A,12
    ,1A,18,05,0E,57,89,59,78,57
87  152 DATA CE,6D,CE,6D,CE,75,77
    ,1C,12,05,19,16,1B,77,1E,04
6D  153 DATA 77,04,16,01,12,13,77
    ,15,12,03,00,12,12,19,77,77
1C  154 DATA 73,66,67,67,67,77,71
    ,77,73,64,11,11,11,57,58,58
C0  155 DATA 67,57,CE,6D,CE,75,15
    ,18,18,03,77,07,16,05,03,77
4B  156 DATA 05,12,1B,18,14,16,03
    ,12,04,77,1C,12,05,19,16,1B
03  157 DATA 77,16,02,03,18,1A,16
    ,03,1E,14,16,1B,1B,0E,57,76
3D  158 DATA 58,66,57,DC,95,7F,66
    ,6E,60,7E,E5,61,63,F0,63,6E
D8  159 DATA 57,7B,58,65,57,C9,61
    ,62,66,65,61,57,65,58,64,57
D8  160 DATA 6D,57,0C,58,63,57,6D
    ,6D,6D,6D,6D,6D,6D,6D,6D,6D
96  161 DATA 6D,6D,6D,6D,6D,6D,6D
    ,6D,6D,6D,6D,6D,6D,6D,6D,6D
C1  162 DATA 6D,6D,6D,6D,6D,6D,6D
    ,6D,6D,6D,57,D3,58,62,57,6D
D4  163 DATA 6D,6D,6D,6D,6D,6D,6D
    ,6D,6D,6D,6D,6D,6D,6D,6D,6D
18  164 DATA 6D,6D,6D,6D,6D,6D,6D
    ,6D,6D,6D,6D,6D,6D,6D,6D,6D
FF  165 DATA 6D,6D,6D,57,FA,58,61
    ,57,6D,6D,77,77,77,77,77,77
89  166 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
E6  167 DATA 77,77,77,77,77,77,77
    ,77,77,77,6D,6D,57,83,58,60
BC  168 DATA 57,6D,6D,77,77,77,D8
    ,12,1A,15,12,05,77,00,1F,12
62  169 DATA 19,77,0E,18,02,77,03
    ,16,1C,12,77,03,1F,12,77,77
BE  170 DATA 77,6D,6D,57,AA,58,6F
    ,57,6D,6D,77,77,77,77,77,77
CC  171 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
57  172 DATA 77,77,77,77,77,77,77
    ,77,77,77,6D,6D,57,73,47,6E
F9  173 DATA 57,6D,6D,77,77,77,14
    ,05,12,13,1E,03,77,D6,77,03
79  174 DATA 1F,1E,04,77,77,07,05
    ,18,10,05,16,1A,1A,12,77,77
F5  175 DATA 77,6D,6D,57,1A,47,6D
    ,57,6D,6D,77,77,77,77,77,77
D7  176 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
87  177 DATA 77,77,77,77,77,77,77
    ,77,77,77,6D,6D,57,21,47,6C
CF  178 DATA 57,6D,6D,77,77,77,03
    ,1F,16,03,77,1A,16,19,0E,77
95  179 DATA 1F,18,02,05,04,77,00
    ,12,05,12,77,04,07,12,19,03
D1  180 DATA 77,77,77,6D,6D,57,CB
    ,47,6B,57,6D,6D,77,77,77,77
1A  181 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
4B  182 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,6D,6D,57,94
5D  183 DATA 47,6A,57,6D,6D,77,77
    ,77,15,0E,77,03,1F,12,77,16
56  184 DATA 02,03,1F,E7,77,F3,77
    ,C3,77,77,0E,18,02,77,77,77
80  185 DATA 6D,6D,57,BB,47,69,57
    ,6D,6D,77,77,77,77,77,77,77
1D  186 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
FA  187 DATA 77,77,77,77,77,77,77
    ,77,77,6D,6D,57,44,46,68,57
C8  188 DATA 6D,6D,77,77,77,03,1E
    ,1A,12,77,04,18,77,14,18,1A
64  189 DATA 12,77,C6,77,15,12,77
    ,16,77,04,07,E7,03,77,77,77
33  190 DATA 6D,6D,57,68,46,17,57
    ,6D,6D,77,77,77,77,77,77,77
60  191 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
03  192 DATA 77,77,77,77,77,77,77
    ,77,77,6D,6D,57,36,46,16,57
06  193 DATA 6D,6D,77,77,77,F8,77
    ,10,1E,01,12,77,77,03,1F,12
40  194 DATA 77,77,1F,C6,18,02,05
    ,04,77,77,F3,77,77,77,6D,6D
8A  195 DATA 57,00,46,15,57,6D,6D
    ,77,77,77,77,77,77,77,77,77
68  196 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
69  197 DATA 77,77,77,77,77,77,77
    ,6D,6D,57,E5,46,14,57,6D,6D
21  198 DATA 77,77,77,03,1F,12,77
    ,16,02,03,1F,E7,77,77,77,77
7C  199 DATA 77,77,77,13,12,04,77
    ,16,1B,1B,16,19,77,77,77,6D
20  200 DATA 6D,57,8C,46,13,57,6D
    ,6D,77,77,77,77,77,77,77,77
EE  201 DATA 77,77,77,77,77,77,77
    ,77,77,77,77,77,77,77,77,77
E9  202 DATA 77,77,77,77,77,77,77
    ,77,6D,6D,57,55,45,12,57,6D
40  203 DATA 6D,77,77,77,65,6F,77
    ,16,03,1C,1E,19,04,C6,77,13
```

```
A7  204 DATA 05,1E,01,12,77,77,77
        ,19,70,07,E7,03,77,77,77,6D
A5  205 DATA 3A,00,28,12,46,00,3A
        ,3A,20,20,20,20,20,20,20,20
41  206 DATA 20,20,20,20,20,20,20
        ,20,20,20,20,20,20,20,20,20
47  207 DATA 20,20,20,20,20,20,20
        ,20,3A,3A,00,54,12,47,00,3A
47  208 DATA 3A,3A,3A,3A,3A,3A,3A
        ,3A,3A,3A,3A,3A,3A,3A,3A,3A
26  209 DATA 3A,3A,3A,3A,3A,3A,3A
        ,3A,3A,3A,3A,3A,3A,3A,3A,3A
DD  210 DATA 3A,3A,3A,00,7D,12,48
        ,00,3A,3A,3A,3A,3A,3A,3A,3A
A4  211 DATA 3A,3A,3A,3A,3A,3A,3A
        ,3A,3A,3A,3A,3A,3A,3A,3A,3A
A8  212 DATA 3A,3A,3A,3A,3A,3A,3A
        ,3A,3A,3A,3A,3A,00,00,00,00
6D  213 DATA 41,00,81,00,00,00,00
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
B9  214 DATA EE,EE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
B5  215 DATA A9,1D,8D,10,08,A9,08
        ,8D,11,08,A9,00,85,FB,A9,08
2F  216 DATA 85,FC,A0,12,B1,FB,49
        ,57,91,FB,C8,D0,F7,E6,FC,A5
3F  217 DATA FC,C9,12,D0,EF,60,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
3D  218 DATA EE,EE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
7C  219 DATA EE,EE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
B3  220 DATA EE,EE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
21  221 DATA A2,00,BD,0D,08,9D,A7
        ,02,E8,E0,59,D0,F5,4C,B7,02
7F  222 DATA 78,A9,34,85,01,A0,00
        ,84,FB,84,FD,A9,10,85,FC,A9
F6  223 DATA D0,85,FE,B1,FB,91,FD
        ,C8,D0,F9,E6,FC,E6,FE,D0,F3
B2  224 DATA A9,37,85,01,58,A9,0
        ,AA,A8,20,BA,FF,A9,04,A2,FA
43  225 DATA A0,02,20,BD,FF,A9,0
        ,20,D5,FF,20,60,A6,20,8E,A6
71  226 DATA 4C,AE,A7,4D,41,49,4
        ,00,00,EE,EE,EE,EE,EE,EE,EE
7E  227 DATA A9,36,85,01,A9,01,8
        ,2B,A9,08,85,2C,A9,E9,8D,FE
A5  228 DATA 03,A9,D0,8D,FF,03,2
        ,CE,03,78,A9,34,85,01,A0,00
2F  229 DATA 84,2B,84,FB,84,FD,A
        ,10,85,2C,85,FC,A9,D0,85,FE
46  230 DATA B1,FD,91,FB,C8,D0,F
        ,E6,FC,E6,FE,D0,F3,A9,37,85
7D  231 DATA 01,58,A9,ED,8D,FE,0
        ,A9,40,8D,FF,03,20,CE,03,A9
14  232 DATA 00,A8,84,FB,A2,08,8
        ,FC,91,FB,C8,D0,FB,E6,FC,A6
7E  233 DATA FC,E0,10,D0,F3,A2,0
        ,BD,F5,03,9D,01,08,E8,E0,09
53  234 DATA D0,F5,A2,00,BD,A7,0
        ,9D,00,08,E8,E0,59,D0,F5,A9
F3  235 DATA 01,85,2B,A9,08,85,2
        ,A9,F1,8D,FE,03,20,CE,03,4C
72  236 DATA 66,FE,A9,08,AA,A8,2
        ,BA,FF,A9,04,AE,FE,03,A0,03
B3  237 DATA 20,BD,FF,A9,2B,A2,0
        ,AC,FF,03,4C,D8,FF,4D,41,49
24  238 DATA 4E,4B,45,52,4E,42,4
        ,4F,54,08,08,00,00,9E,32,30
69  239 DATA 36,31,00,00,EE,EE,E
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
8C  240 DATA A0,00,A8,85,FB,85,F
        ,A9,80,85,FC,A9,08,85,FE,B1
BF  241 DATA FB,91,FD,C8,D0,F9,E
        ,FC,E6,FE,A5,FC,C9,A0,D0,EF
DB  242 DATA A2,00,BD,00,8B,9D,A
        ,02,E8,E0,59,D0,F5,A2,00,BD
76  243 DATA 60,08,9D,3C,03,E8,E
        ,C4,D0,F5,A9,00,AA,A8,20,BA
77  244 DATA FF,A9,0C,A2,D0,A0,B
        ,20,BD,FF,A9,01,85,2B,A9,08
CA  245 DATA 85,2C,A9,2B,A2,D0,A
        ,12,20,D8,FF,A9,04,A2,E0,A0
FA  246 DATA BC,20,BD,FF,A9,A7,8
        ,2B,A9,02,85,2C,A9,2B,A2,00
1C  247 DATA A0,03,20,D8,FF,A9,0
        ,A2,E8,A0,8C,20,BD,FF,A9,3C
3B  248 DATA 85,2B,A9,03,85,2C,A
        ,2B,A2,00,A0,04,20,D8,FF,4C
1F  249 DATA 66,FE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
01  250 DATA 4D,45,4D,4F,52,59,20
        ,53,41,56,45,52,EE,EE,EE,EE
29  251 DATA 4D,45,4D,31,EE,EE,EE
        ,EE,4D,45,4D,32,EE,EE,EE,EE
23  252 DATA EE,EE,EE,EE,EE,EE,EE
        ,EE,EE,EE,EE,EE,EE,EE,EE,EE
C7  253 :
C4  254 :
FF  255 ::::::::::::::::::::::::::::
        :::::::::::
A4  256 :  MEMORY SAVER     BY LE
        S ALLAN   :
0D  257 :  28 ATKINSON DRIVE  NEW
        PORT IW   :
B3  258 ::::::::::::::::::::::::::::
        :::::::::::
```

DISC DRIVE £125 ex VAT

Enhancer 2000 and Free Software

- *On sale in computer stores across the USA
- *CBM64, Plus 4 compatible
- *Super high speed–it's fast
- *1 year warranty–it's reliable
- *Does not use any computer memory–it's smart
- *Free Utility Bonus Disc
- *5¼" DD
- *£143.75 plus £5 p&p. Total £148.75

BLANK DISCS

£8.69 ex VAT

10 discs per box

- *Double sided, double density
- *Hub reinforced,

100% certification, 2 notches and index holes. Ring now for great service and double storage.

- *£9.99 plus £1 p&p/box

FIRSTLINE SOFTWARE–
Your firstline of supplies

Write for full details or phone Access 0480 213969
Cheques payable to R.E. Ltd.,
206 Great North Road, Eaton Socon, St. Neots, Cambs. PE19 3EF.

PRINTER OFFER
CITIZEN 120D
120cps; NLQ 25cps; 2 yr. guarantee
ONLY £185 ex VAT
p + p £5. Total £217.75

Split Sprite

Many programmers find that sprite manipulation can be hard work. Perhaps this program will make things a little easier.

By S.J. Chance

While developing a machine code program recently, after the initial paperwork I thought it might be constructive to do a 'rough sketch' of it in Basic. Slow it might be, but it's a good way to flush out a few errors in logic and structure, which might otherwise only be uncovered after hours wasted producing redundant code.

I immediately ran into a problem. I intended to use more than eight hardware sprites in the program, and of course it is quite impossible to write a raster-interrupt routine in Basic. For the sake of thoroughness, I shall explain the nature of raster interrupts for the uninitiated.

The image on your monitor screen is drawn by an electron beam scanning across the screen in a series of horizontal lines, each line starting just below the previous one. This pattern of lines is called a raster.

Now as we all know, the VIC chip in a 64 supports eight hardware sprites. However, if you put your sprites at the top of the screen, and then use a raster interrupt to find out when the raster has travelled far enough down the screen to have drawn these sprites, you can then reposition them further down the screen so that when the raster gets to their new location, it draws them all over again. And when you reposition the sprites you can also change their colour and definition.

I decided to write a routine which would make raster-interrupt sprites available from Basic. This was quite easy to do, but created a new problem. I had settled on a screen format of five zones, (see Fig.1) which meant that my routine was being called 250 times per second. With all that going on, Basic was running at about 1/4 of its normal speed. With potentially 40 sprites to manipulate in addition to whatever else it was doing, it became clear that Basic would need helping out.

I extended Basic with a set of extra commands to set sprite parameters and move them around. Although this slowed down the interpreter even more, the new commands were more efficient and therefore resulted in a net increase in speed. These commands are listed in Figure 2, and I will say more about them later.

Returning to Figure 1, you will see that it shows the screen divided into zones 0 to 4, and link spaces 0 to 3. The zones are the areas in which the top edge of an unexpanded sprite can be positioned such that the sprite is clear of the raster-interrupt divisions above and below it.

If a sprite is positioned in link space, part of it will lie across the raster-interrupt line and will be drawn with the sprite parameters for the adjacent zone. To prevent the sprite from looking as if it has been torn in half, it must be 'linked' to the equivalent sprite in the next zone, i.e. that sprite must share the same parameters. If that all seems a bit of a headache, it will become clearer later on

Understanding the Commands

Looking again at Figure 2, all the commands are prefixed by the £ symbol. This is not intended as a source of inspiration, but rather to divert handling of the commands away from the normal interpreter. You will see that many of the commands use the syntax

[zone],[sprite]

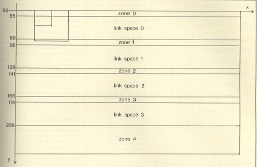


fig 1

where zone=0 to 4 and sprite=0 to 7. From now on I shall refer to a specific sprite by these parameters e.g. sprite 3,6 is sprite number 6 in zone 3.

Having said that, the Basic extension supports a far easier way of specifying a sprite. Consider the command £YPO in Figure 2. When positioning a sprite with this command, it is important that the y co-ordinate falls within the specified zone. This is easy enough to do using Figure 1, but there is an alternative syntax. This is to assign an integer array element to the sprite, replacing [zone], [sprite] in the syntax. For instance, suppose I give the command

```
£YPO 2,6,130
```

positioning sprite 6 in zone 2 at y=130. This is correct as y=130 falls within zone 2. However, if I give the command

```
£YPO C%(6),130
```

the sprite will be positioned exactly as before, and the correct zone number will be written into C%(6). i.e. C%(6) will now equal 2.

```
£YPO C%(6),150
```

will move the sprite into link space 2, so it will automatically by 'linked' to sprite 3,6 i.e. its parameters will be copied into sprite 3,6 . C%(6) will still equal 2.

```
£YPO C%(6),170
```

moves sprite C%(6) into zone 3. Sprite 2,6 will automatically be disabled, and the value of C%(6) will change to 3.

Using this system, it is quite

Figure 2

£VIS [zone],[sprite]	enable sprite (i.e. make sprite VISible.
£OFF [zone],[sprite]	disable sprite.
£XPO [zone],[sprite],[x co-ordinate]	set X Position.
£YPO [zone],[sprite],[y co-ordinate]	set Y Position.
£FRM [zone],[sprite],[definition no.]	set pointer to sprite definition (i.e. FRaMe)

£MNO [zone],[sprite]	set sprite to hi-res mode (i.e. MoNO).
£MUL [zone],[sprite]	set sprite to MULti-colour mode.
£COL [zone],[sprite]	set sprite COLour.
£MCO [zone],[colour]	set MultiColour 0.
£MC1 [zone],[colour]	set MultiColour 1.
£STX [zone],[sprite]	STretch X.
£STY [zone],[sprite]	STretch Y.
£FRT [zone],[sprite]	set priority: sprite in FRonT.
£BAK [zone],[sprite]	set priority: sprite at BAcK.
£ACT [zone],[sprite],[integer array element]	returns 1 in ARRAY% (SPRITE) if sprite is on (i.e. ACTive); returns 0 if sprite is off.
£HIT [zone],[sprite],[integer array element]	returns 0 in ARRAY% (SPRITE) if no collision; 1 if sprite to sprite; 2 if sprite to data; 3 if both.
£MOV [sprite integer array],[x offset], [y offset],[number of moves],[x integer array], [y integer array]	MOVes sprite through (x,y) for set number of moves, storing the new co-ordinates in XARRAY%(SPRITE), YARRAY%(SPRITE).
£P [pace]	sets the Pace of BASIC relative to the movement of sprites, from 0 to 200. 0: BASIC slow/sprites fast 200: BASIC fast(ish)/ sprites slow
£R	stops all sprites being MOVed, and clears LINK table, (i.e. Resets).
£Q	Quits split sprite.
SYS 49152	cold start.
SYS 49155	warm start.

painless to move sprites vertically about the screen, as long as the relevant sprite in the next zone is available. A sprite expanded in the y-axis (see £STY) will always need to be linked. £YPO takes this into account, but the sprite must be expanded before £YPO is called.

This alternative syntax can be used with all the commands with the [zone],[sprite] parameters, in which case these commands will affect the 'linked' sprite also. However, please note that the INTEGER ARRAY must be declared before it is referred to by one of these commands. This often occurs naturally when an initial value is assigned to an element in the array, but if not, an "undef'd statement" error message will be given.

Moving Sprites

A command which takes this idea even further is £MOV. This command moves a sprite by hooking it on to what I call an 'interject' routine, which is like an interrupt routine, but more polite, as it waits for Basic to finish its present command before taking over: a sort of multi-tasking.

```
£MOV C%(7),-2,4,10,CX%(7),CY%(7)
```

will move sprite C%(7) from (x,y) to (x-2,y+4) 10 times, each time storing the new co-ordinates in CX%(7),CY%(7). The frequency of these moves against the speed of Basic is controlled by the £P [pace] command where pace can have any value between zero and 200. Again, the relevant arrays must be declared before the command is used. Up to 20 sprites may be £MOVed at any one time.

Other commands which pass values to an array are £ACT and £HIT.

The Demo

Listed with the SPLIT SPRITE LOADER is a demonstration program using many of the new commands. It is probably most constructive to RUN this while following the listing, which I have tried to make as clear as possible. The program waits between the main sections so you can work out what is going on.

Before loading the demo program, make sure you have run the one line

DEMO SET-UP program, which moves the bottom of Basic up to $0A00 to make room for the sprite definitions.

When running the demonstration program, please note the last section which uses the £HIT command to detect collisions. As the sprites move back and forth, every so often they demonstrate a weakness in the system, when a perfectly good collision is not registered. This is because it takes a finite time to transfer all the data to and from the VIC registers at each interrupt, and as a result it sometimes happens that VIC is looking in the wrong direction when the collision occurs. In fact there are some dead spots in mid 'link space' where no collisions are registered at all. If this proves critical, it often helps to use a different sprite number, or engineer the collision to occur at a different point. Alternatively, a more reliable system is to check for collision by comparing the array elements containing the sprite co-ordinates.

When writing a program using SPLIT SPRITE, it is important to remember that changing a line of Basic, or re-RUNning the program clears all the variables. If there is still a sprite hooked onto the MOV routine, when you next enter any Basic command, the MOV routine will be called and will be unable to locate the relevant arrays. This will give an error message, which does not really matter, but the way to avoid it is to execute £R beforehand.

SPLIT SPRITE itself is presented here as a Basic Loader. When POKEd into memory, the program resides at $C000 — $CD07. Life will obviously move faster if, once loaded, you save this block of memory for future use, with a machine code monitor.

The program uses the rest of the $C-block along with $02B6 — $02DD to store variables, and is initialised by SYS 49152.

A final thought: if you do write a masterpiece with SPLIT SPRITE and intend to save it to tape, make sure you £Quit the program first to avoid timing problems, as I would hate to be responsible for the kind of grief I experienced when, while writing SPLIT SPRITE and preparing to make a back-up copy of my work so far, I accidentally re-formatted the only disk I had it on. Augh! YC

```
PROGRAM: SPLIT LOADER

09   10 A=49152:B=1000
24   20 FORZ=0TO158:C=0:FORY=0TO2
     0
72   30 READD$:HB$=LEFT$(D$,1):LB
     $=RIGHT$(D$,1)
78   40 HB=VAL(HB$):IFASC(HB$)>57
     THENHB=ASC(HB$)-55
86   50 LB=VAL(LB$):IFASC(LB$)>57
     THENLB=ASC(LB$)-55
4A   60 D=HB*16+LB:C=C+D:POKEA,D:
     A=A+1:NEXT
EE   70 READCHECK:IFCHECK<>CTHENG
     OTO90
60   80 PRINTB:B=B+10:NEXT:END
7A   90 PRINT"ERROR IN LINE"B:STO
     P
98   1000 DATA 20,27,CA,A9,18,8D,
     B6,02,A9,4A,8D,B7,02,A9,72,8
     D,B8,02,A9,9A,8D,2434
90   1010 DATA B9,02,A9,C2,8D,BA,
     02,78,A9,49,8D,14,03,A9,C0,8
     D,15,03,A9,01,8D,2242
42   1020 DATA 1A,D0,AD,B6,02,8D,
     12,D0,AD,11,D0,29,7F,8D,11,D
     0,A9,F0,8D,08,03,2451
AE   1030 DATA A9,C1,8D,09,03,58,
     60,4C,BC,FE,AD,19,D0,29,01,F
     0,F6,A5,FB,48,A5,2804
7E   1040 DATA FC,48,A5,FD,48,A5,
     FE,48,38,AD,12,D0,CD,BA,02,9
     0,30,A9,C8,85,FD,3113
CC   1050 DATA A9,CE,85,FE,A9,90,
     85,FB,A9,CE,85,FC,20,3A,C1,A
     D,B6,02,8D,12,D0,3226
AB   1060 DATA 68,85,FE,68,85,FD,
     68,85,FC,68,85,FB,EE,BE,02,A
     D,BE,02,C9,03,B0,3133
55   1070 DATA 06,EE,DA,02,4C,46,
     C0,A9,00,8D,BE,02,4C,31,EA,C
     D,B9,02,90,1C,A9,2396
69   1080 DATA 90,85,FD,A9,CE,85,
     FE,A9,58,85,FB,A9,CE,85,FC,2
     0,3A,C1,AD,BA,02,3337
D8   1090 DATA 8D,12,D0,4C,26,C1,
     CD,B8,02,90,1C,A9,58,85,FD,A
     9,CE,85,FE,A9,20,2843
5A   1100 DATA 85,FB,A9,CE,85,FC,
     20,3A,C1,AD,B9,02,8D,12,D0,4
     C,26,C1,CD,B7,02,2851
CE   1110 DATA 90,1C,A9,20,85,FD,
     A9,CE,85,FE,A9,E8,85,FB,A9,C
     E,85,FC,20,3A,C1,3348
A4   1120 DATA AD,B8,02,8D,12,D0,
     4C,26,C1,CD,B6,02,90,1C,A9,E
     8,85,FD,A9,CD,85,2888
1D   1130 DATA FE,A9,C8,85,FB,A9,
     CE,85,FC,20,3A,C1,AD,B7,02,8
     D,12,D0,4C,26,C1,3082
E0   1140 DATA A9,01,8D,19,D0,68,
     85,FE,68,85,FD,68,85,FC,68,8
     5,FB,4C,BC,FE,A0,3180
AD   1150 DATA 00,B1,FD,99,00,D0,
     C8,C0,11,D0,F6,A0,15,B1,FD,9
     9,00,D0,A0,17,B1,2986
7C   1160 DATA FD,99,00,D0,A0,1B,
     B1,FD,99,00,D0,C8,C0,1E,D0,F
     6,A0,25,B1,FD,99,3248
9A   1170 DATA 00,D0,C8,C0,2F,D0,
     F6,A2,00,B1,FD,9D,F8,07,E8,C
     8,C0,37,D0,F5,A0,3397
4F   1180 DATA 1E,B9,00,D0,11,FB,
     91,FB,C8,B9,00,D0,11,FB,91,F
     B,60,AD,BD,02,0A,2814
87   1190 DATA A8,B1,FB,91,FD,C8,
     B1,FB,91,FD,A0,10,20,CE,C1,A
     0,15,20,CE,C1,A0,3399
B4   1200 DATA 17,20,CE,C1,A0,1B,
     20,CE,C1,A0,1C,20,CE,C1,A0,1
     D,20,CE,C1,A9,27,2519
3A   1210 DATA 18,6D,BD,02,A8,B1,
     FB,91,FD,A9,2F,18,6D,BD,02,A
     8,B1,FB,91,FD,60,2940
B0   1220 DATA A9,00,AE,BD,02,E8,
     38,2A,CA,D0,FC,8D,BF,02,31,F
     B,F0,05,11,FD,91,2820
64   1230 DATA FD,60,A9,FF,38,ED,
     BF,02,31,FD,91,FD,60,A5,7A,8
     D,C9,02,A5,7B,8D,3115
23   1240 DATA CA,02,20,73,00,C9,
     5C,D0,0A,20,73,00,C9,52,D0,0
     3,4C,BB,CC,AD,C9,2344
B9   1250 DATA 02,85,7A,AD,CA,02,
     85,7B,AD,DA,02,CD,DB,02,90,0
     3,20,49,CB,20,73,2311
C3   1260 DATA 00,C9,5C,F0,0C,4C,
     E7,A7,AD,D9,02,F0,01,60,4C,A
     E,A7,A9,00,8D,D9,2692
08   1270 DATA 02,20,73,00,C9,51,
     D0,03,4C,FB,C9,C9,52,D0,03,4
     C,BB,CC,C9,50,D0,2620
08   1280 DATA 03,4C,E9,CC,8D,C0,
     02,20,73,00,8D,C1,02,20,73,0
     0,8D,C2,02,20,2C,1894
A5   1290 DATA C7,E6,7A,D0,02,E6,
     7B,20,8A,AD,20,F7,B7,A5,14,C
     9,05,90,05,A2,0E,2635
ED   1300 DATA 4C,37,A4,8D,C3,02,
     AD,D2,02,D0,0E,20,FD,AE,20,8
     A,AD,20,F7,B7,A5,2669
26   1310 DATA 14,8D,C5,02,AE,C3,
     02,20,87,C4,AD,C3,02,20,80,C
     8,B9,06,CD,8D,D5,2574
E0   1320 DATA 02,AD,C0,02,C9,4D,
     F0,2B,C9,53,F0,2A,C9,4F,F0,2
     9,C9,58,F0,28,C5,2827
78   1330 DATA 59,F0,27,C9,56,F0,
     26,C9,43,F0,25,C9,46,F0,24,C
     9,42,F0,23,C9,48,2840
F2   1340 DATA F0,22,C9,41,F0,21,
     4C,53,C4,4C,F4,C2,4C,16,C3,4
     C,2A,C3,4C,37,C3,2614
C6   1350 DATA 4C,44,C3,4C,51,C3,
     4C,5E,C3,4C,68,C3,4C,78,C3,4
     C,85,C3,4C,92,C3,2646
CD   1360 DATA AD,C1,02,C9,43,F0,
     0F,C9,55,F0,0E,C9,4E,F0,0D,C
     9,4F,F0,0C,4C,53,2654
78   1370 DATA C4,4C,9F,C3,4C,B3,
     C3,4C,C0,C3,4C,7A,C4,AD,C1,0
     2,C9,54,F0,07,C9,3034
E4   1380 DATA 48,F0,06,4C,53,C4,
     4C,CD,C3,4C,59,C4,AD,C1,02,C
     9,46,F0,03,4C,53,2551
C6   1390 DATA C4,4C,E1,C3,AD,C1,
     02,C9,50,F0,03,4C,53,C4,4C,E
     E,C3,AD,C1,02,C9,3017
3C   1400 DATA 50,F0,03,4C,53,C4,
     4C,FB,C3,AD,C1,02,C9,49,F0,0
     3,4C,53,C4,4C,08,2524
97   1410 DATA C4,AD,C1,02,C9,4F,
     F0,03,4C,53,C4,4C,15,C4,AD,C
     1,02,C9,52,F0,03,2629
48   1420 DATA 4C,53,C4,4C,22,C4,
     AD,C1,02,C9,41,F0,03,4C,53,C
     4,4C,36,C4,AD,C1,2585
D7   1430 DATA 02,C9,49,F0,03,4C,
     53,C4,4C,43,C4,AD,C1,02,C9,4
     3,F0,03,4C,53,C4,2447
3F   1440 DATA 4C,6D,C4,AD,C2,02,
     C9,30,F0,07,C9,31,F0,06,4C,5
     3,C4,4C,1B,C9,4C,2477
70   1450 DATA 39,C9,AD,C2,02,C9,
     4C,F0,03,4C,53,C4,4C,34,C5,A
     D,C2,02,C9,4F,F0,2716
CF   1460 DATA 03,4C,53,C4,4C,52,
     C5,AD,C2,02,C9,58,F0,07,C9,5
     9,F0,06,4C,53,C4,2509
2E   1470 DATA 4C,70,C5,4C,8E,C5,
     AD,C2,02,C9,46,F0,03,4C,53,C
     4,4C,16,C5,AD,C2,2700
6B   1480 DATA 02,C9,4F,F0,03,4C,
     53,C4,4C,24,C6,AD,C2,02,C9,4
     F,F0,03,4C,53,C4,2437
95   1490 DATA 4C,8F,C6,AD,C2,02,
     C9,53,F0,03,4C,53,C4,4C,F8,C
     4,AD,C2,02,C9,4C,2834
28   1500 DATA F0,03,4C,53,C4,4C,
     E8,C8,AD,C2,02,C9,54,F0,07,C
     9,4D,F0,06,4C,53,2690
51   1510 DATA C4,4C,E8,C5,4C,B8,
     C8,AD,C2,02,C9,48,F0,03,4C,5
     3,C4,4C,06,C6,AD,2857
28   1520 DATA C2,02,C9,54,F0,03,
     4C,53,C4,4C,3E,C9,4C,2A,C2,2
     0,08,AF,4C,2A,C2,2257
B6   1530 DATA AD,C2,02,C9,58,F0,
     07,C9,59,F0,06,4C,53,C4,4C,A
     C,C5,4C,CA,C5,AD,2889
D3   1540 DATA C2,02,C9,54,F0,03,
     4C,53,C4,4C,C3,C9,AD,C2,02,C
     9,56,F0,03,4C,53,2609
BD   1550 DATA C4,4C,52,CA,A9,E8,
     85,FB,A9,CD,85,FC,E0,00,F0,1
     0,18,A5,FB,69,38,3181
D0   1560 DATA 85,FB,A5,FC,69,00,
     85,FC,CA,D0,F0,60,E0,08,90,0
     5,A2,0E,4C,37,A4,2889
06   1570 DATA E8,A9,00,38,2A,CA,
     D0,FC,11,FB,91,FB,60,E0,08,9
     0,05,A2,0E,4C,37,2609
56   1580 DATA A4,E8,A9,00,38,2A,
     CA,D0,FC,8D,C7,02,A9,FF,38,E
     D,C7,02,31,FB,91,3030
02   1590 DATA FB,60,E0,08,90,05,
     A2,0E,4C,37,A4,E8,A9,00,38,2
     A,CA,D0,FC,31,FB,2660
09   1600 DATA D0,C4,8D,D4,02,60,
     A9,01,8D,D4,02,60,A0,15,AE,C
     5,02,20,A4,C4,AD,2403
3C   1610 DATA D5,02,F0,0E,AD,D2,
     02,F0,09,20,AA,C8,AE,C5,02,2
     0,A4,C4,4C,2A,C2,2582
36   1620 DATA A0,15,AE,C5,02,20,
     BA,C4,AD,D5,02,F0,0E,AD,D2,0
     2,F0,09,20,AA,C8,2646
87   1630 DATA AE,C5,02,20,BA,C4,
     4C,2A,C2,A0,1C,AE,C5,02,20,A
     4,C4,AD,D5,02,F0,2680
9C   1640 DATA 0E,AD,D2,02,F0,09,
     20,AA,C8,AE,C5,02,20,A4,C4,4
     C,2A,C2,A0,1C,AE,2489
E9   1650 DATA C5,02,20,BA,C4,AD,
     D5,02,F0,0E,AD,D2,02,F0,09,2
     0,AA,C8,AE,C5,02,2664
CE   1660 DATA 20,BA,C4,4C,2A,C2,
     A0,1D,AE,C5,02,20,A4,C4,AD,D
     5,02,F0,0E,AD,D2,2705
0D   1670 DATA 02,F0,09,20,AA,C8,
     AE,C5,02,20,A4,C4,4C,2A,C2,A
     0,17,AE,C5,02,20,2318
8E   1680 DATA A4,C4,AD,D5,02,F0,
     0E,AD,D2,02,F0,09,20,AA,C8,A
     E,C5,02,20,A4,C4,2803
24   1690 DATA 4C,2A,C2,A0,1D,AE,
     C5,02,20,BA,C4,AD,D5,02,F0,0
     E,AD,D2,02,F0,09,2564
85   1700 DATA 20,AA,C8,AE,C5,02,
     20,BA,C4,4C,2A,C2,A0,17,AE,C
     5,02,20,BA,C4,AD,2644
23   1710 DATA D5,02,F0,0E,AD,D2,
     02,F0,09,20,AA,C8,AE,C5,02,2
     0,BA,C4,4C,2A,C2,2604
80   1720 DATA A0,1B,AE,C5,02,20,
     BA,C4,AD,D5,02,F0,0E,AD,D2,0
     2,F0,09,20,AA,C8,2652
1A   1730 DATA AE,C5,02,20,BA,C4,
     4C,2A,C2,A0,1B,AE,C5,02,20,A
     4,C4,AD,D5,02,F0,2679
31   1740 DATA 0E,AD,D2,02,F0,09,
     20,AA,C8,AE,C5,02,20,A4,C4,4
     C,2A,C2,20,FD,AE,2586
E8   1750 DATA 20,8A,AD,20,F7,B7,
     AD,C5,02,0A,A8,A5,14,91,FB,A
     D,D5,02,F0,0E,AD,2751
FD   1760 DATA D2,02,F0,09,98,18,
```

```
     69,38,A8,A5,14,91,FB,A0,10,A
     E,C5,02,A5,15,F0,2522
F3   1770 DATA 22,C9,01,F0,03,4C,
     16,C5,20,A4,C4,AD,D5,02,F0,1
     0,AD,D2,02,F0,08,2446
C1   1780 DATA 98,18,69,38,A8,AE,
     C5,02,20,A4,C4,4C,2A,C2,20,B
     A,C4,AD,D5,02,F0,2624
99   1790 DATA 10,AD,D2,02,F0,08,
     98,18,69,38,A8,AE,C5,02,20,B
     A,C4,4C,2A,C2,20,2288
DC   1800 DATA FD,AE,20,8A,AD,20,
     F7,B7,AD,C5,02,0A,A8,C8,A5,1
     5,F0,03,4C,16,C5,2706
CF   1810 DATA A5,14,91,FB,8D,C8,
     02,20,89,C8,AE,D2,02,F0,03,4
     C,80,C7,4C,2A,C2,2637
99   1820 DATA A9,00,8D,D3,02,AE,
     C5,02,A0,17,20,D9,C4,AD,D4,0
     2,D0,3E,AD,C8,02,2556
76   1830 DATA C9,37,90,28,C9,59,
     90,2D,EE,D3,02,C9,5F,90,20,C
     9,81,90,22,EE,D3,2802
A9   1840 DATA 02,C9,86,90,15,C9,
     A8,90,17,EE,D3,02,C9,AE,90,0
     A,C9,D0,90,0C,EE,2821
76   1850 DATA D3,02,4C,FE,C6,A9,
     00,8D,D6,02,60,A9,01,8D,D6,0
     2,60,AD,C8,02,C9,2562
9C   1860 DATA 59,90,F3,EE,D3,02,
     C9,81,90,EC,EE,D3,02,C9,A8,9
     0,E5,EE,D3,02,C9,3482
CE   1870 DATA D0,90,DE,EE,D3,02,
     4C,FE,C6,A5,7A,8D,C9,02,A5,7
     B,8D,CA,02,A9,00,2986
0F   1880 DATA 8D,D2,02,A9,80,8D,
     D1,02,8D,D0,02,A2,06,20,73,0
     0,C9,2C,F0,0D,C9,2367
C8   1890 DATA 25,F0,14,18,69,80,
     9D,C8,02,CA,D0,EC,AD,C9,02,8
     5,7A,AD,CA,02,85,2703
24   1900 DATA 7B,60,20,73,00,20,
     FA,AE,20,8A,AD,20,F7,B7,A5,1
     4,8D,C5,02,20,F7,2431
45   1910 DATA AE,A9,01,8D,D2,02,
     4C,59,C7,20,8A,C6,20,62,C8,A
     D,C5,02,8D,BD,02,2511
66   1920 DATA 20,88,C1,AD,D6,02,
     F0,0C,EE,D3,02,20,62,C8,CE,D
     3,02,20,88,C1,A0,2729
4B   1930 DATA 15,AE,C5,02,20,BA,
     C4,AD,C3,02,20,80,C8,B9,06,C
     D,F0,0F,AE,C3,02,2560
8C   1940 DATA E8,20,87,C4,A0,15,
     AE,C5,02,20,BA,C4,AE,D3,02,2
     0,87,C4,A0,15,AE,2668
DB   1950 DATA C5,02,20,A4,C4,AD,
     D6,02,F0,0F,AE,D3,02,E8,20,8
     7,C4,A0,15,AE,C5,2769
35   1960 DATA 02,20,A4,C4,AD,C3,
     02,20,80,C8,A9,00,99,06,CD,A
     D,D3,02,20,80,C8,2403
B9   1970 DATA AD,D6,02,99,06,CD,
     4C,FE,C7,A5,2F,85,FB,A5,30,8
     5,FC,A5,FB,C5,31,3138
C8   1980 DATA D0,06,A5,FC,C5,32,
     F0,32,A0,00,A2,06,B1,FB,DD,C
     B,02,D0,09,C8,CA,2969
E2   1990 DATA B1,FB,DD,C8,02,F0,
     23,18,A0,03,B1,FB,AA,88,B1,F
     B,65,FB,85,FB,8A,3352
CD   2000 DATA 65,FC,85,FC,A5,FB,
     C5,31,D0,D4,A5,FC,C5,32,D0,C
     E,A2,04,4C,37,A4,3359
FD   2010 DATA AD,C5,02,0A,18,65,
     FB,85,FB,A5,FC,69,00,85,FC,A
     D,D3,02,A0,08,91,2748
17   2020 DATA FB,4C,2A,C2,A9,E8,
     85,FD,A9,CD,85,FE,AE,D3,02,F
     0,10,18,A5,FD,69,3301
08   2030 DATA 38,85,FD,A5,FE,69,
     00,85,FE,CA,D0,F0,60,0A,0A,0
     A,18,6D,C5,02,A8,2629
```

```
D3   2040 DATA 60,98,AA,AD,C3,02,
     20,80,C8,B9,06,CD,F0,13,8A,A
     8,AE,C3,02,E8,20,2744
CF   2050 DATA 87,C4,A5,14,91,FB,
     AE,C3,02,20,87,C4,60,18,A5,F
     8,69,38,85,FB,A5,2892
41   2060 DATA FC,69,00,85,FC,60,
     20,FD,AE,20,8A,AD,20,F7,B7,A
     0,2F,AE,C5,02,E8,2914
10   2070 DATA CA,F0,04,C8,4C,C7,
     C8,A5,14,91,FB,AD,D5,02,F0,0
     E,AD,D2,02,F0,09,2978
DA   2080 DATA 98,18,69,38,A8,A5,
     14,91,FB,4C,2A,C2,20,FD,AE,2
     0,8A,AD,20,F7,B7,2662
DB   2090 DATA A9,27,18,6D,C5,02,
     C9,2F,B0,18,A8,A5,14,91,FB,A
     D,D5,02,F0,0E,AD,2555
C9   2100 DATA D2,02,F0,09,98,18,
     69,38,A8,A5,14,91,FB,4C,2A,C
     2,A2,0E,4C,37,A4,2330
DD   2110 DATA A0,25,AD,C5,02,91,
     FB,AD,D5,02,F0,0F,AD,D2,02,F
     0,0A,98,18,69,38,2580
0C   2120 DATA A8,AD,C5,02,91,FB,
     4C,2A,C2,A0,26,4C,1D,C9,20,F
     D,AE,A5,7A,D0,02,2708
0C   2130 DATA C6,7B,C6,7A,AD,C5,
     02,48,20,2C,C7,68,8D,C5,02,E
     6,7A,D0,02,E6,7B,2719
7C   2140 DATA 20,8A,AD,A0,1F,AE,
     C5,02,20,D9,C4,AE,C5,02,20,B
     A,C4,AD,D5,02,D0,2735
6F   2150 DATA 16,AD,D4,02,D0,11,
     98,18,69,38,A8,AE,C5,02,20,D
     9,C4,AE,C5,02,20,2362
C4   2160 DATA BA,C4,AD,D4,02,0A,
     8D,D3,02,A0,1E,AE,C5,02,20,D
     9,C4,AE,C5,02,20,2546
A3   2170 DATA BA,C4,AD,D5,02,D0,
     16,AD,D4,02,D0,11,98,18,69,3
     8,A8,AE,C5,02,20,2522
FC   2180 DATA D9,C4,AE,C5,02,20,
     BA,C4,18,AD,D4,02,6D,D3,02,8
     D,D3,02,4C,FE,C7,2816
9E   2190 DATA 20,FD,AE,A5,7A,D0,
     02,C6,7B,C6,7A,AD,C5,02,48,2
     0,2C,C7,68,8D,C5,2758
1E   2200 DATA 02,E6,7A,D0,02,E6,
     7B,AD,D2,02,D0,03,4C,53,C4,2
     0,8A,AD,A0,15,AE,2566
8A   2210 DATA C5,02,20,D9,C4,AD,
     D4,02,8D,D3,02,4C,FE,C7,78,A
     9,31,8D,14,03,A9,2585
12   2220 DATA EA,8D,15,03,A9,FE,
     2D,1A,D0,8D,1A,D0,58,A9,E4,8
     D,08,03,A9,A7,8D,2590
0C   2230 DATA 09,03,A9,00,8D,15,
     D0,E6,7A,D0,02,E6,7B,4C,2A,C
     2,A0,2A,A9,D0,99,2302
98   2240 DATA 05,CD,88,D0,FA,A2,
     E8,86,FB,A2,CD,86,FC,A2,09,A
     9,00,91,FB,E6,FB,3553
6E   2250 DATA D0,02,E6,FC,A5,FB,
     C9,00,D0,F0,A5,FC,C9,D0,D0,E
     A,60,AD,D2,02,D0,3714
E8   2260 DATA 03,4C,53,C4,A0,00,
     A2,14,B9,00,CF,D0,07,C8,B9,0
     0,CF,F0,0E,88,98,2441
07   2270 DATA 18,69,0C,A8,CA,D0,
     EC,A2,0F,4C,37,A4,88,8C,D7,0
     2,20,FD,AE,20,8A,2549
7F   2280 DATA AD,20,BF,B1,A5,65,
     AC,D7,02,99,02,CF,20,FD,AE,2
     0,8A,AD,20,BF,B1,2792
E4   2290 DATA A5,65,AC,D7,02,99,
     03,CF,20,FD,AE,20,8A,AD,20,F
     7,B7,A5,14,AC,D7,2854
F4   2300 DATA 02,8D,DC,02,A5,15,
     8D,DD,02,AD,D1,02,99,04,CF,A
     D,D0,02,99,05,CF,2411
15   2310 DATA AD,C3,02,99,06,CF,
     AD,C5,02,99,07,CF,20,FD,AE,A
```

```
       5,7A,D0,02,C6,7B,2752
CE     2320 DATA C6,7A,AD,C5,02,48,
       20,2C,C7,68,8D,C5,02,E6,7A,D
       0,02,E6,7B,20,8A,2568
62     2330 DATA AD,AD,D2,02,D0,03,
       4C,53,C4,AC,D7,02,AD,D1,02,9
       9,08,CF,AD,D0,02,2648
D2     2340 DATA 99,09,CF,20,FD,AE,
       A5,7A,D0,02,C6,7B,C6,7A,AD,C
       5,02,48,20,2C,C7,2685
9D     2350 DATA 68,8D,C5,02,E6,7A,
       D0,02,E6,7B,20,8A,AD,AD,D2,0
       2,D0,03,4C,53,C4,2653
C3     2360 DATA AC,D7,02,AD,D1,02,
       99,0A,CF,AD,D0,02,99,0B,CF,A
       D,DC,02,AC,D7,02,2681
77     2370 DATA 99,00,CF,AD,DD,02,
       99,01,CF,4C,2A,C2,A9,01,8D,D
       9,02,8D,D2,02,AD,2472
33     2380 DATA 00,A2,14,8E,D8,02,
       B9,00,CF,D0,18,C8,B9,00,CF,D
       0,14,88,98,18,69,2406
27     2390 DATA 0C,A8,CE,D8,02,D0,
       EA,A9,00,8D,D9,02,8D,DA,02,6
       0,88,8C,D7,02,38,2581
34     2400 DATA B9,00,CF,E9,01,99,
       00,CF,B9,01,CF,E9,00,99,01,C
       F,B9,07,CF,8D,C5,2710
9C     2410 DATA 02,20,4C,CC,AE,D7,
       02,A0,08,18,BD,02,CF,71,FB,9
       1,FB,85,14,88,BD,2533
45     2420 DATA 02,CF,30,05,A9,00,
       4C,B1,CB,A9,FF,71,FB,91,FB,8
       5,15,C9,02,90,09,2581
EF     2430 DATA 20,1E,CC,20,16,C5,
       4C,AD,CC,20,1E,CC,20,2D,C6,1
       8,AD,D7,02,69,02,2032
86     2440 DATA 8D,D7,02,20,4C,CC,
       38,AD,D7,02,E9,02,8D,D7,02,A
       E,D7,02,A0,08,18,2292
F3     2450 DATA BD,03,CF,71,FB,91,
       FB,85,14,88,BD,03,CF,30,05,A
       9,00,4C,FB,CB,A9,2768
F4     2460 DATA FF,71,FB,91,FB,85,
       15,F0,09,20,1E,CC,20,16,C5,4
       C,AD,CC,20,1E,CC,2654
02     2470 DATA 20,98,C6,AC,D7,02,
       AD,D3,02,99,06,CF,4C,64,CB,A
       C,D7,02,B9,04,CF,2687
4E     2480 DATA 8D,D1,02,B9,05,CF,
       8D,D0,02,B9,06,CF,8D,C3,02,B
       9,07,CF,8D,C5,02,2575
16     2490 DATA AE,C3,02,20,87,C4,
       AD,C3,02,20,80,C8,89,06,CD,8
       D,D5,02,60,A5,2F,2524
F2     2500 DATA 85,FB,A5,30,85,FC,
       A5,2F,C5,31,D0,09,A5,30,C5,3
       2,D0,03,4C,88,CC,2795
47     2510 DATA AE,D7,02,A0,00,B1,
       FB,DD,08,CF,D0,08,C8,B1,FB,D
       D,09,CF,F0,26,18,2998
EF     2520 DATA A0,03,B1,FB,AA,88,
       B1,FB,65,FB,85,FB,8A,65,FC,8
       5,FC,A5,FB,C5,31,3599
A3     2530 DATA D0,D4,A5,FC,C5,32,
       D0,CE,20,88,CC,A2,04,4C,37,A
       4,AD,C5,02,0A,18,2788
25     2540 DATA 65,FB,85,FB,A5,FC,
       69,00,85,FC,60,A9,00,AC,D7,0
       2,99,00,CF,99,01,2811
FE     2550 DATA CF,4C,64,CB,A9,00,
       85,FB,A9,CF,85,FC,A0,00,A9,0
       0,91,FB,C8,D0,FB,3284
5A     2560 DATA A9,06,85,FB,A9,CD,
       85,FC,A9,00,91,FB,C8,C0,29,D
       0,F9,20,03,C0,E6,3230
ED     2570 DATA 7A,D0,02,E6,7B,4C,
       2A,C2,E6,7A,D0,02,E6,7B,20,8
       A,AD,20,F7,B7,A5,2882
AE     2580 DATA 14,C9,C9,B0,06,8D,
       D8,02,4C,2A,C2,A2,0E,4C,37,A
       4,00,00,00,00,00,1749
```

PROGRAM: DEMO SET-UP

```
AF   10 REM*********************
46   20 REM MOVE BOTTOM OF BASIC
BB   30 REM*********************
D3   40 POKE43,1:POKE44,10:POKE25
     60,0:NEW
```

PROGRAM: SPLIT-DEMO

```
A3   100 REM********************
33   110 REM READ IN SPRITE DATA
BF   120 REM********************
E2   130 A=2048:B=10000
60   140 FORZ=0TO24:C=0:FORY=0TO2
     0
71   150 READD$
69   160 HB$=LEFT$(D$,1):LB$=RIGH
     T$(D$,1)
2A   170 HB=VAL(HB$):IFASC(HB$)>5
     7THENHB=ASC(HB$)-55
B8   180 LB=VAL(LB$):IFASC(LB$)>5
     7THENLB=ASC(LB$)-55
55   190 D=HB*16+LB:C=C+D
77   200 IFA<2560THENPOKEA,D
5B   210 A=A+1:NEXT
F3   220 READ CHECK:IF CHECK<>C T
     HEN GOTO 240
3C   230 PRINTB:B=B+10:NEXT:GOTO2
     50
3C   240 PRINT"ERROR IN LINE"B:ST
     OP
35   250 REM*********************
     *
F6   260 REM PART 1: SET-UP ZONE
     0
80   270 REM*********************
     *
C3   280 SYS49152:REM COLD START
71   290 PRINT"[CLR]"
FB   300 £P 200:REM PACE BASIC FA
     ST/SPRITES SLOW
71   310 ZN=0:REM** ZN= ZONE (0-4
     )
A8   320 £MC0 ZN,0:REM SET MULTIC
     OLOR 0 TO BLACK
16   330 £MC1 ZN,14:REM SET MULTI
     COLOR 1 TO LT BLUE
85   340 FOR SP=0 TO 7:REM** SP=S
     PRITE (0-7)
D1   350 £MUL ZN,SP:REM** MULTICO
     LOUR ON
3E   360 READ F,C,X,Y
6D   370 A%(SP)=ZN:AX%(SP)=X:AY%(
     SP)=Y
7B   380 £FRM A%(SP),F:REM** SET
     SPRITE POINTER
0B   390 £COL A%(SP),C:REM** SET
     COLOUR
CC   400 £XPO A%(SP),X:REM** X CO
     -ORDINATE
3D   410 £YPO A%(SP),Y:REM** Y CO
     -ORDINATE
82   420 £VIS A%(SP):REM** ENABLE
      SPRITE
2D   430 NEXT
52   440 REM**************
9F   450 REM SET-UP ZONE 1
5E   460 REM**************
9A   470 ZN=1
19   480 £MC0 ZN,0
4D   490 £MC1 ZN,14
F0   500 FOR SP=0 TO 7
12   510 £MUL ZN,SP
5D   520 READ F,C,X,Y
E9   530 B%(SP)=ZN:BX%(SP)=X:BY%(
     SP)=Y
2C   540 £FRM B%(SP),F
CE   550 £COL B%(SP),C
34   560 £XPO B%(SP),X
C0   570 £YPO B%(SP),Y
D9   580 £VIS B%(SP)
D2   590 NEXT
D5   600 REM**************
27   610 REM SET-UP ZONE 2
A1   620 REM**************
F4   630 ZN=2
B8   640 £MC0 ZN,0
76   650 £MC1 ZN,14
D1   660 FOR SP=0 TO 7
9B   670 £MUL ZN,SP
7D   680 READ F,C,X,Y
30   690 C%(SP)=ZN:CX%(SP)=X:CY%(
     SP)=Y
8F   700 £FRM C%(SP),F
2F   710 £COL C%(SP),C
D3   720 £XPO C%(SP),X
21   730 £YPO C%(SP),Y
B8   740 £VIS C%(SP)
72   750 NEXT
35   760 REM**************
47   770 REM SET-UP ZONE 3
80   780 REM**************
56   790 ZN=3
D3   800 £MC0 ZN,0
97   810 £MC1 ZN,14
B2   820 FOR SP=0 TO 7
74   830 £MUL ZN,SP
9C   840 READ F,C,X,Y
12   850 D%(SP)=ZN:DX%(SP)=X:DY%(
     SP)=Y
61   860 £FRM D%(SP),F
0F   870 £COL D%(SP),C
31   880 £XPO D%(SP),X
0F   890 £YPO D%(SP),Y
98   900 £VIS D%(SP)
13   910 NEXT
14   920 REM**************
E0   930 REM SET-UP ZONE 4
E0   940 REM**************
B7   950 ZN=4
73   960 £MC0 ZN,0
37   970 £MC1 ZN,14
92   980 FOR SP=0 TO 7
D4   990 £MUL ZN,SP
BC   1000 READ F,C,X,Y
A3   1010 E%(SP)=ZN:EX%(SP)=X:EY%
     (SP)=Y
C0   1020 £FRM E%(SP),F
6F   1030 £COL E%(SP),C
97   1040 £XPO E%(SP),X
6D   1050 £YPO E%(SP),Y
4C   1060 £VIS E%(SP)
BD   1070 NEXT
F1   1080 REM********************
     *******
41   1090 REM PART 2: MOVE THINGS
      AROUND
5D   1100 REM********************
     *******
E7   1110 PRINT"[DOWN3]"TAB(7)"PR
     ESS SPACE BAR FOR ACTION!"
4F   1120 GETA$:IFA$<>" "GOTO1120

81   1130 PRINT"[CLR]":FORSP=1TO7
      STEP2
55   1140 £MOV A%(SP),0,-2,70,AX%
     (SP),AY%(SP)
1B   1150 NEXT:£P0:REM** BASIC SL
     OW/SPRITES FAST
46   1160 ZO%(0)=0
AB   1170 £ACT 0,1,ZO%(1):IFZO%(1
     )>0GOTO1170:REM** HAVE SPRIT
     ES CLEARED ZONE 0 ?
6F   1180 £P200:FORSP=1TO7 STEP2
9E   1190 £MOV B%(SP),0,-3,100,BX
     %(SP),BY%(SP):REM** ZONE 0 C
     LEAR, SO MOVE ZONE 1 UP
4C   1200 NEXT:£PO
53   1210 Z1%(0)=0
88   1220 £ACT 1,7,Z1%(7):IFZ1%(7
     )>0GOTO1220
E1   1230 £P200:FORSP=1TO7 STEP2
5C   1240 £MOV C%(SP),0,-3,140,CX
     %(SP),CY%(SP)
22   1250 NEXT:£PO
88   1260 Z2%(0)=0
32   1270 £ACT 2,7,Z2%(7):IFZ2%(7
     )>0GOTO1270
D4   1280 £P200:FORSP=1TO7 STEP2
86   1290 £MOV D%(SP),0,-3,160,DX
     %(SP),DY%(SP)
96   1300 NEXT:£PO
48   1310 Z3%(0)=0
8D   1320 £ACT 3,7,Z3%(0):IFZ3%(7
     )>0GOTO1320
86   1330 £P200:FORSP=1TO7 STEP2
DC   1340 £MOV E%(SP),0,-3,130,EX
     %(SP),EY%(SP)
9F   1350 NEXT:£PO
65   1360 ES%(0)=0
45   1370 £ACT E%(1),ES%(1):IFES%
     (1)>0 GOTO1370
80   1380 £P200:FORSP=0 TO 6 STEP
     2
95   1390 £MOV A%(SP),0,4,70,AX%(
     SP),AY%(SP)
85   1400 NEXT:£PO
FF   1410 AS%(0)=0
B2   1420 £ACT A%(0),AS%(0):IFAS%
     (0)>0 GOTO1420
3E   1430 REM*********************
     *******
5B   1440 REM PART 3: CHANGING PR
     IORITY
BA   1450 REM*********************
     *******
B3   1460 £P200:PRINT"[CLR,DOWN8]
     "
DC   1470 FOR BLOB=0TO9
0C   1480 PRINTTAB(15)"[YELLOW,CK
     12]"
55   1490 NEXT
52   1500 PRINTTAB(7)"[DOWN3,BLAC
     K]PRESS SPACE BAR WHEN BORED
     "
95   1510 AX%(0)=100:AY%(0)=160:£
     COL A%(0),0:£PO
C6   1520 £FRT A%(0):REM** SPRITE
      IN FRONT
DF   1530 £MOV A%(0),4,0,42,AX%(0
     ),AY%(0)
8F   1540 GETA$:IFA$=" "GOTO1610
0E   1550 IFAX%(0)<268GOTO1540
CF   1560 £BAK A%(0):REM** SPRITE
      AT BACK
85   1570 £MOV A%(0),-4,0,42,AX%(
     0),AY%(0)
67   1580 GETA$:IFA$=" "GOTO1610
28   1590 IFAX%(0)>100GOTO1590
57   1600 GOTO1520
33   1610 REM*********************
     ******
C5   1620 REM PART 4:STRETCHING S
     PRITES
4F   1630 REM*********************
     ******
CD   1640 PRINT"[CLR]":£P200:£OFF
     A%(0):£R:REM** RESET SPRITE
     LINKS AND £MOV TABLE
94   1650 FORSP=0TO6
0E   1660 A%(SP)=0
2F   1670 £YPO A%(SP),50
CD   1680 £XPO A%(SP),15+(SP*48)
3C   1690 £STX A%(SP):REM** STRET
     CH IN X
```

```
CE   1700 £VIS A%(SP)
8C   1710 E%(SP)=4
0C   1720 £STY E%(SP):REM** STRET
     CH IN Y
D8   1730 £YPO E%(SP),208
95   1740 £XPO E%(SP),15+(SP*48)
03   1750 £STX E%(SP)
86   1760 £VIS E%(SP)
72   1770 NEXT
35   1780 FORSP=0TO1
74   1790 C%(SP)=2
19   1800 £STY C%(SP)
C5   1810 £YPO C%(SP),130
D9   1820 £XPO C%(SP),24+(SP*296)

43   1830 £VIS C%(SP)
5C   1840 NEXT:PRINTTAB(19)"[BLAC
     K,DOWN2,SQ2]"
26   1850 REM*********************
     ********
D7   1860 REM PART 5: COLLISION D
     ETECTION
82   1870 REM*********************
     ********
AA   1880 A%(7)=0:AH%(7)=0:DA=6:A
     Y%(7)=90
96   1890 £YPO A%(7),AY%(7)
FE   1900 £XPO A%(7),172
A8   1910 £HIT A%(7),AH%(7)
2F   1920 £VIS A%(7)
FD   1930 C%(6)=2:CH%(6)=0:DC=-10
     :CX%(6)=60
98   1940 £YPO C%(6),140
02   1950 £XPO C%(6),CX%(6)
6C   1960 £HIT C%(6),CH%(6)
2C   1970 £VIS C%(6)
34   1980 £HIT A%(7),AH%(7):£HIT
     C%(6),CH%(6):REM** TEST ONCE
      TO CLEAR REGISTER
59   1990 £HIT A%(7),AH%(7):£HIT
     C%(6),CH%(6):REM** TEST TWIC
     E FOR COLLISION
48   2000 IFAH%(7)>0 THEN DA=-DA:
     REM** IF B.G. COLLISION THEN
      CHANGE DIRECTION
8D   2010 IFCH%(6)=1 THEN DC=-DC:
     REM** IF SPRITE COLLISION TH
     EN CHANGE DIRECTION
75   2020 AY%(7)=AY%(7)+DA:£YPO A
     %(7),AY%(7)
D5   2030 CX%(6)=CX%(6)+DC:£XPO C
     %(6),CX%(6)
E6   2040 GOTO1980
8A   2050 END
E3   2060 REM************
7A   2070 REM SPRITE DATA
BF   2080 REM************
4E   2090 DATA AA,AA,AA,80,00,02,
     80,3D,02,80,D3,42,83,40,D2,8
     3,43,D2,83,43,D2,2457
B2   2100 DATA 83,4D,D2,83,4D,D2,
     83,4D,D2,83,74,D2,83,74,D2,8
     3,74,D2,83,D0,D2,3174
81   2110 DATA 83,D0,D2,83,D0,D2,
     83,40,D2,80,D3,42,80,3D,02,8
     0,00,02,AA,AA,AA,2739
5E   2120 DATA ED,AA,AA,AA,80,00,
     02,80,3D,02,80,FD,02,80,3D,0
     2,80,3D,02,80,3D,2022
7E   2130 DATA 02,80,3D,02,80,3D,
     02,80,3D,02,80,3D,02,80,3D,0
     2,80,3D,02,80,3D,1337
77   2140 DATA 02,80,3D,02,80,3D,
     02,80,3D,02,80,3D,02,80,FF,4
     2,80,00,02,AA,AA,1685
DC   2150 DATA AA,04,AA,AA,AA,80,
     00,02,80,3D,02,80,D3,42,83,4
     0,D2,83,40,D2,80,2348
95   2160 DATA 00,D2,80,00,D2,80,
     00,D2,80,00,D2,80,03,42,80,0
     3,42,80,0D,02,80,1889
7E   2170 DATA 0D,02,80,34,02,80,
     34,02,80,D0,02,80,D0,02,83,F
```

```
     F,D2,80,00,02,AA,1951
8D   2180 DATA AA,AA,AD,AA,AA,AA,
     80,00,02,80,FD,02,83,43,42,8
     0,00,D2,80,00,02,2476
E0   2190 DATA 80,00,D2,80,00,D2,
     80,00,D2,80,03,42,80,3D,02,8
     0,03,42,80,00,D2,1937
89   2200 DATA 80,00,D2,80,00,D2,
     80,00,D2,80,00,D2,83,43,42,8
     0,FD,02,80,00,02,2129
55   2210 DATA AA,AA,AA,00,AA,AA,
     AA,80,00,02,80,00,02,80,0F,4
     2,80,3F,42,80,3F,1937
5D   2220 DATA 42,80,DF,42,80,0F,
     42,83,4F,42,83,4F,42,83,4F,4
     2,80,0F,42,80,0F,2106
0B   2230 DATA 42,8F,FF,D2,8F,FF,
     D2,80,0F,42,80,0F,42,80,0F,4
     2,80,3F,D2,80,00,2438
47   2240 DATA 02,AA,AA,AA,A9,AA,
     AA,AA,80,00,02,83,FF,D2,83,D
     0,02,83,D0,02,83,2730
84   2250 DATA D0,02,83,D0,02,83,
     D0,02,83,D0,02,83,FD,02,80,0
     F,42,80,03,D2,80,2297
78   2260 DATA 00,D2,80,00,D2,80,
     00,D2,80,00,D2,80,03,D2,80,0
     F,42,83,FD,02,80,2288
F2   2270 DATA 00,02,AA,AA,AA,08,
     AA,AA,AA,80,00,02,80,3D,02,8
     0,D3,42,80,D3,42,2161
A4   2280 DATA 83,40,D2,83,40,D2,
     83,40,02,83,7D,02,83,FF,42,8
     3,C3,D2,83,40,D2,2658
91   2290 DATA 83,40,D2,83,40,D2,
     83,40,D2,83,40,D2,80,D3,42,8
     0,D3,42,80,30,02,2621
77   2300 DATA 80,00,02,AA,AA,AA,
     BF,AA,AA,AA,80,00,02,83,FF,D
     2,83,FF,D2,80,00,2743
C1   2310 DATA D2,80,00,D2,80,03,
     42,80,03,42,80,03,42,80,0D,0
     2,80,0D,02,80,0D,1566
28   2320 DATA 02,80,0D,02,80,34,
     02,80,34,02,80,34,02,80,34,0
     2,80,34,02,80,34,1235
BC   2330 DATA 02,80,00,02,AA,AA,
     AA,EF,00,00,00,00,00,00,00,0
     0,00,00,00,00,00,881
6E   2340 REM*********************
     **
06   2350 REM FRAME,COLOUR,X,Y DA
     TA
8A   2360 REM*********************
     **
6E   2370 DATA 32,3,24,50,33,4,66
     ,50,34,5,108,50,35,7,150,50
87   2380 DATA 36,8,192,50,37,10,
     234,50,38,12,276,50,39,13,32
     0,50
A2   2390 DATA 32,3,24,90,33,4,66
     ,90,34,5,108,90,35,7,150,90
93   2400 DATA 36,8,192,90,37,10,
     234,90,38,12,276,90,39,13,32
     0,90
1C   2410 DATA 32,3,24,130,33,4,6
     6,130,34,5,108,130,35,7,150,
     130
D5   2420 DATA 36,8,192,130,37,10
     ,234,130,38,12,276,130,39,13
     ,320,130
70   2430 DATA 32,3,24,170,33,4,6
     6,170,34,5,108,170,35,7,150,
     170
D9   2440 DATA 36,8,192,170,37,10
     ,234,170,38,12,276,170,39,13
     ,320,170
B2   2450 DATA 32,3,24,210,33,4,6
     6,210,34,5,108,210,35,7,150,
     210
13   2460 DATA 36,8,192,210,37,10
     ,234,210,38,12,276,210,39,13
     ,320,210
```

COMMODORE plus-4/C16

PHOTON LOAD — FAST LOAD AND SAVE

Have you ever wasted time waiting for your programs to load or save? This excellent program will make a real difference to your computer. PHOTON LOAD, the new cassette operating system loads in seconds and allows you to load and save your programs at about TEN times the speed of a normal load or save. Two additional Basic commands make this extremely easy to use. Why spend money on a disc drive when you can load and save this fast. Features such as stiped screen loading and an audio warning when loading is complete assure you loading/saving is going to plan (unlike the Commodore system) — A well designed Cassette loading and saving system — once you have one you won't want to be without one. *Great value £7.95.*

SUPER SPRITE

This extremely clever utility allows you to use 8 sprites simultaneously over a low-resolution screen. With this program you can now imitate the sprites found on the Commodore 64! Each sprite is composed of 16 × 16 pixels for high definition. Sprites can be independently moved in any direction with VERY SMOOTH scrolling. Sprites may take on any colour and travel at any speed. Sprite priorities and collision detection are provided. Despite adding all these complex features to your computer it is very easy to use. We provide extra Basic commands to make it very easy to use sprites with your programs. On top of all this we provide you with FREE demo programs and a FREE sprite designer. What more do you need to bring real power to your games on your C16/PLUS 4. This entire package is a must for games programmers.

Excellent value - Cassette £7.95
Disc £9.95

ELECTRIK PENCIL!!!

A truely excellent high resolution art program. Magnificent masterpieces can be quickly drawn using the powerful facilities provided by this package. The program is entirely written in high speed machine code and includes Variable pencil size, Variable drawing speed, Easy select cursor menu, pixel draw/plot, freehand, lines, circles, flood, characters/letters plotted on high-res screen at any position, 121 colours all usable simultaneously, hard copy to printer, load and save of pictures to cassette or disc, joystick or keyboard operation. Many other facilities too numerous to mention. Complete with instructions.
Bring some colour into your life with ELECTRIK PENCIL. Impressive results in no time at all. Amaze your friends!!

Cassette only £7.95
Disc only £9.95

THE MIRROR - TAPE BACK UP

Superb tape to tape back up copier catering for the majority of PLUS-4/C16 games. Backs up both standard and FAST loading software. All major loading systems catered for. Very large menu of both general back up routines and popular games. Basic, machine code and protected games all easily handled. NO extra hardware and NO second cassette. Very popular utility.
Excellent value £7.95

THE WAND — TAPE TO DISC

Make full use of your disc drive by effortlessly converting your games/software to disc. Convenient and fast loading from disc. Handles all major loading systems with a very large menu of general back up routines and games. We have had many letters telling us how much people appreciate this utility. Don't be left out — buy one! Every disc user should have one.
Excellent value - supplied on disc - £12.95

MERLIN ASSEMBLER

100 o/o machine code assembler for the plus-4/C16. Very fast assembly of source code. Easy entry/editing of code via the full screen editor. Full error messages pinpointing the errors. Full load/save and printer facilities. Intelligent assembly. Variable names, labels, hex/decimal, text and data statements, remarks, post indexing of variables etc. Many other facilities too numerous to mention. Highly recommended — A truely superb assembler. Comes with instruction booklet and FREE booklet of machine code routines.

Cassette £8.95
Disc £13.95

BLACK CAT — CASSETTE CONVERTER

Have you ever wanted to use your PLUS-4 Wordprocessor, Spreadsheet, Business graphics etc. With a cassette unit? This program allows you to save your files to cassette rather than disc (as forced to by Commodore). Quick, convenient, easy to use.
Only £4.95

BARGAIN JOYSTICKS — 3 GREAT DEALS

Because of bulk purchases we can offer you these three value for money deals to suit the needs of your computer.
1) Incredible value — Brand new Quickshot II Joysticks at only £5.95 plus £1.00 for P & P. Features include — *Autofire *Thumb and trigger finger fire buttons. *Built in suction cups. *New improved design. — The best selling joystick in the world.
2) Quickshot II joystick and joystick adaptor (for Plus-4/C16) at only £7.95 plus £1.00 (per joystick) P&P.
3) If you already have a Joystick we can sell you Joystick adaptors at only £2.95.

CASSETTE INTERFACES

If you have a Commodore 64 cassette unit which you would like to use with your C16/PLUS 4 then you need one of these. This adaptor lead is simple to use. Just plus in and go! — A sound investment £5.95.

TAPE HEAD ALIGNMENT C16/+4

The perfect cure of the majority of loading problems. Specification as for the Commodore 64 (see below).
Only £6.95

COMMODORE 64

EVER HAD A LOADING PROBLEM?

Then send off for WIZARD'S 'TAPE HEAD ALIGNMENT KIT 64' — No one should be without one!
The most common cause of loading failure is bad alignment of your tape heads. This kit allows you to set up the tape heads of your cassette unit for the best possible loading conditions. In many cases this will make a remarkable difference in loading reliability.
Our kit comprises of:
1) A precision recorded cassette containing a sophisticated test program. 2) A special adjustment screwdriver. 3) A direction indicator. 4) A turning meter. 5) A detailed instruction booklet with diagrams 6) A Loading Doctor — to help you diagnose any loading problems.
All of this for only £6.95!!!

RAPID dispatch of orders.

U.K. P&P FREE and by FIRST CLASS post. Europeans please ADD 50p. Outside Europe ADD £1.50 for AIR MAIL. Overseas orders welcome. All payments must be in pounds sterling.
Cheques/POs to:

WIZARD SOFTWARE *(Dept. BB) 20, Hadrian Drive, Redhills, Exeter, Devon EX4 1SR*

C64 disk £36.95 tape £19.95 OXFORD PASCAL C128 £44.95

- Full standard Pascal + extensions
- Speed . . . Fast to compile, Fast to run
- Resident compiler, works like a BASIC interpreter
- Full disk to disk compiler

- Graphics & sound extensions include BOX, CIRCLE, COLOR, DRAW, VDU, GRAPHIC, LOCATE, PAINT, SCALE, RCLR, RDOT, WINDOW, RGR, WIDTH, RWINDOW, FILTER, SOUND, PLAY, TEMPO, VOL, ENVELOPE FAST, SLOW, BANK, JOY, PEN, POT for the 128 and similar for the 64.

- Full Linker for separately compiled files
- Compact Code
- Powerful Editor, FIND, CHANGE etc
- 84 page tutorial/reference manual
- Stand alone compiled programs
- 90 K free on the 128
- **More than 20,000 enthusiastic customers worldwide!**

"Well worth buying, an investment in your programming future" C.C.I. *"I can wholeheartedly recommend it to Pascal novices and experts alike"* Computing Weekly

PETSPEED BASIC COMPILER

C64 £19.95 C128 £44.95

- UP TO 40 TIMES THE SPEED OF BASIC
- Compiles ALL BASIC commands including all 128 commands
- Compatible with machine code
- Makes large programs smaller
- Users extensions to BASIC allowed on the C128
- Extensions to BASIC
- Long variable names option
- Recommended by Commodore
- Program analysis utility included

"Always a good product — Even better on the 128" Commodore Computing

Using PETSPEED couldn't be simpler; just type in the name of your program, wait a few minutes and then see your software run up to 40 times faster.

RAMDOS – C128/1700/1750 £34.95

"SAVEs and LOADs almost instantly" . . . Your Commodore

RAMDOS is a full feature RAM based lightning fast disk operating system for the new expansion RAM cartridges. RAMDOS is similar to RAM-DISK except that it uses only expansion RAM.

- All disk commands supported
- DLOAD a 50 K program in 0.5 sec!
- 2048 blocks free on the 1750 cartridges
- Use all or part of the expansion RAM . . . your choice.

C64 £24.95 hack-pack C128 £39.95

The ultimate utility pack for the 64 and 128

"Exceptionally Useful — An excellent extension package" Your Commodore

RAM-DISK
Imagine a disk drive like the 1541 or 1571 only many times faster. This is RAM-DISK. Modelled on the AMIGA, RAM-DISK organises the RAM inside your 64 or 128 as a soft disk drive. Once loaded, RAM-DISK responds to all the usual disk commands and behaves exactly like an intelligent floppy drive. The only difference is that everything happens at LIGHTNING SPEED. RAM-DISK is accessible from BASIC or machine code.

TOOLKIT including FIND, CHANGE, DUMP, MERGE, TYPE, INFO etc etc

COMPRESSOR
Compresses programs down to their minimum size. Removes all spaces and REMs and packs up to 255 characters onto each line. Makes your code smaller and faster and protects programs from unauthorised tampering.

C64 £34.95 OXFORD BASIC

The complete BASIC programming environment packed with sophisticated utilities

- **ANALYZER**
  - Flow cross reference reports
  - Data usage frequency report
  - Data cross reference reports
  - Very detailed statistics report
  - Redundant code eliminator (removes all unreachable code)
  - Header file generator (changes your program to make it run faster)
  - Output to screen, printer or disk
- **TOOLKIT** including
  FIND, CHANGE, DUMP, MERGE, TYPE, INFO, RENUMBER, DELETE etc
- **COMPRESSOR**
  Like the HACK-PACK compressor, reduces your programs to minimum size
- **OPTIMIZING BASIC COMPILER**

DEVELOPER'S PACK
HACK-PACK 64
plus
OXFORD BASIC 64
£44.95

LANGUAGE PACK
OXFORD PASCAL
plus
PETSPEED
C64 **£44.95**
C128 **£69.95**

Please rush me: –	C64	C128
PETSPEED	☐	☐
OXFORD PASCAL 64 DISK	☐	N/A
OXFORD PASCAL 64 CASSETTE	☐	N/A
HACK-PACK	☐	☐
OXFORD BASIC	☐	N/A
RAMDOS	N/A	☐
LANGUAGE PACK	☐	☐
DEVELOPER'S PACK	☐	☐

S.S.O.L. 16B WORCESTER PLACE, OXFORD OX1 2JW Tel: (0865) 54195
I enclose cheque/postal order for ______
(prices include VAT and UK postage. For overseas orders please add £3.00).
NAME______
ADDRESS______
______ PHONE______
MAKE ALL CHEQUES PAYABLE TO S.S.O.L. Allow 14 days for delivery.

NEW Mk III

NOW THE FIRST OF A NEW GENERATION OF BACKUP CARTRIDGE

Innovative new hardware design and programming techniques have allowed us to produce a cartridge of a calibre never seen before!!!

Action Replay Mk III is more powerful, more friendly, has more features and will back-up more programs than any competing utility —even the latest protected progams!!

ACTION REPLAY III

Works by taking a "Snapshot" of the program in memory – so it doesn't matter how the program was loaded –from tape or disk – at normal or turbo speed. EVEN SO CALLED **"ANTI-FREEZE" PROGRAMS.**

ONLY **£29.99** POST FREE

ACTION... REPLAY

NEW Mk III VERSION

JUST LOOK AT THE FEATURES

So simple to use: Just press the button and make a complete backup: Tape to Tape, Tape to Disk, Disk to Disk, Disk to Tape.
– THE PROCESS IS AUTOMATIC – JUST GIVE THE BACKUP A NAME –

TAKE ME TO THE HEART OF YOUR COMPUTER!
MK3
ACTION REPLAY
D

SEE DISKMATE AD FOR COMBO OFFER

- ☐ All backups will reload at turbo speed independently of the cartridge.
- ☐ Dual speed tape turbo system programs can load up to 3 times faster than commercial turbos –thats over 10 times normal Commodore speed.
- ☐ Freeze the action then view the program with the monitor feature. Add pokes for infinite lives etc. Then Restart the game or backup – ideal for customised versions of your games.
- ☐ Picture Save. Save any multi-colour. Hires screen to disk or tape. Compatible with Blazing Paddles, Koala, Slideshow etc.
- ☐ Fully compatible with 1541, 1541C, 1570, 1571, and enhancer or any CBM compatible data recorder.
- ☐ For C64, 64C, 128, 128D (in 64 mode).
- ☐ Unique Sprite Monitor. Freeze the Action and view all the Sprites, watch the animations scroll across the screen. Save Sprites to disk or tape. Customize your games by loading Sprites from one game to another – then restart the program or make a backup.
- ☐ Compatible with fast DOS and Turbo ROM systems.
- ☐ Backup process in turbo speed – faster than any rivals.
- ☐ Special compacting techniques. Each program is saved as a single file.
- ☐ Transfers multistage tape programs to disk – more than any other cartridge – even the extra stages are turbo load – a unique feature.
- ☐ Sprite Killer! make yourself indestructible by disabling Sprite collisions in games.
- ☐ Fast disk format (20 secs).
- ☐ Built-in Unstoppable reset button.

FASTLOADER

Action Replay III even has a built in disk fast loader which speeds up loading 5 times. Uses no memory – invisible to the system. **You could pay £20 alone for this feature.**

PERFORMANCE GUARANTEE

100% SUCCESS? RIVAL CLAIMS? WHO'S KIDDING WHO? "Action Replay Mk 3 will backup any program which any other cartridge can backup – and more! It also has an unmatchable range of features. Consider 'Freeze-Frame' for example, which uses more disk space, saves at slower speed, has slower tape loader, has no built in disk fastloader, no picture, Sprite or restart features and costs £10 more than Action Replay. So who's kidding who? Buy Action Replay Mk 3. If you find that it does not live up to our claims return it within 7 days of receipt and your money will be refunded.

ACTION REPLAY ENHANCEMENT DISK

Extending Action Replay's capabilities even further, this disk, contains a collection of tape to disk routines for a few newer games which load subsequent parts in a non-standard way. All the latest titles are catered for – more than any competing utility, and unlike other systems, ACTION REPLAY LOADS EXTRA SECTIONS AT TURBO SPEED. Disk includes file copy, disk backup and other useful utilities. Regular updates at low cost for use with Action Replay only. **Disk £7.95.**

GRAPHICS SLIDESHOW SOFTWARE

Cartridge based backup systems usually destroy loading pictures – WITH ACTION REPLAY. Multicolour pictures from games, graphic packages or loading screens can be saved to disk using Action Replay and viewed singly or in sequence with this sophisticated slideshow package. Turboload throughout. Sixteen pictures per disk. Joystick or keyboard control. An interesting new use for your computer. **Disk £4.95.**

SPECIAL!! ENHANCEMENT DISK AND SLIDESHOW TOGETHER **ONLY £11.99**

NEW

Disk Mate II ™

DISK UTILITY CARTRIDGE

only £14.99 POST FREE

Built-in Reset Switch

If you have a disk drive then you **need** a Diskmate!!

☐ Diskmate*
is a fast disk turbo loader that will speed up your normal loading software by 5 times.

BUT THAT'S NOT ALL

- ☐ Fast save
- ☐ Fast format (approx 10 seconds)
- ☐ Improved single stroke DOS commands ie. load, save, directory, scratch, etc.
- ☐ Redefined function keys: ie. load, load/run, list, directory, monitor, etc.
- ☐ Powerful toolkit commands: ie. old, delete, merge, copy, append, autonum, linesave etc., etc.

PLUS A powerful machine code monitor/disassembler. All the usual monitor commands: assemble, disassemble, move, find, compare, fill, number conversion etc., etc. **NB.** This is a full monitor, not a token effort like some available.

* Diskmate incorporates special switching techniques which make it "invisible" to the system. Therefore the fastload will work with more software than other types. In addition this makes the other commands including the monitor more powerful. For instance the monitor 'floats' and is able to look under ROMs and even under itself!

SPECIAL OFFERS

Buy Action Replay III and Diskmate together on the same cartridge for only. . . . This must surely be the most powerful cartridge available for the Commodore	£39.99 POST FREE
Buy Action Replay III and Fast Hack'em for.	£44.99 POST FREE
Buy Action Replay III and Diskmate II on the same cartridge plus Fast Hack'em for.	£54.99 POST FREE

Diskmate II was designed by Datel and the programming is by Dosoft. Need we say more?

IT'S HERE... **AMERICA'S BEST SELLING DISK BACKUP SYSTEM NOW AVAILABLE IN THE UK!**

FAST HACK'EM ™

FOR THE COMMODORE 64/128

A MULTI-MODULE SYSTEM - ALL ON ONE DISK

FAST HACK'EM IS QUITE SIMPLY THE BEST DISK COPYING SYSTEM AVAILABLE, ANYWHERE AT ANY PRICE.

£19.99

SIMPLE TO USE FULLY MENU DRIVEN

****WARNING****
FAST HACK'EM IS A VERY EFFECTIVE PRODUCT DESIGNED TO ENABLE USERS TO MAKE BACK UP FOR THEIR OWN USE – DATEL IN NO WAY CONDONES SOFTWARE PIRACY.

BECAUSE FAST HACK'EM IS PRODUCED IN THE U.S. IT WILL ALWAYS BE ON TOP OF THE LATEST PROTECTION TECHNIQUES SINCE MANY OF OUR LATEST PROGRAMS APPEARED IN THE U.S. MANY MONTHS

SINGLE 1541 MODULE

- AUTO NIBBLER: Copy an entire protected disk in 3 minutes. [illegible]
- NIBBLER: [illegible]
- FAST COPY: [illegible]
- FAST COPY: [illegible]
- [illegible]

SINGLE 1571 DRIVE (64 OR 128 MODE)

- FAST COPY: [illegible]
- [illegible]
- [illegible]

TWIN 1541 DRIVES MODULE

- AUTO NIBBLER: Copy an entire protected disk in under 1 minute. Features auto track/sector analyzer.
- FAST COPY: Copy entire disk in 36 seconds with verify.
- AUTOMATIC FASTCOPY: As above but with completely automatic operation. In fact once set up doesn't even need the computer. A must for duplicating disks on a large scale.

1541 PARAMETERS MODULE

This is the module that gives Fast Hack'em its power. The parameters module contains dozens of "Parameter Keys" that are used to unlock those heavily protected programs. Each parameter is designed for a particular software brand or even a particular program. Other copy programs may make strong claims, but without special parameters they just can't cope. Datel will be offering updates to Fast Hack'em on a quarterly basis, featuring 20/50 new parameters plus other improvements as they're made. Prices to be £5 plus old disk.

SPECIAL OFFER! QuickShot II ONLY **£6.99** or for C16 including interface **£8.99**

IDGE

N...

ÓN

DADER

III even has
fast loader
up loading
no memory
the system.
y £20 alone
re.

TEE

TWARE

g pictures – NOT
, graphic
Action Replay
d slideshow
k. Joystick or
uter

P SYSTEM

9.99 POST FREE

LY MENU DRIVEN

S PRODUCED IN
E ON TOP OF
ECHNIQUES.
ST PROGAMS
Y MONTHS AGO

99 POST FREE

---

e wear on your expansion port: 3 slot
therboard for 64/128

ONLY **£16.99** POST FREE

- ☐ ACCEPTS 3 CARTRIDGES
- ☐ SWITCH IN/OUT ANY SLOT
- ☐ ON BOARD SAFETY FUSE
- ☐ HIGH GRADE PCB/CONNECTORS
- ☐ RESET SWITCH

VAILABLE NOW!!

Now a full Midi Interface for your 64/128 at a realistic price! POST FREE

NOW ONLY **£24.99**

- ☐ MIDI IN
- ☐ MIDI THRU
- ☐ 2x MIDI OUT
- ☐ Compatible with most leading software packages:
- • Advanced Music System • JMS • SEIL, etc.

Special Offer! Buy Midi Interface + advanced music system only £49.99 + £2 postage (disk only).

COM-DRUM

ONLY **£29.99** POST FREE

DIGITAL DRUM SYSTEM

SPECIAL OFFER AUDIO/TV LEAD (WORTH £4) FREE!!

Now with the Com-Drum digital system you can produce studio quality drum rhythms with real drum sounds. All the features of systems 10 times the price.

- A complete digitally recorded drum kit, i.e. 8 voices – kick drum, snare, tom-tom, hi-hat, cymbal etc. etc. N.B. these are real drum sounds – not synthesized.
- Real time and step time sequences • Full editing system. • 16 Alternative voices supplied free.
- 8 pre programmed rhythms to start you off.
- External sync facility. • Very simple to use.
- Line output to hi-fi amp or through TV with optional audio TV lead (see offer). • On screen menus. • Stylish case. • Please state tape or disk software.

COM-DRUM EDITOR

Enables you to construct your own drumkits. 24 Drum sounds supplied on disk which you can arrange yourself to make custom kits. Names are then added and saved as a complete set for use in the Com-Drum. Existing kits as supplied with Com-Drum can also be editing to your choosing. Available on Disk only **£4.99** post free.

DIGITAL SOUND SAMPLING

COMPLETE PACKAGE

£49.99 POST FREE

FREE AUDIO/TV LEAD!!

NOW FOR YOUR COMMODORE 64

The Datel Sampler now brings you this technology at a sensible price!

- The Sampler allows you to record any sound digitally into memory and replay it instantly at any pitch, backwards, forwards ascending scale, descending, with echo, reverb, flanging, endlessly looped etc. Truly professional hardware incorporating:
- Full 8 bit D and ADC conversion
- Line or MIC input, line output and feedback control

A comprehensive software package including:

- A live effects menu with echo, reverb, digital delay, etc
- Full sample editing facilities with review and on screen frequency plotting
- A powerful real time sequencer

Copy Drum Software available separately at £9.99 to turn your sound sample into a Com-Drum system as well as a sampling system.

COMPUTER DATA RECORDER

ONLY **£24.99** POST FREE

- ☐ QUALITY COMMODORE COMPATIBLE DATA RECORDER.
- ☐ PAUSE CONTROL ☐ COUNTER.
- ☐ SUITABLE FOR 128/64.
- ☐ ALSO AVAILABLE FOR: C16/PLUS 4 PLEASE ADD £1.00.
- ☐ SEND NOW FOR QUICK DELIVERY.

MODEL • ROBOTIC CONTROL MADE EASY WITH

ROBOTEK 64

£39.99 POST FREE

Robotek 64 is a comprehensive hardware/software package to interface your 64 to the outside world, models, robots, lighting, sensors etc., etc. The features make Robotic 64 the most sophisticated unit available at any price.

- 4 output channels each with on board relay • 4 digital inputs fully buffered. • Analogue input with full 8 bit conversion.
- Sound input for voice recognition and voice controlled switching.
- ☐ Software features: sequencers to control output. Analogue measuring module. Test Program. Voice Activation Module, much more. Voice recognition software to be released soon. Total package no more to buy!

NEW

Turbo Rom II

Replacement Kernal

New upgraded routines! PLUS

Fast Format

Fast Save

POST FREE! **£14.99**

Turbo Rom actually fits inside your computer and replaces the normal slow Kernal Rom with superfast disk loading routines, plus extended DOS commands

- Loads most programs at 5-6 times speed
- Improved single key commands
- Fits inside computer so all ports are free
- Return to normal kernal at flick of switch
- Fitted in minutes – no soldering usually needed (on a few C64's the old Rom may have to be desoldered)

Turbo Rom I can be upgraded for £5 plus old chip.

NEW

smart cart ©

An 8K or 32K pseudo ROM cartridge

£14.99 8K version

£29.99 32K version

Now you can have a cartridge that you program as if it were computer RAM then acts as if it were ROM.

- ☐ Battery backed to last for upto 5 years (lithium battery). Simply load in the program and flick the switch. The cartridge can be removed and will retain the program just like ROM.
- ☐ Make autostart cartridges without the need for an EPROM burner.
- ☐ Can be switched on/off board from keyboard.
- ☐ 32K version offers 4 x 8K pages under software switching.
- ☐ Some knowledge of m/c is required but full instructions included.

TURN YOUR MPS 801 INTO 4 PRINTERS IN ONE!

PRINTER IV

ONLY POST FREE **£19.99**

Alternative character Rom fitted in minutes – no soldering required.

Each set has true descenders.

All 4 sets can be mixed within one document.

Printer IV is a direct replacement for the normal printer ROM so it is 100% compatible with your existing software Graphics – No Problems either.

SEND NOW FOR QUICK DELIVERY

"For anyone who uses their printer often this chip is a must. It's quick and easy to use and the end results are impressive. YOUR COMMODORE Jan. '87."

- At the flick of a switch you can choose between any of 4 different superb new character sets.

DESCENDER • SCRIBE

ECLIPSE • FUTURE

IT'S BACK

TOOLKIT IV

ONLY **£9.99** POST FREE

THE ULTIMATE DISK TOOLKIT FOR 1541/1540

Toolkit IV has, for some time, been generally recognised as the best disk toolkit available. The only problem for Datel was that it was distributed by someone else!! So when the opportunity to obtain the rights came our way, we jumped at it. And what's more, in keeping with our general pricing policy, we are offering it at less than half the previous selling price. A disk toolkit is an absolute must for the serious program hacker and TOOLKIT IV has more features than most for less:

DISK DOCTOR V2 – Read and write any track and sector including extra and renumbered tracks. Repair damaged sectors. Look underneath read errors.

HEADER/GAP EDITOR – Decodes and displays ALL header information including off bytes and header gap. Rewrite the entire header and header gap. Renumber sectors. Also edit any sector tail gap.

DISK LOOK – Sort directory. Recover lost files. Display file start/end addresses. Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes. Edit Bam. Much, much more.

FILE COMPACTOR – Can compact machine code programs by upto 50%. Saves disk space. Compacted programs run as normal.

FAST DISK COPY – Copy an entire disk in 2 minutes or less using single 1541.

FAST FILE COPY – Selective file copy. Works at upto 6 times normal speed.

FORMATTER – 10 second format an entire disk or format any individual track or half track 0 to 41. Redefine any of 30 parameters to create or recreate unique disk formats.

ERROR EDIT – Quickly find and recreate all read errors including extra and renumbered tracks or sectors and half tracks from 0 to 41, even recreates data under errors and allows you to redefine any necessary parameters.

PLUS DISK DRIVE SPEED TEST, DISK ERASE, DISK DRIVE RAM MONITOR, DISK LOG, BASIC COMPACTOR/UNCOMPACTOR, FILE MAKER + MUCH, MUCH MORE.

TOOLKIT IV is an absolute must for the serious disk hacker. It has all the routines the the others have plus all the ones they don't . . . there is no better product available at any price . . . available now complete with comprehensive instructions.

IT'S A COMPLETE LIGHTPEN SYSTEM . . . IT'S AN ALL IN ONE ILLUSTRATOR/GRAPHICS PACKAGE.

IT'S BLAZING PADDLES ILLUSTRATOR

DEALER ENQUIRIES WELCOME

Complete with the DATEL LAZERWRITER

An Advanced Lightpen featuring state of the art fibre optic technology.

ONLY *£24.99* POST FREE

TAPE OR DISK (PLEASE STATE WHICH)

Yes Blazing Paddles is one of America's top selling graphics packages. Fully Icon/Menu driven, comes complete with the Datel Lazerwriter – A lightpen featuring the latest polymer fibre optic cable and sensor for pin point accuracy of a calibre simply not possible with conventional system.... ....But that's not all – Blazing Paddles will also work with any standard input device including Joysticks, Touch Tablets, Paddles, Mice, Trackball and Professional Graphic Tablets

A SUPERB PACKAGE WITH ADVANCED FEATURES

- ☐ Advanced Colour Mixing to create over 200 textured hues
- ☐ Painting with a range of brushes ☐ Air Brush ☐ Ovals
- ☐ Rectangles ☐ Lines ☐ Rubberbanding ☐ Text Mode
- ☐ Fill ☐ Single Dot Mode ☐ Freehand Draw
- ☐ Shape Library ☐ Clear ☐ Printer Dump
- ☐ Hires Screens saved from Action Replay can be loaded and edited etc (Disk)

PLUS A zoom feature for single Pixel editing while viewing, the results at full scale. ☐ Powerful cut and paste facility, shapes can be picked up, moved around, repeated and saved. ☐ Full Load and Save feature for pictures, shapes and windows which are supplied.

If you think the Software you get with your Mouse/Graphtablet is a bit weak then you can buy Blazing Paddles Software alone FOR ONLY *£12.99* TAPE OR DISK (PLEASE STATE)

More conventional Lightpens cannot cope with the high Pixel resolution of Blazing Paddles – only Lazerwriter is suitable as a Lightpen input.

PADDLES ILLUSTRATOR IS FOR EVERYONE!

Using the Lazerwriter a child can use it as a colouring book or a computer artist can create superb graphics.

DATEL ELECTRONICS

USUALLY SAME DAY DESPATCH ON ALL ORDERS

SEND CHEQUES/P.O's TO:

UNITS 8/9
FENTON INDUSTRIAL ESTATE,
DEWSBURY ROAD, fenton,
STOKE-ON-TRENT TEL: 0782 273815
FAX: (0782) 264510

24 HR CREDIT CARD LINE

FOREIGN ORDERS ADD £2 POSTAGE

SEE US ON PRESTEL PAGE No. 258880000A 12 Page Catalogue + Order Page

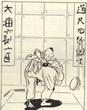
The Way of the Exploding Fist

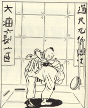
Attention C16 and Plus/4 owners! Try our easy to enter competition to obtain your own copy of Melbourne House's most popular game.

There are 50 prizes in this month's competition, each one an all-kicking, all-punching C16 version of *The Way of the Exploding Fist* from Melbourne House. This game will enable you to become a master of the mysterious oriental art as you progress from novice to tenth dan in a gruelling test of strength and discipline. Each copy is worth £7.95.

How to Enter

To start yourself on the road to martial arts prowess, just study the two cartoons on this page. There are several defences between them. Mark the differences on the first picture and complete the entry coupon. Make sure that you write clearly and fully and please write the number of differences you found on the back of your envelope.





The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Melbourne House. This restriction applies to employee's families and agents of the company. The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.

Melbourne House Competition Entry Coupon

Name...
Address...
....
....
post code...
Number of differences found ....

Post to: *Your Commodore*, Melbourne House Competition, 1 Golden Square, London W1R 3AB. Closing date: Friday 26 April 1987.

STACK COMPUTER PRODUCTS

C64/C128/C128D

SWITCHABLE
4-SLOT
MOTHERBOARD

£28

SPECIFY
MODEM
OR
NORMAL
VERSION

- USE COMPATIBLE CARTRIDGES TOGETHER
- SAVES UNPLUGGING & WEAR

C64/128/+4/VIC 20/C128D

£33

PROFESSIONAL RS232 SERIAL INTERFACE

- TYPEWRITER
- PRINTER
- MODEM
- OTHER COMPUTER

- Connect any serial device to your computer.
- Easyscript, Superscript, Scrip 128 etc. compatible.
- Send and receive

C64/128/+4/C16/VIC 20/128D

£59.95

- TYPEWRITER
- PRINTER
- PLOTTER

UNIVERSAL
CENTRONICS INTERFACE

- Fully CBM compatible.
- Full Graphics on Dot Matrix Printers.
- Use 341 on Plus 4.
- Chainable with Disk

C64/128/128D or VIC 20

LIGHTPEN

£28

DRAW ACCURATELY ON SCREEN

- Superb precise drawing package COMPLETE.
- Save, Load & Print Pictures.
- Really useable.
- 10 Games included.

100 CAPACITY
£10.00

50 CAPACITY
£9.50

5¼" LOCKABLE DISK STORAGE BOXES WITH RIGID INDEX SEPARATORS.

1540/1541/1550/1570/1571/128D

£10.50
A

£7.50
B

5¼"
FLOPPY DISKS
INC. LABELS, SLEEVES,
WRITE TABS

- **A** 10 Super Quality Doubled Sided in Library Case.
- **B** 10 Standard quality in polythene bag.

1540/1541/1550/1570

NOTCHER

£5

HALVE DISK COSTS

- Use both sides on single sided drives.
- Tested on all our Disks.

£19.95

MAGIC DISK
Fix 1541/1570
SPEED &
ALIGNMENT
SIMPLY

ALIGN & CLEAN
ALL CBM TAPE
DECKS ON ALL
CBM'S SIMPLY

£4.95

C64/C128/128D

*

£39

FINAL
CART
II

- DISK & TAPE TURBO
- CENTRONICS I/F
- TOOL KIT
- GAMES KILLER
- RESET SWITCH
- FREEZER

C64/C128/128D

*

£39

FREEZE
FRAME
IIIB

- DISK TO TAPE/TAPE TO TAPE.
- TAPE TO DISK/DISK TO DISK.
- MULTIPART PROGS HANDLED.
- SIMPLE OPERATION.

C64/C128/128D

*

£37.50

EXPERT
CARTRIDGE

NEEDS DISK
DRIVE

- NOW WITH ESM
- FREEZER WITH ONE FILE & COMPACTING.
- TURBOS & UPGRADABLE.
- MONITOR & GAMES KILLER.
- DISK TO TAPE ETC.

C64/C128/128D

£44.90

NEOS MOUSE
& CHEESE CASSETTE

- COMPLETE MOUSE GRAPHICS PACKAGE.
- JOYSTICK MODE INCLUDED.

*** IF YOU BUY THE WRONG ONE WE WILL EXCHANGE IT FOR ANOTHER**

HIGH
QUALITY
RIBBONS

•MPS801	3.54
•MPS802	3.93
•MPS803	3.92
•1525	3.35
•1526	3.93
•DPS1101	3.52
•MX/FX80	3.78

ALL OTHERS AVAILABLE

BS3120
SAFETY DUSTCOVERS

FROSTED -BLACK TRIMMED
ANTI-STATIC -FIRE RETARDANT

64/20/16	2.75
Plus 4	2.75
128	3.50
128D	4.50
C2N/1530/1531	2.00
1541/1570	3.00
1571	3.00
MPS801	3.00
1701	6.00

C64/128/128D

£14.95

SLOMO

- Slow or stop any Program.
- Slow or Pause Listings.
- Stop Action or Instructions while you think.
- Cheat 'Time Limit' Games.

- CBM COMPATIBLE

£22.50

DATA RECORDER

- PIANO KEYS.
- RECORD (SAVE) LIGHT.
- COUNTER.
- C16/+4 ADAPTOR £2 EXTRA.

VIC
MODULATOR

£16.95

64
TRANSFORMER

£26.95

VIC 20

- 4 SLOT MOTHERBOARD SWITCHABLE

£6.95

- 3/16K RAM PACK £34.95
- 3/16/32K RAM PACK £49.95

FREE 40 PAGE CATALOGUE ON REQUEST OR WITH ORDER

ALL CBM SPARES SUPPLIED

C16

- 16K RAMP PACK

£29.95

PRICES INCLUDE VAT
P&P £1.90
(FREE OVER £20)

MEEDMORE
(Distribution) LIMITED
28 Farriers Way
Netherton, Merseyside,
L30 4XL

Tel: 051-521 2202

VISA

Arcade Action

Hints, tips and programs to help in writing your own arcade games

By Tony Crowther

Producing your first arcade game need not be the difficult chore that many people believe it to be. All that is required is a good strong idea as to the basis of the game and an understanding of how all of the different parts are going to work.

In order to produce a quality game then it should of course be written in machine code. It is a lot harder to write a program in machine code than Basic, however, the increased speed of execution is essential to a good program.

It is outside the scope of this series to actually teach you about machine code. Should you be interested in learning then you could take a look at a series Welcome to the Machine that started in the March '86 issue of *Your Commodore* and finished in December, '86.

I am aware that many people will not be ready to tackle the rigours of machine code just yet. Don't let this put you off. Many good programs are written as a mixture of Basic and machine code.

During this series I will be presenting a series of small programs that you can use yourselves, either as part of a larger machine code program or simply called from within your own Basic program.

The series will be concentrating on programming with the C64, if you are a C16 or Plus/4 owner don't worry, whenever possible I will provide programs that will work on these machines.

What's to Come

So what will we be looking at? For a start I will be discussing the use of User Defined characters within your programs, how to use them and move them. Sprites will be dealt with in detail complete with routines to animate them and move them around your screen. Many games use backgrounds that are larger than the screen. The screen acts as a window over the larger playing area. I will be explaining how this is done and again provide routines to do this in your own programs.

A number of miscellaneous routines will also be provided for your use. These will include routines to scroll messages on the screen, print and increment scores, character editors, music programs and many more.

Presentation

Most of the programs that are presented in this series will be in machine code. I will be giving both the source code for the program and a Basic loader for those of you who don't want to tackle the assembler.

The assembly language programs have been produced using the Commodore Macro Assembler. I have tried to keep the assembly language as simple as possible so should you use a different assembler you should be able to enter the programs with very few changes.

Starting Out

In this month's article I am afraid that I am going to make you jump straight in at the deep end and deal with something that is extremely important

```
10 REM * C16 IRQ DEMO ROUTINE *
20 FOR A=818 TO 842:READ C:K=K+C
: POKE A,C: NEXT
25 IF K<> 2577 THEN PRINT "ERROR
 IN DATA":STOP
30 DATA 120,169,63,141,20,3,169,
3,141,21,3,88,96
40 DATA 162,0,142,25,255,202,208
,250,76,14,206,0
50 PRINT"[DOWN][DOWN] SYS 818 TO
 START"
```

```
5 REM * C64 INTERRUPT DEMO ROUTI
NE *
10 BL=1     :LN=50    :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15:READ A:CX=CX+A:POKE SA+L*16+
D,A:NEXT D
30 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
40 NEXT L
50 DATA 120,169,13,141,20,3,169,
192,141,21,3,88,96,162,0,142,148
0
60 DATA 32,208,202,208,250,76,49
,234,5,0,0,0,0,0,0,0,1264
70 PRINT"[CLEAR][DOWN][DOWN][DOW
N]SYS 49152 TO START FOR C64"
```

FIGURE 1

to a games writer — interrupts.

In the coming months I will be going back to simpler subjects, however many examples that I will be giving will require a knowledge of interrupts and use the IRQ program that I am going to give this month.

Let Me Interrupt

So, just what is this thing that is so important to games writing? Well it's really as simple as its name suggests it is an interruption of whatever the computer is doing. Let me illustrate what I mean with a simple everyday example.

Let's suppose that you are having a conversation with someone and the telephone rings and interrupts your conversation. You leave the conversation and go and answer the telephone. If the call is for you then you would now hold a conversation with the person on the other end of the telephone. When you had finished you would put the telephone down and go back to and continue your original conversation.

What has happened is that the ringing of the telephone simply interrupts and paused your original conversation for a short while and you carried on where you left off upon returning.

So what about interrupts in programming?

Let's take a look at a practical example. If you were to write a program that required you to move a sprite across the screen you may write a routine that went along the following lines:

1. This is the main program.
2. The main program becomes interrupted by the routine that moves the sprite.
3. The sprite is moved by the routine.
4. Once the sprite has been moved we go back to step (1) and continue where we left off.

This is of course an over simplification but should give you an idea of what an interrupt can do.

Believe it or not your computer is actually being interrupted every 1/50th of a second by the computer's hardware. Everytime an interrupt occurs the computer takes a look at a memory location which holds information about where the interrupt program is stored. These couple of memory locations are referred to as the interrupt vector. In normal use whenever an interrupt occurs the interrupt vector holds the address of the general routines which look after the general running of the computer. These routines are items such as scanning the keyboard to see if a key has been pressed etc.

The interrupt vector is stored at the following memory locations:

788 and 789

These locations are the same on all the Commodore machines we are using.

So how do you use this in your own programs?

In Practice

Let's take a look at a practical example. Figure 1 gives a Basic loader for a machine code program that uses interrupts. Note there are two versions of the program one for the C64 and one for the Plus/4 and C16.

FIGURE 2

```
 10            ;*************************
 20            ;* INTERRUPT / FLASHING *
 30            ;* BORDER DEMONSTRATION *
 40            ;* C64 VERSION *
 50            ;*************************
 60            *=$C000                 ;WHERE PROGRAM STARTS IN MEMORY
 70 IRQVEC =$0314                      ;IRQ VECTOR
 80 BORCOL =$D020                      ;ADDRESS OF BORDER COLOUR
 90 NORIRQ =$EA31                      ;VALUE NORMALY STORED IN IRQ VECTOR
100            ;
110            ;THIS IS SECTION 1 THE SETUP ROUTINE
120            ;
130            SEI                     ;INTERRUPTS OFF
140            LDA #PROG&255           ;POINT THE IRQ VECTOR
150            STA IRQVEC              ;TO OUR NEW PROGRAM
160            LDA #PROG/256
170            STA IRQVEC+1
180            CLI                     ;INTERRUPTS BACK ON
190            RTS                     ;AND RETURN TO BASIC
200            ;
210            ;THIS IS SECTION 2 THE ACTUAL PROGRAM THAT CHANGES THE BO
RDER COLOUR
220            ;
230 PROG       LDX #$00
240 LOOP       STX BORCOL              ;STORE X REGISTER IN BORDER COLOUR
250            DEX
260            BNE LOOP
270            JMP NORIRQ              ;CONTINUE NORMAL IRQ PROGRAM
```

```
1000 REM C64 IRQ DATA BASE LOADE
R
2000 FORL=0TO9:CX=0:FORD=0TO15:R
EADA:CX=CX+A:POKE49152+L*16+D,A:
NEXTD
2010 READA:IFA<>CXTHENPRINT"ERRO
R IN LINE";2040+(L*10):STOP
2020 NEXTL:END
2040 DATA120,162,0,169,0,157,63,
3,232,224,192,144,248,162,0,169,
2045
2050 DATA0,170,157,0,157,157,0,1
58,157,0,159,232,208,244,169,81,
2049
2060 DATA157,88,192,169,192,157,
89,192,232,232,232,224,30,144,23
9,169,2738
2070 DATA0,141,14,220,169,82,141
,20,3,169,192,141,21,3,169,0,148
5
2080 DATA141,18,208,169,27,141,1
7,208,169,1,141,25,208,141,26,20
8,1848
2090 DATA88,96,169,1,141,25,208,
32,0,0,32,0,0,32,0,0,824
2100 DATA32,0,0,32,0,0,32,0,0,32
,0,0,32,0,0,32,192
2110 DATA0,0,32,0,0,76,49,234,12
0,169,49,141,20,3,169,234,1296
2120 DATA141,21,3,169,1,141,14,2
20,169,121,141,25,208,169,240,14
1,1924
2130 DATA26,208,88,96,255,255,25
5,255,255,255,255,255,255,255,25
5,255,3478
```

FIGURE 3

When you run this program it simply POKEs a short machine code routine into memory. To start this machine code routine simply type the SYS instruction which is printed by the program.

What this program does is to change the border colour every time an interrupt occurs. Because interrupts occur extremely quickly the flash rate is so high that the different colours appear as a number of flashing bands.

You may notice that the border is still flashing even though the computer has returned to the READY prompt. You can list any program that is in memory or even type in a new program and the border will continue to flash. This is because, as I stated earlier, the computer is always being interrupted every 1/50th of a second and our little screen flash routine is run every time an interrupt occurs.

The Machine Code

So let's have a look at our machine code program and have a look at what it does. Figure 2 gives the source code for the C64 version of the border flash routine. The C16 version is almost identical apart from the locations that are used to change the border colour.

The program is actually in two separate parts. The first section actually alters the IRQ vector so that it holds the location of our border flash routine, section two of our little demonstration.

Taking the program line by line this is what it does:

1. We turn off the interrupts with the SEI instruction. The reason for turning them off is quite simple. We are going to change the vector that is jumped to when an interrupt occurs. Since interrupts occur every 1/50th of a second, if we didn't switch off the interrupts then it is possible that an interrupt would occur before we had changed both memory locations. If this was the case then the computer would not jump to our routine but rather to some other location in memory and the computer would probably crash.

2. After turning off the interrupts we alter the IRQ vector so that it points to our border flash routine.

3. Now we turn the interrupts back on.

Of course the interrupt vector isn't changed until you execute this program with a SYS instruction.

Our border flash program is extremely simple, all it does is to load the X register with the number 0. This is then stored in the border colour location. The X register now has 1 subtracted from it. Note in machine code if you substract a 1 from a memory location that contains a 0 it will become 255. The program then loops around until the counter gets back to zero when it jumps to the normal interrupt routines – keyboard scanning etc.

By normal interrupt routines what I mean is that we jump to the routine that is normally executed when an interrupt occurs. In other words we jump to the routine whose address is stored in the IRQ vector when the computer is switched on.

Going further

I hope that the above demonstration and supporting text makes it a little clearer as to what an interrupt is. The interrupts we have been dealing with are hardware interrupts that are generated every 1/50th of a second.

There are other ways of generating interrupts, for example the raster interrupt which can cause an interrupt depending on the position of the raster on the TV screen. However, at this time we don't really need to go into the other types of interrupt as we will deal with them as required.

IRQ Database

As I have already stated we will be using interrupts quite frequently within this series. In order to make them easier to use with our numerous routines you will find in Figure 3 the Basic loader for a C64 machine code routine which I call IRQ DATABASE, Figure 4 has the source for this for those of you who want to follow it through and see how it works.

This program functions by setting up a 'data base' of switches which are used to turn each routine on and off.

Each routine will be allocated a position in the database and can be turned on and off by simply POKEing a 1 or 0 into the relevant location of the database. For example on the C64 should you enter:

POKE 839,1

then the Message Scroll routine will be enabled. Of course the Message Scroll routine needs to be present in memory and this will be printed in a later part of the series.

Next Month

Have you ever wondered how you get moving objects in programs? If any of you have seen either of my *Blagger* games then the moving conveyor belts and ladders are the type of things I mean. Well next month I will provide a routine that will allow you to perform this with ease in your own programs.

FIGURE 4

```
1000 ;********************************
1010 ;****    INTERRUPT BOOT      ****
1020 ;********************************
1030 ;
1040 ;HOW TO USE FROM M/C
1050 ;
1060 ;     JSR 49152   IRQ ON
1070 ;     JSR 49272   IRQ OFF
1080 ;
1090 ;
1100 ;HOW TO USE FROM BASIC
1110 ;
1120 ;     SYS 49152   IRQ ON
1130 ;     SYS 49272   IRQ OFF
1140 ;
1150 ;*********************************
1160 ;
1170 CINV = 788      ;INTERRUPT VECTOR
1180 CINOUT = 59953 ;64 IRQ ROUTINE
1190 DTBASE = 831    ;START OF DATA BASE
1200 REDRAS = 53266 ;RASTER POSITION
1210 RASCOM = 53265
1220 TIMERA = 56334 ;TIMER 'A'
1230 INTFLG = 53273
1240 IQMASK = 53274 ;INTERRUPT MASK
1250 * = 49152
1260 ;
1270 ;
1280 PROG1           ;SET UP ROUTINES
1290  SEI
1300  LDX #0         ;CLEAR DATA BASE
1310  LDA #0         ;BY PUTTING 0 INTO
1320 LOOP1           ;831-1023
1330  STA DTBASE,X
1340  INX
1350  CPX #192
1360  BCC LOOP1
1370  LDX #0         ;CHANGE NEXT
1380  LDA #0
1390  TAX
1400 LOOP6
1410  STA 40192,X
1420  STA 40448,X
1430  STA 40704,X
1440  INX
1450  BNE LOOP6
1460 LOOP2           ;PROGRAM TO
1470  LDA #<FRED     ;JSR FRED
1480  STA CHANGE+1,X
1490  LDA #>FRED
1500  STA CHANGE+2,X
1510  INX
1520  INX
1530  INX
1540  CPX #30
1550  BCC LOOP2
1560  LDA #0
1570  STA TIMERA     ;TIMER A OFF
1580  LDA #<PROG2    ;POINT IRQ VECTOR
1585
1590  STA CINV       ;TO PROG2
1600  LDA #>PROG2
1610  STA CINV+1
1620  LDA #0
1630  STA REDRAS
1640  LDA #27        ;CLEAR BIT 8
1650  STA RASCOM
1660  LDA #1
1670  STA INTFLG     ;TURN ON RASTER
1680  STA IQMASK     ;CONTROL
1690  CLI
1700 FRED
1710  RTS
1720  ;
1730  ;
1740 PROG2
1750  LDA #1
1760  STA INTFLG
1770 CHANGE
1780  JSR 0         ;THESE ARE TO BE
1790  JSR 0         ;RE-VECTORED
1800  JSR 0         ;WHEN THE DATABASE
1810  JSR 0         ;IS IN USE
1820  JSR 0
1830  JSR 0
1840  JSR 0
1850  JSR 0
1860  JSR 0
1870  JSR 0
1880  JMP CINOUT
1890 ;
1900 ;
1910 PROG3          ;BACK TO NORMAL
1920  SEI           ;TURN OFF INTERRUPT
1930  LDA #<CINOUT
1940  STA CINV
1950  LDA #>CINOUT
1960  STA CINV+1
1970  LDA #1
1980  STA TIMERA
1990  LDA #121
2000  STA INTFLG
2010  LDA #240
2020  STA IQMASK
2030  CLI
2040  RTS           ;YOUR IRQ'S NOW OFF
2050 .END
```

Evesham Micros

ALL PRICES INCLUDE VAT & DELIVERY

THE star PRINTERS FOR BUSINESS NL-10

WHICH MAGAZINE BEST BUY

- **Automatic single sheet handling**
- **Tractor feed built in**
- **"Front Panel" mode selection**
- **Double and Quad height characters**
- **120 cps draft and 30 cps NLQ**

This is the best Commodore ready printer you can buy. Combines many unique features with **superb reliability, styling and print quality.** But the real beauty is that the interface cartridge is interchangeable so if you change comp-uters just buy a new interface.

In a group test with other popular printers such as Epson, Citizen and OKI *What Micro* magazine described the NL10 as **'the Rolls Royce of this group'.** ONLY **£249.00**

Automatic cut sheet feeder available as an option for **£63.25**

SELECTED PRODUCTS

1541C DRIVE. The latest version of the 1541, better drive mechanism and new colour ONLY **£189.95**

DISC NOTCHER. Double the capacity of your discs with this handy gadget. Cuts second write protect notch accurately and easily ONLY **£5.95**

AZIMATE 3000. Handy package allows you to easily check and realign the tape head of your CBM data recorder. Includes screwdriver ONLY **£6.95**

MOTHERBOARD. 4-slot, with either all upright sockets, or three upright and one through socket, to suit modem; please specify ONLY **£28.00**

POWER PACK. High quality replacement power pack for CBM 64 ONLY **£24.95**

XETEC SUPERGRAPHIX. The best centronics printer interface for your 64/128. Large buffer, downloadable fonts, etc ONLY **£69.00**

DATA RECORDER. CBM compatible, same performance as the C2N/1531 but cheaper and includes a pause button. ONLY **£24.95**

Large stocks of Commodore-related equipment at sensible prices. If you don't see what you want, give us a call.

DISKS AND BOXES

25 bulk-packed DS/DD disks with w/p tabs and labels ONLY **£13.95**

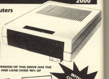
25 disks as aove with 50 capacity lockable box ONLY **£22.95**

25 disks as above with 100 capacity lockable box ONLY **£24.95**

50 capacity lockable box ONLY **£10.95**

100 capacity lockable box ONLY **£13.95**

THE EVESHAM ENHANCER 2000



For COMMODORE Computers

The Evesham Micros version of this reliable and compact disc drive has a **new ROM** to ensure a **very high** degree of compatibility with disc turbos and protection schemes.

FEATURES

- ★ **Handles Disc Turbos**
- ★ **Direct Drive Motor**
- ★ **1 Year Guarantee**
- ★ **Highly Compatible**
- ★ **No Overheating**
- ★ **Very Reliable**
- ★ **Compact Size**
- ★ **Very Quiet**

IMPORTANT: ONLY THE EVESHAM MICROS VERSION OF THIS DRIVE HAS THE NEW ROM THAT WILL HANDLE DISC TURBOS AND LOAD OVER 98% OF PROTECTION SCHEMES.

THREE PURCHASE OPTIONS —

OPTION 1
Evesham Enhancer with free s/ware.
ONLY £149.95

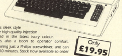
OPTION 2
Evesham Enhancer with free s/ware and Quickdisc + cartridge.
ONLY £159.95

OPTION 3
Evesham Enhancer with free s/ware, Freeze Frame Mk IV and 25 blank discs.
ONLY £179.95

WITH NEW COMPATIBLE ROM

THE SLIMLINE '64

Give your '64 the modern look



A NEW IMAGE FOR THAT FAVOURITE COMPUTER

- Easy to Fit
- Lower key height

This modern case with it's sleek style will transform your '64. The high quality injection mould is superbly finished in the latest ivory colour. The lower key height is also a boon to operator comfort. Fitting is very simple, requiring just a Philips screwdriver, and can be completed in less than 10 minutes. Stock now available so order for quick delivery.

Only **£19.95**

DOLPHIN DOS

YOU WON'T BELIEVE YOUR EYES!

THE EFFECT IS STAGGERING.

Now established as **THE parallel operating system** for the 1541 disc drive. Hundreds of satisfied users include business, hobby, full-time programmers, and **many leading software houses, including Gremlin Graphics, Domark, Superior, Alligata, Thalamus, Adventure International, and Software Projects.**

The speed and efficiency is truly unbelievable, it is compatible with **the vast majority of commercial software, speeding up both the loading of the program and of SEQ/REL files.** (It is brilliant with Superbase, Easyscript, etc.) For non-compatible programs it can be **completely switched out.** It DOES NOT use a special disc format and your existing discs will be compatible.

FITTING

Fitting involves the insertion of two sub assembly circuit boards, one in the 1541 and one in the '64/'128. These normally just plug in but on some '64s a small amount of soldering is necessary.

SOME OF THE FEATURES

- ★ **25x FASTER LOADING (PRG FILES)**
- ★ **12x FASTER SAVING (PRG FILES)**
- ★ **10x FASTER LOADING (SEQ FILES)**
- ★ **8x FASTER SAVING (SEQ FILES)**
- ★ **3x FASTER LOAD/SAVE (REL FILES)**
- ★ **E.G. LOAD 202 BLOCKS IN 5 SECS**
- ★ **EASY AND FAST DOS COMMANDS**
- ★ **USE 40 TRACKS FOR 749 BLOCKS**
- ★ **MONITOR BUILT IN**
- ★ **DRIVES CENTRONICS PRINTER**
- ★ **ENHANCED SCREEN EDITOR**
- ★ **EXTRA BASIC COMMANDS**

(These figures do not allow for searching)

Best Hardware Utility of year

EXTRAS AVAILABLE

Kernal for '128 in '128 mode	£9.95
User port expansion card (3 slot)	£14.95
Dolphin Copy (Whole disc in 18 secs and lightning fast file copier)	£7.95
Dolphin main board for second drive c/w lead	£44.95

If you require further information, please send SAE for fact sheet

Only **£69.95**
Available for CBM 64, or '128 in '64 mode, please specify.

In Australia: contact **Micro Accessories of S.A.,** Unit 8, Hewittson Road, Elizabeth West, S. Australia 5113. Tel: (08) 287-0191

THE CHOICE IS YOURS!

BACKUP CARTRIDGES

THE FACTS

Almost eighteen months ago, Freeze Frame Mk I revolutionised backup methods. Since then many imitators have appeared on the market. Some of the claims being made for certain of these products are rather misleading. Let us inform you of some positive facts.

1. **Much of the new software released uses "Anti-Freeze"; only Freeze Frame and one other product can handle these.**
2. **Only Freeze Frame can automatically handle these and other programs. You don't need to be an "Expert" or need "O" levels to operate Freeze Frame.**
3. **At press date (11.2.87) our exhaustive tests were unable to find any memory resident program that both Freeze Frame Mk IV and Lazer were unable to back up, completely automatically.**
4. **Similar tests with all rival products proved disastrous.**

THESE ARE THE FACTS
(not outrageous advertising claims)

FREEZE FRAME Mk IV

NEW PRICE . . . WHY SETTLE FOR LESS!

Now you can buy a **pedigree Freeze Frame** backup cartridge for a startling new price. **No need to settle for less,** this is the latest development of the originator. **More power, more features, easier to use.**

POWER

Legendary amongst Commodore owners but with continual development now even more impressive.

FEATURES

Three cartridges in one . . . fast load, utilities and backup.

TAPE to DISC **TAPE to TAPE**
DISC to DISC **DISC to TAPE**

So simple to use, just plug in and switch on, at the menu choose your option, no messing with software, it's always ready.

Load the program that you wish to backup, press the button on Freeze Frame, then you can either:

1. **Press "D" to save to disc with fast reload.**
2. **Press "S" to save to disc with standard reload.**
3. **Press "T" to save to tape with fast reload.**

MULTI STAGE PROGRAMS

The standard cartridge will transfer to disc **many tape based multi stage programs, e.g. Summer Games II, Silent Service, Winter Games, etc.** and when used in conjunction with the regularly updated **"F.F. Utility Disc"** the **vast majority** of programs of this type can be handled.

MORE FEATURES

- ★ **Doubles as a fast load cartridge**
- ★ **Loads extra parts fast**
- ★ **Built-in Fast Format**
- ★ **Built-in File Copier (up to 248 blocks)**
- ★ **New "SELECTALOAD" feature (Press "L" for directory, select with cursors, then press F3 to load.**
- ★ **Undetectable by software**
- ★ **Files compressed for disc economy**
- ★ **128/128D compatible in '64 mode**

PROGRAM RELOAD IS INDEPENDENT OF CARTRIDGE

NOW ONLY **£28.95**

At this price there is no need to settle for less

UPGRADES: Mk I or II . . . £14.95
Mk III or IIIB . . . £9.95
Mk IV to LAZER . . . £11.95

FREEZE FRAME LAZER

ANOTHER TRENDSETTER?

From the design team that changed the face of backup technology comes **another innovation.** The powers of Freeze Frame have been combined with a **staggeringly quick** new loading system. An **amazing 32K of ROM** provides you with **all the facilities of Freeze Frame Mk IV** as described opposite, plus the stunning new **LAZER** loading technique.

Check these LAZER features

- ★ **Reload a program in 10-15 seconds**
- ★ **Fast saving of programs**
- ★ **Loads extra parts at VERY HIGH speed**
- ★ **Load speed approx. 20× normal**
- ★ **Uses standard disc format**
- ★ **Includes RESET**

Cartridge must be present to reload at LAZER speed
Proven power with stunning new technology:

ONLY **£39.95**

UPGRADES: Mk I or II . . . £29.95
Mk III or IIIB . . . £19.95
Mk IV . . . £11.95

"F.F." UTILITY DISC V2.0

Now with **many more** routines to allow the complete transfer from tape to disc of programs that load parts as the program progresses. Used **in conjunction with Freeze Frame** for the awkward ones that cannot be handled by the standard cartridge. Included are routines for most popular games like **Supercycle, World Games, Gauntlet, Trivial Pursuit, Ace of Aces, Dragons Lair I & II (includes training mode), etc., etc.**

ONLY **£7.95**

Update fee for owners of **V1.0** is **£2.00**

DISC DISECTOR V5.0

The fifth version of the country's **leading** disc backup/utility program. This latest version includes **many "PARAMETERS"** to handle the latest highly protected discs. This includes the latest **American and English software.** Be warned if you want to back up software by Ocean, Gremlin, Hewson, Domark, and even U.S. Gold whose protection schemes are NOT always the same as the American versions, then you **MUST have "D.D.".** At press date, **we are sure NO other advertised product will handle all these, be it American or German.**

INCLUDES THE FOLLOWING

- ★ **EVESHAM 3 MINUTE NIBBLER**
- ★ **EVESHAM 8 MINUTE NIBBLER**
- ★ **MANY PARAMETERS** (The vital code for the protection schemes)
- ★ **DUAL DRIVE NIBBLER**
- ★ **MENU MAKER (with select facility)**
- ★ **DISC ORDERLY**
- ★ **FAST FORMAT**
- ★ **FAST FILE COPY**
- ★ **UNSCRATCH**
- ★ **DISC RESCUE**
- ★ **DISCMON+**
- ★ **ETC., ETC., ETC.**

The whole package is menu driven and has its own fast boot system built in for your convenience. Pays for itself the first day you receive it.

ONLY **£24.95**

Customers with earlier versions may return them along with a payment of **£7.95** to receive **V5.0.**
Most routines are CBM 128 and 1570/71 compatible in '64 mode.

QUICKDISC+

Our highly popular fast load and save plus utility cartridge has received many favourable reviews.

- ★ **FAST LOAD (5 to 7 times improvement)**
- ★ **FAST SAVE (5 to 7 times improvement)**
- ★ **FAST FORMAT (20 seconds)**
- ★ **FAST BACKUP (4 minutes)**
- ★ **FAST FILE COPY (up to 248 blocks)**
- ★ **EASY DOS COMMANDS**
- ★ **CENTRONICS PRINTER DRIVER**
- ★ **RESET BUTTON (unstoppable)**
- ★ **HELPS MENU**
- ★ **USES NO MEMORY**
- ★ **'128 COMPATIBLE ('64 mode)**

Exception value for money at only . . .

£19.95

1541 QUIET STOPS

Cure for ever the dreaded 1541 drive head "hammering"

- ★ **Easy to fit**
- ★ **Detailed instructions**
- ★ **One kit does two drives**
- ★ **Helps prevent misalignment**

ONLY **£4.95**

Not suitable for "turn lever" type drives.

DOUBLER

THE tape backup "device"

Many thousands of this popular product have been sold and sales continue to flourish. Why? We think because it is the best product of it's type. Consisting of hardware and software it uses a unique method controlled by the software that allows you to produce perfect backups of your tape software.

It is very easy to use and very successful, in fact our tests have proved that Doubler can achieve 100% success.

ONLY **£12.95**

1541 PHYSICAL EXAM

Have you got . . .

Alignment problems

If so, you need this package. Contains digital alignment disc and drive fault diagnosis software that allows you to check **and correct** head alignment.

- ★ **CHECKS RADIAL ALIGNMENT**
- ★ **CHECKS SPEED**
- ★ **CHECKS BELT AND CLAMPING**
- ★ **THOROUGH INSTRUCTIONS**
- ★ **INCLUDES QUIET STOPS**

ONLY **£39.95**

ORDERING INFORMATION

ALL PRICES INCLUDE VAT AND FREE DELIVERY WITHIN U.K. (Despatch within 24 hours whenever possible)

HOW TO ORDER

By Post
Send cheque, P.O., or ACCESS/VISA details to our Evesham address

By Phone
Call our Evesham branch and quote your ACCESS/VISA details

EVESHAM MICROS, 63 BRIDGE ST, EVESHAM, WORCS. WR11 4SF

CALLERS WELCOME **Tel: 0386 41989 Telex: 333294** **TRADE ENQUIRIES WELCOME**

Also at: 1756 Pershore Road, Cotteridge, Birmingham B30 3BH. Tel: 021 458 4564

All items subject to availability. E.&O.E. Orders from Government and Educational departments welcome.

Overseas Orders: Within Europe, please send advertised price. Outside Europe, add **£2.00** for Air Mail

Printmaster

Creat your own headed paper, greetings cards or other forms of stationary with this program from Ariolasoft.

By Evelyn Mills

Printmaster by Ariolasoft is a very extensive program with an overwhelming selection of options which, in my opinion, give it a very high rating in the operative field of creating your own graphics stationary. Performance is smooth, impeccable and the program is dedicated to the user in every respect.

On loading, the main menu gives the following options: Greeting Card, Sign, Stationary, Calendar, Banner, Graphic Editor and setup. The latter is for printer output options: while Printmaster (PM) is preset for the Commodore 1525/801, the printer output will allow conversion for Epson, Star, Okimate, Oki and C-Itan printers.

Editor

So what do we choose first from the main menu? I would suggest Graphics Editor to familiarise yourself with the graphics on the disk and also to experiment with creating your own graphics. Having highlighted this option, choose 'graphics by picture'... Here you will find 120 plus inbuilt graphics for your inspection and use!! Some of these graphics are relatively standard, a large proportion are very novel, but each and every one is very well designed for maximum graphic effect.

On display with your graphics, there is a side menu which allows you to edit, clear, invert, flip horizontally, flip vertically, save to disk or print (each graphic occupies three blocks on saving): inversion and flipping are shown very rapidly on screen. Editing and creating both have four functions controlled by F1 which handles drawing, shading, toggling and erasing. Drawing gives solid lines, shading gived dotted lines while toggling draws and erases where lines corss; the shading and toggling combination gives excellent 3D effects. All functions are joystick controlled, F1 setting the mode of operation for you.

Cards

Greeting Card: Here there are seven borders from which to choose, including a few unconventional ones such as 'crawling ants' – the programmers really enjoyed making this software. Eight fonts are available and there is space for seven lines of text (39 column width) so there is no need to stick to the usual conventional, cryptic greeting. Both upper case and lower case may be used. Naturally a graphics selection is available in either small, medium or large mode.

Now the program really gets interesting – you can stagger your graphics in a set manner or place them where you wish. At this point the function keys 1, 3, 5 and 7 interplay with one another. F1 positions writing to left centre or right; F3 alters size; F5 alters style while F7 alters the font. Effectively then, you may interchange positions and change fonts within any one graphic; should you overflow with enthusiasm, the screen will say so and it can be sorted out with the delete key. While you are still creating a Greetings Card, there is a Front Page and an Inside Page for you to use.

What have you done?

Now keep moving along (plenty of screen prompts) and you will be given the chance to PREVIEW what you have done. This, I think, is an excellent option. If you don't like what you have designed, back-step with the key and change it all. For a really radical change go back to the Main Menu and start all over again. If you like it – save the whole thing to disk for use at a later date (change a few names around when you reload if you wish) or print it out directly. Now who could ask for more than that?

The ↑ function is operative all through the program and allows you to back-step at any point for editing.

Making Signs

The SIGN Facility operates in a similar manner, and gives you a one page presentation with all the facilities described above including seven lines of entry.

Stationary naturally creates your own paper heading. Here the graphics may be to the left, to the right, 'tiled' or a row of tiles. Both the top and bottom of the page are programmable: note – the RESTORE Key stops printer output – so don't go too far away or you will have multiple pages at your feet. On the other hand, try half a page if you want!

What's the date?

The CALENDAR: very good is this: again chose your graphics, and font, plus months and year. The 12 calendar months are listed and are selected by highlighting; the year is listed as 1986 which may be changed as directed; you are now asked for a monthly or weekly calendar.

The Monthly calendar selection gives the menu: continue, alter heading, and enhance date.

With 'alter heading' the font may be changed with F7 while the typed heading at the top may be altered with the delete key and input from the keyboard. Anyway assuming that you are quite happy with what you see, select 'enhance date': from this option you can now enter three lines of five characters each for any one date to remind you of who's who and what's what. Again you get a preview of your monthly calendar picture.

Yes, if you choose any particular year, the calendar will start on the correct day and date of that year. Leap Years? – of course they are catered for.

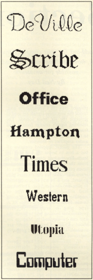
If you choose the weekly option you will then be asked for generic or specific options. The GENERIC format is not dated and the output is full screen with Sunday to Saturday of any one week (of any one month, of any one year) running downwards with blanked, lined spaces running transversely for you to write on at a later date (in pen, pencil or what not). The SPECIFIC format is similar but dated. Again you may have a preview before printout. The Calendar also supports graphics.

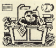
Long Notices

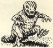
On to the BANNER which gives you graphics, fonts and one line of writing up to 39 characters long. This also used F7 for font changing thus allowing you to 'mix it up'.

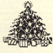
All through the program upper and lower case may be used as can REVERSE MODE for both graphics and print. Fonts can be single, solid or 3D. The 3D effect can be a bit startling but what displeases my eye may well please yours.

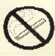
Now if you cannot create with this program don't blame the back room boys. They have given you a disk full of powerful commands to implement plus excellent on screen instructions. The end result is very pleasing to the eye. The ability to back step, change fonts and words and preview your material before printing is an inspiration – plus the fact that, not only can you save graphics alone, you can save the whole card, calendar, banner or whatever. A five star epic. YC

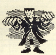

DeVille
Scribe
Office
Hampton
Times
Western
Utopia
Computer











Touchline
Name: ***Printshop*** *Price:* ***£29.94*** *Machine C64 Supplier:* ***Ariolasoft, 68 Longacre, Covent Garden, London WC2 9JH*** *Tel:* ***(01) 836 3411.***

Percussion Section

Building add-ons for your computer sounds like a daunting task, however Maplins Computadrum makes it possible for amateurs.

By Neil Day

My friend who knows about such things said I was crazy to try, but I wanted to build something to add on to my C64. I think I found the ideal beginner's project in a cheap drum synthesizer kit from Maplins, a large electronics chain and mail order firm.

Computadrum is supplied as a packet of components with a printed circuit board. The kit will work with a number of different micros including the C64 and Vic 20. It should also work on a C128 in C64 mode, but I haven't tried it.

The unit provides six separate channels, or different drum sounds. Each channel can be tuned for pitch and resonance by altering the setting of variable registers on the circuit board with a small screwdriver. Software can be used to switch each channel on or off and to control the time between each beat. You might think this would give access to six sounds only. You'd be wrong. The six channels can be mixed in any combination. In effect, this gives you access to a large variety of sounds.

I'm told, by my friend who knows, that commercial drum synthesizers will do more, and the software provided is fancier. The *Computadrum* has one big advantage over these – you construct it yourself, and, in the process, learn a lot about the wonderful mysteries of the user port. That's what I now know to call the hole you can feel on the lefthand side of the back of your C64!

Signals, controlled by the computer, come from this port and are plugged into the *Computadrum* unit. Inside the unit these signals are used to generate the six drum sounds. The resulting signals emerge from a lead from the unit that has to be connected to the line-in or audio-in socket of an audio amplifier or monitor.

The packet supplied contains all but a box to house the unit and the leads. For the lead into the drum unit from the C64 computer you need a seven pin din plug, a couple of feet of seven way cable for the six lines plus ground, and a 24 way edge connector to plug into the computer. The output lead will depend on the type of amplifier or monitor or you are going to use. Most commonly a single RCA type plug is required. A very professional looking box to house the unit can be supplied by Maplins for about £5.60. Cheaper ones are available too, or you could probably improvise one.

If, like me, you have never previously assembled electronic equipment, you may start out feeling a bit apprehensive. However, the process is easy. Maplins has a little brochure called *Constructors Guide* (ref xh791). It costs just 25p and tells you how to identify resistors, capacitors and other such beasts. I used the magnifying glass out of my daughter's stamp collection to read the values off the tiny components. I noted the value (ohms for resistors and farads for capacitors) on to a scrap of paper and then wrapped up the components of the same value together in the paper. This meant that I did all the identification of components (probably the hardest thing of all for me) in one sweep.

Sticking the components into the printed circuit board reminds me of knitting to a pattern, except it's a lot easier than the fairisle sweater I laboured over for 18 months! Some items need to be orientated correctly so that the positive end goes through the correct hole in the PCB, but this is always indicated in the very clear lettering on the board itself.

You are advised to poke in a few components at a time, and then solder them into position. You use small wire-cutters to remove the excess wire, protruding from the bottom of the board, and repeat the process until all the components are installed.

The last time I used a soldering iron was to mend the spouting; that was harder than soldering the components in place. The detailed advice in the *Constructors' Guide* and the project instructions helped me here. Large lumps of blue tack secured the board, leaving two hands free for the soldering. The only items that were at all tricky were the semiconductors because the pins on these are very close together. The finer the point on your soldering iron the easier it is.

Well, putting it all together takes a few hours, but in the process you read the excellent instructions and get a general idea of what each circuit does. Before long you've soldered the leads and it's time to test the unit.

Mine didn't work! I checked both for whiskers of solder shorting the tracks on the pcb and the correct placement of components. These were all OK. My mistake was that I had assumed that the wire marked "ground" from the user port would wind up attached to the metal shield round the seven pin plug at the end of the input cable. I was informed by my friend, who knows about these things, that only a person with the brain of a small gnat would do this but you still might appreciate the tip. The ground wire has to be connected to one of the seven pins. Mis-wiring the cable was the only construction error I made.

This fixed, I got some convincing drum sounds, but I couldn't work out which of the adjustable resistors altered which of the six voices. It turned out to be my misunderstanding of the short program you type in to run the drum. To turn a line on, or "set it high" as they say, you have to poke the appropriate value into register 56577: for instance binary %000001 turns on the first line and makes the first drum, called drum zero sound: binary %0000011 turns on lines zero and one making these two channels of the synthesizer sound simultaneously. My problem was that when the program asked me to type in the drum number, I assumed that five would give me drum number five and so on. But five is, in binary, %00000101, so it turns on drum zero and two together. In other words you must tell the program to poke in a denary equivalent of the binary value of the drum number. If you want drum three you need to type eight (2*2*2 or 2 to the power of 3). Similarly, drum four is indicated as 16, and drum five as 32 or two to the power of five.

All-in-all, building the Computadrum kit is very absorbing, and gives you a good understanding of how the computer can be used to control external equipment. Now I'm looking for a mail order DIY robot that will dance to the pulsating rhthym of my drum machine. He who knows about these things says I should get in touch with one of those seamier types of mail order places that sell a special type of inflatable robot. He says that what I did when wiring up the cable would stand me in good stead. You have to get used to opaque comments like this from electronics experts when you're an amateur hardware constructor! ▣

Touchline
Comptadrum Construction Kit.
Reference: *LK52G*
Cost: *£10.95*

Constructors' Guide Pamphlet.
Reference: *XH79L*
Cost: *25p*

Maplin Electronic Supplies Ltd
P.O. Box 3, Rayleigh, Essex, SS6 8LR.
Tel: *(0702) 552911.*
Also Branches in Manchester, Birmingham, London, Southampton, and Southend.

U.K.Soft Centre

C128			C128
C128 BASIC Compiler			47.00 d
DBASE II			118.00 d
Micro Clerk (Complete accounting package)			89.50 d
New Paperclip (Word Processor)	NEW		42.50 d
Oxford PASCAL			47.00 d
Swift Spreadsheet 128			22.50 d

C64 BUSINESS			C64
Cut & Paste (Word Processor)	NEW		22.50 d
New Consultant (Data Manager)	NEW		44.00 d
Practifile 64 (Database)	Special		20.00 d
Swift Spreadsheet 64			22.50 d
First Word 64 (Word Processor)			32.50 d
Superbase 64			44.95 d
Superscript 64			44.95 d

C64 EDUCATIONAL			C64
French Mistress A and B (each)		7.95 t	
Kermit's Story Maker (5-10yrs)		8.50 t	12.95 d
Logic Levels (7-12yrs)		8.95 t	
Number Tumblers (8-12yrs)		8.75 t	
Up 'n' add 'em (3-7yrs)		8.75 t	
Winnie The Pooh			11.50 d

C64 UTILITIES/GENERAL			C64
Art Studio		12.75 t	15.95 d
GEOS	NEW		48.00 d
LASER Basic		14.50 t	17.50 d
LASER Compiler		19.00 t	24.00 d
Newsroom	NEW		37.00 d
Optical Mouse & Graphics Pack			47.50 d
Print Shop	NEW		44.50 d
Quill & Illustrator		16.50 t	19.50 d

C64 FLIGHT/SIMULATORS/WAR GAMES			C64
ACE (Air Combat Emulator)		8.50 t	11.50 d
Ace of Aces		8.50 t	12.95 d
Acro Jet		8.50 t	12.95 d
Carriers at War (SSG)	NEW		24.00 d
Destroyer	NEW		12.95 d
Europe Ablaze (SSG)	NEW		24.00 d
Field of Fire	NEW	8.50 t	12.95 d
Gunship	NEW	13.50 t	18.00 d
Heathrow Air Traffic Control		7.50 t	
Knights of the Desert		8.50 t	12.95 d
Reach for the stars (SSG)	NEW		24.00 d
Sky Runner	NEW	8.50 t	
Tigers in the Snow		8.50 t	12.95 d
Tomahawk	NEW	8.50 t	12.95 d
Vietnam	NEW	8.50 t	12.95 d
747 Flight Simulator (Doc Soft)		10.75 t	13.50 d

C64 ADVENTURES			C64
221b Baker Street	NEW		12.95 d
Bard's Tale	NEW		12.95 d
Hitch-Hiker's Guide to the Galaxy			24.50 d
Jewels of Darkness (3 Adv's)		12.75 t	12.95 d
Leather Goddesses (Adults only)	NEW		24.50 d
Masters of Universe	NEW	8.50 t	12.95 d
Moonmist by Infocom	NEW		23.00 d
Murder on the Mississippi			12.95 d
Silicon Dreams	NEW	12.75	18.00 d
Sorcerer by Infocom			22.50 d
Tass Times in Tone Town	NEW		12.95 d
The PAWN	NEW		18.00 d
Ultima III		Special	15.00 d
Ultima IV			18.00 d

C64 ACTION/GAMES/SPORTS			C64
10th Frame	NEW	8.50 t	12.95 d
Alien	NEW	8.50 t	12.95 d
B. Clough's F'ball Fortunes		13.50 t	16.00 d
Colossus Chess 4.0		8.50 t	12.95 d
Footballer of the Year	NEW	8.50 t	12.95 d
Gauntlet	NEW	8.50 t	12.50 d
Leader Board (Golf)		8.50 t	12.95 d
Light Force	NEW	7.75 t	12.95 d
Repton 3	NEW	8.50 t	10.50 d
Scrabble		11.50 t	13.50 d
Shao-Lin's Road	NEW	8.50 t	12.95 d
Starglider	NEW	12.75 t	16.00 d
Super Sunday	NEW	8.50 t	12.95 d
Tracker	NEW	12.75 t	16.00 d
Trivial Pursuit		12.75 t	18.00 d
World Games		8.50 t	12.95 d

C16 - PLUS 4			C16/PLUS 4
Blockbusters	NEW		7.00 t
Cassette Head Alignment Kit			8.00 t
Computer Hits 3 (10 games)			8.50 t
Home Office (Database & WP)			6.75 t
King Size 50 (50 Games)			8.75 t
Paintbox (Drawing Utility)			6.00 t
Scooby-Doo	NEW		7.00 t
Sports 4	NEW		7.00 t
Trailblazer	NEW		6.00 t
Way of the Tiger	NEW		6.50 t

PLUS 4 only			PLUS 4
ACE (Flight Simulator)		8.75 t	12.95 d
Mercenary		8.50 t	
2nd city for Mercenary		5.50 t	
Saboteur		7.50 t	
Strip Poker	NEW	7.50 t	

JET the brilliant new F16/F18 Fighter simulator. C64 Disc only **£42**

FLIGHT SIMULATOR II without doubt the best Flight Simulator on the C64.
Cass **£35** Disc **£44**

Extra SCENERY DISCS compatible with Flight Sim II and JET £19.50 each.

PLEASE SEND STAMP FOR OUR COMPLETE LIST (STATE WHICH COMPUTER).
Please include 50p for Post and Packing for all orders less than £20. Outside UK please include £1 plus 75p for each additional item on all orders. Send Cheque, Eurocheque, Sterling money order or UK Postal Order with order to:

PO BOX 36 UK SOFT CENTRE LTD (YC) TELEPHONE
DUNSTABLE BEDS LU6 2NP DUNSTABLE (0582) 607929

MPC SOFTWARE

AMIGA SOFTWARE

Arcade Style Games	
Arctic Fox	£27
Arena	£29
Brataccus	£32
Deep Space	£32
Marble Madness	£27
One on One basketball	£27
Racteur	PHONE
Skyfox	£27
Winter Games	PHONE
Business Software	
Aegis Draw	£145
Aegis Impact	£160
Analyse	£90
Digital Link	£65
Dynamic CAD	£425
Financial Cookbook	PHONE
Fantasy	£199
Gizmo	£45
Keyboard Cadet	£35
Logic Works	£90
Logistix	£155
Maxiplan	£140
Mi Amiga File	£90
Mi Amiga Ledger	£90
Mi Amiga Word	
Nancy (Spell Checker)	£47
Omega Base	£95
On-Line	£85
Organize	£100
Scribble	£85
Superbase Personal	£135
Talker	£65
Text Craft	£55
Typing Tutor	£33
VIP Professional	£180

Leisure Software	
Archon	£27
Archon II	£27
Balance of Power	£39.95
Chessmaker 2000	£40
Defenders of the Crown	£45.95
Dr. Xes	£40
Flight Simulator II	£49.95
Hacker	£23
Halley Project	£40
Leaderboard	£23
Little Computer People	£30
Mean 18	PHONE
SDI	PHONE
Seven Cities of Gold	£27
Shanghai	£23
Silent Service	PHONE
Sinbad + Statue of Falcon	PHONE
Strip Poker	
Temple of Apshai Trilogy	£23
Winnie the Pooh	£23
Languages + Utilities	
AC Basic	£265
AC Fortran	£265
K-SEKA	£75
Lattice C	£120
Metacomco Macro Assembler	£65
Metacomco Make	£46
Metacomco Pascal	£83
Metacomco Shell	£45
Metacomco Toolkit	£37
Modula 2 (Standard)	£90
Modula 2 (Developers)	£135
Quick Nibble	£35
The Mirror	£45
True BASIC	£160

Graphic/Sound	
Aegis Animator + Images	£110
Aegis Images	£64
Deluxe Paint	£85
Deluxe Paint II	PHONE
Deluxe Print	£83
Deluxe Video	£99
Deluxe Music	£85
Graphicraft	£50
Instant Music	£27
Music Studio	£31
Adventures	
Ballyhoo	£27
Borrowed Time	£23
Crimson Crown	£25
Deadline	£27
Enchanter	£27
Hitchhikers Guide	£27
Jewels of Darkness	£18
Leather Goddesses of Phobos	£27
Mind Forever Voyaging	£27
Mindshadow	£23
Oo Topos	£25
Planetfall	£27
Silicon Dreams	PHONE
Starcross	£27
Suspect	£27
Suspended	£27
Tass Times in Tonetown	£23
The Pawn	£23
Three Musketeers	£23
Transylvania	£25
Trinity	£32
Wishbringer	£27
Witness	£35
Zork I	£27
Zork II	£27

Flight Simulator II	Defender of the Crown	Deluxe Music	Chessmaster 2000
£49.95	£45.95	£83	£40

DESK TOP PUBLISHING — PHONE FOR DETAILS

HARDWARE

Technical Reference Manuals	PHONE
Other Books	PHONE
10 3.5" Kao Guaranteed discettes	£30
40×3.5" lockable discette storage box	£13
80×3.5" lockable discette storage box	£18
Mouse Mat	£9
Elite Joystick	£13
Professional Standard Joystick	£15
Arcade Joystick	£19
Quickshot IX Joyball	£10
Citizen 120D Printer & Lead	£290
Citizen MSP-20 Printer & Lead	£500
Quadram Quadjet colour printer & lead	£320
Commodore MPS1000 Printer	£280
Other sound digitisers	PHONE

Amiga Computers	PHONE
256K-512K memory upgrade	£140
Uncased 256K-512K memory upgrade	£90
Sidecar	£800
Printer Lead	£20
Comspec 2MB memory upgrade	£800
Add on 3.5" disc drive	£280
Add on 5.25" disc drive	PHONE
20MB Hard Disc	£1700
40MB Hard Disc	£2000
Easyl Graphics Tablet	£560
Triangle Graphics Tablet	£359
Midi Interface	£55
Soundscape Digitiser	£90
Digiview	£200

GRAPHICS TABLET	AMIGA COMPUTER	INTERNAL MEMORY EXPANSION
£359	PHONE FOR BEST DEAL	PHONE

MPC SOFTWARE, 72, JULIAN ROAD, WEST BRIDGFORD, NOTTINGHAM.
NG2 5AN. TEL: 0602 820106

All prices correct at time of going to press. E&OE.

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.

It's three o'clock in the morning. You sit at the computer keyboard just finished a marathon typing session entering one of the superb 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 lo ng 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, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.
TEL: (0442) 48435

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 C16 and Plus/4 cassettes. 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 strap 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 strap. 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 placing a program that expects to be reading from disk on to tape.

NOVEMBER 1986

Into The Eighties — now you can give your C64 80 column capability, with this program. You have access to two screens either the 40 column version or the new 80 column one.

C16 SOUND SAMPLER — now your C16 or Plus/4 can sound like any instrument you like with this sound sampler – Available on disk only.

C64 AUTOSAVE — You've been programming for hours and your computer crashes taking all of your work with it. Well, you can prevent this with our C64 Autosave. This will save your programs to disk or tape every five minutes automatically so you won't have too much work to catch up on.

DATAMAKER 128 & C64 — Two excellent datamaker programs one for the C128 and one for the C64.

ORDER CODE
DISK YDNOV86 £6.00
TAPE YCNOV86 £4.00

DECEMBER 1986

WIMP – Create your own graphics operating system in your own programs. Complete with pull down menus and sample icons.

REMEMBER THE PLUS/4 – An assembler for Plus/4 owners. Complete with a couple of new Basic commands including a MERGE facility.

ORDER CODE
DISK YDDEC86 £6.00
TAPE YCDEC86 £4.00

JANUARY 1987

SELECT MENU 128 — Add a menu program to your C128 disk collection.

DISK ARCHIVE — Now you can make a total backup of all your disks on to cassette for safe keeping. A complete disk uses five minutes of tape (C64).
TAPE HEADER — Find out where your cassette based programs start in memory. For the C16 (Jan Disk only).
ANIMATOR — Generate your own animated character sequences with this program for the C64.
DUMPER — Produce copies of your Plus/4 text and Hi-res screens with this handy screen dump program (Jan disk only).

ORDER CODE
DISK YDJAN87 £6.00
TAPE YCJAN87 £4.00

FEBRUARY 1987

TURBO MENU MAKER — Add menus and high speed loading to your disks (C64 — disk only).
HEX DATA ENTRY — Your Commodore program entry system.
X-RAY FILE — Get more information from your disk drive (C64 disk).
ADVENTURE AID GRAPHICS — Easy graphics for our Adventure Creator system.
LABELLER 64 — Easy addressing with this label printer for the C64.
WORD PRO ADD ON — Add descenders to your MPS 801 printouts with the Plus/4 word processor.
NURSERY RHYME LAND — An educational adventure for the young ones.

ORDER CODE
DISK YDFEB87 £6.00
TAPE YCFEB87 £4.00

MARCH 1987

SPELLING CHECKER — for use with the Plus/4 word processor — disk only.
NINE LINE MATRIX — Clearer 80 column displays on your C128.
JOYSTICK READ — Invaluable joystick routine for Basic programmers with a C64.
LABELLER 64 — See February 1987.
HEX DATA ENTRY — Our machine code easy entry program for C64.
WIMPS AND MUCH MORE — An extension to our C64 Wimps program plus a foolproof INPUT system.
DISKIT — Memory Saver, Program Compressor and One Part Maker. The first three parts of this popular series for C64 and disk (Disk only).
NURSERY RHYME LAND — See February 1987.
POPPER — A game featuring Popper the green pea, for the C64.

Order codes
YC MAR 87
YD MAR 87

Cassettes or disks are available back to March 1986. Please ring the Editorial office (01-437-0626) for details of these.

ORDER FORM – PLEASE COMPLETE IN BLOCK CAPITALS

NAME	QTY	TAPE/DISK	ORDER CODE	PRICE
March '87		TAPE (£4.00)	YC APR 87	
March '87		DISK (£6.00)	YD APR 87	
OVERSEAS POST £1				
			TOTAL	

NAME...

ADDRESS...

POSTCODE...

I enclose a cheque/postal order for £...... made payable to ARGUS SPECIALIST PUBLICATIONS LTD.

All orders should be sent to: YOUR COMMODORE, READERS SERVICES, ARGUS SPECIALIST PUBLICATIONS, 9 HALL ROAD, HEMEL HEMPSTEAD, HERTS HP2 7BH.
Please allow 28 days for delivery.

Device One

A printer interface is one of the most important items you may ever buy. Device One could be just what you're looking for.

By Stuart Cooke

When Commodore launched its range of home computers, the need to purchase Commodore products in the future was virtually built in. Should you require a disk drive then you would have to use Commodore's. If you wanted a printer then you would have to use Commodore's. All this is due to the fact that the computers have a non-standard interface.

Most of the popular printers such as Epson, Star and Citizen come complete with a centronics interface making them unuseable with a Commodore computer. To solve this problem many parallel interfaces have been built that enable you to use a parallel printer with a Commodore though none of them have been as powerful as the *Device One* from Precision Software.

The purpose of *Device One* is basically to link together a printer with a parallel interface to the Commodore computer. The computer talks to the printer in the normal way i.e. it thinks it is talking to a Commodore printer while the interface makes the printer behave as though it is a Commodore printer.

The actual casing for the interface is made from what appears to be a Vic20 cartridge case. The only reservations that I have about the interface are partly due to this. Only part of the circuit board is covered and a large proportion of it is visible to the outside world. I can't help wondering if a metallic object such as a paper clip could find its way into the interface through this opening and cause havoc to the chips inside.

The interface itself contains 16K of RAM and 16K of ROM, there are four built in character fonts, so you can print listings in different faces. There is also the facility to print out in your own fonts, print pictures, calendars and banners.

Documentation

The manual accompanying the interface was printed using *Device One* and its different fonts showing the flexibility of the interface. The manual is extremely clear with many examples used to illustrate different functions.

Many of the different commands are extremely difficult to remember, even though the manual does make it extremely clear how to use them, the interface therefore has its own inbuilt documentation. Hold down the reset button on the interface for more than three seconds and a brief summary of the available commands will be printed out for you.

In Use

Setting up the interface is extremely simple. The interface plugs into the Commodore serial port and the printers centronics port. A third connection is made with a transformer to a convenient mains socket.

The interface will work with no less than 25 different types of printer, all of the popular types such as Epson etc. are available. Selection of the printer type is simply made by altering the position of three switches on the front of the interface. Other switches determine if you require an autoline feed and the mode of operation of the interface. There are four different modes of operation, 1525 emulation is, as its title suggests, total emulation of a Commodore 1525 printer, you also have access to all of the *Device One* features such as fonts and calendars.

Semi-transparent mode passes all commands directly to the printer without any conversion, however Device One commands will still work.

Transparent mode passes characters straight through to the printer, Device One commands will not work.

ASCII mode passes al codes straight through to the printer except for characters. Any characters are translated from Pet-ASCII to normal ASCII so that they are printed correctly on your printer.

1525 Emulation

When using this mode all of the Commodore printer commands such as double size work as you would expect. This means that you can now use any program that requires a Commodore printer without any problems at all.

Device One Control

There are no fewer than 32 different commands that can be sent to the *Device One* interface. Commands can be sent to the interface in one of two ways. Either you can open a channel to the printer with a secondary address of 15 e.g.

```
OPEN 4,4,15
```

or you can send two escape codes (27) to the interface before a command.

Obviously there are far too many commands available to go into them all so I will concentrate on the main ones.

Custom Fonts

One command will allow you to select the font that you would like to use. There are no fewer than six variations of this command and for many of them you must have down-loaded into the *Device One* the font that you require, note this is not the same as one of the four in-built fonts.

You can select a low-res font which

is made up of 6*8 dots. You may select a mid-res font which is made up of 8*8 dots. A hi-res font may be selected which is made up of 12*8 dots on an Epson type printer or 16*8 dots on some others.

One of the four in-built fonts may be selected, Figure 1 gives examples of each of these. You can select your printers normal font and Underline can be switched on or off.

Downloading

In order to get fonts etc. into the interface you must select one of the seveon download commands. Commands exist to download each of the different styles of font as well as downloading a picture into the interface's RAM, sending a text file so that it is printed in transparent mode and downloading a disk drive to the printer. Downloading is extremely easy since once the interface is told to download it waits until you send it the necessary information. The easiest way to do this is to VERIFY the file that you require. This file isn't read into memory but is sent down the bus to the interface.

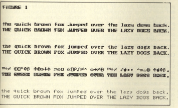


FIGURE 1

the quick brown fox jumped over the lazy dogs back.
THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK.

the quick brown fox jumped over the lazy dogs back.
THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK.

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK.

the quick brown fox jumped over the lazy dogs back.
THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK.

Printing Pictures

Pictures can be printed in either full-tone or half-tone. Full-tone simply means that the image is in black and white while half-tone means that the interface will use shading to print out the different colours. In order to print a picture it must be down-loaded into the RAM in the interface. Then each time the interface is told to print a line each line of the picture is printed. Should you send text to the printer you could print this over an illustration.

Printing Calendars

There is an in-built calendar mode in the interface. This simply prints out a calendar for a specified month on your printer and can be printed in any font.

Banners

This mode will allow you to print any message sideways on to your printer, each letter of your message being as high as the width of the paper.

Laying It Out

Commands exist within the interface to set the page length of the interface and the left and right margins. For anyone who uses a wordprocessor that doesn't have header and footer commands the inclusion of this in the interface will be a welcome addition. You could even use headers and footers to print messages at the top and bottom of any listings that you print out.

NLQ

Many people would love to have access to a daisy-wheel printer which prints extremely clear characters, however for most of us the price of these is far out of our reach and we are therefore stuck with the dotty products that our printers provide. The NLQ mode of the *Device One* does improve these dramatically by printing each character twice. This gives a more professional finish to any printouts.

Software

Not only does *Device One* come complete with its own built in software, it also comes complete with a disk full of it for the C64. The software included is:

Printerizer – This allows you to convert pictures from most of the popular packages to Device One format.

Font Editor – This allows you to create your own fonts for use with your printer.

Dump All – This patches into your machine and allows you to get a screen dump at any time by holding down a few keys.

Dump Text – Similar to the above but this only prints text.

Draw! – A simple drawing package that allows you to create your own hi-res pictures.

Print Utility – A program that makes printing calendars, banners or down-loading pictures and fonts much easier.

Font Capture – This allows you to go through the memory of the computer so that you can capture any fonts that are used within your programs for use with your printer.

Verdict

Device One is the most powerful printer interface that I have come across for the Commodore range of machines.

The interface is easy to use and the manual is clear enough for even a novice computer owner to get to grips with the interface without any problems.

The interface is expensive but well worth saving your pennies for, and especially since there are interfaces in the market that don't do as much and cost more.

Touchline

Product: *Device One.*
Company: *Precision Software, 6 Park Terrace, Worcester Park, Surrey KT4 7JZ.* ***Tel:*** *01 330 7166.* ***Machine:*** *C64/128.*

CP/M and the Commodore128

CP/M, much neglected mode of the C128, is probably the most useful for the serious user. Here we examine the Commodore version of this phenomenon.

By Mycroftt Appleby

There are differences between the definitive CP/M and the Commodore implementation, however this article should enable you to understand just what these differences are, plus I hope to give you an idea of the more common transient programs supplied with the CP/M+ system.

The Commodore Connection

If you read my article in *Your Commodore*, March 1987, you should remember that, the CP/M system, as now defined, requires a Z80 processor, 64K, an 80 column screen and one or two disk drives. The CP/M+ system, supplied with the C128, assumes 128K.

In the Commodore implementation there are a couple of changes made to this initial specification. The screen can be in either 40 or 80 column mode and, as most people can only have one disk drive, there is a software mechanism for treating it as two separate drives to make copying and various disk functions easier.

This is achieved through the use of drive 'E'. Normally to copy between two disks you need two drives, for instance 'A' and 'B'. The computer takes the information off drive A and puts it on to drive B. That works fine for dual drive systems, but most Commodores only have one drive, which makes things rather difficult. So Commodore came up with the drive 'E' system. Specifying a copy between drives A and E is like a single disk copy with drive A refering to the original and E refering to the copy. Although, you can do it the other way around. The main point is that drive E doesn't exist. Only in the minds of the system's programmer and everybody knows that most systems programmers are deranged anyway. This system is very good and simple to use and is a brilliant way around a rather tricky problem. It's much more usual for Commodore to leave something like that for the user to sort out.

On Screen

The other anomaly in the Commodore CP/M system is the ability to use a 40 column screen. This is for the legions of C128 owners who have no 80 column monitor but just one of the old composite colour monitors or TVs. It operates by having a 40 column window on a logical 80 column screen. Everybody must recognise this from a large number of wordprocessors that run on the C64. This is probably the most ideal solution and the only real way to get some of the software working. This said, it is probably better to find a cheap green screen monitor and use that instead. There are some very good ones nowadays for around £80 and it is worth the investment if you are going to use CP/M for any length of time.

Though CP/M+ was designed to have a certain amount of room in the OS for graphical links, CP/M 2.2 – the operating version that most CP/M programs were written under – has none. So most CP/M programs are in monochrome anyway. Other than that you are best sticking to software that will run under 40 column CP/M like languages or programs written for the old C64 version of CP/M 2.2.

On the Record

The other difference that is inherent in all CP/M systems is the disk format. The disk format is the way that the disk controller tells the disk drive to write to the disk. As most people know, the process of writing to a disk is very similar to that of writing to tape. To take the analogy further, there are different ways of writing to tape and two distinct writing systems. One is 'Helical Scanning' as used in video recorders and the new Digital Audio Tape (DAT) system. This is incredibly complex and is beyond the scope of this article. The other method is the straight linear recording system.

Using this method, a certain amount of tape will pass the tape head in a certain amount of time. In that time a certain amount of data will be written to the head. There can also be between one and nine tracks on the head. Now as we know, different computers have different methods of writing data to tape, on tape this is known as the tape format. But, on disk it is known as the sector format. Also, the way in which the head writes to the tape is different, effectively how the varying magnetic field of the head affects the tape.

All these differences also apply to disks. The amount of data packed on to a linear of a disk is called the sector density and can vary between five and 10 for CP/M disks or 16 and 22 for Commodore disks. The number of tracks on a disk can vary between 35,40, and 80. There are three main ways of writing data to the disk FM, MFM, and Commodore GCR. And there are one or two other differences as well.

So, now you see that there are a lot of differences between disks, even though they are the same size (imagine poor old Amstrad users who even use different types of disks!) the C128 *has* to be able to read many formats as possible to be able to make the best use of CP/M. To do this a novel solution was found.

The Solution

In the past, Commodore computers used 35 (or 77 for older machines) tract, GCR, 22 to 16 sectors per track and 256 bytes per sector. This format was designed from the start to be reliable, fast, and make the best possible use of disk space. And indeed the figure of 180K for a single aided, single density, 35 track disk has never been beaten. However, the rest of the world started with very low density disk drives and could only modify their system as the hardware got better.

As you can see, there is no way on earth that an old Commodore drive can read the more standard type of disk. So all you people with 1541s – hard luck. You can use Commodore specific CP/M programs (and there are quite a few available from ICPUG) but you won't be able to access any of the generic CP/M stuff.

No, to read CP/M generic disks you need to have either a 1570 or 1571. The difference between the two is that the 1571 will read and write to both sides of the disk and the 1570 is only a single sided drive. What this means is whilst you *could* read some CP/M disks in the single sided drive, you may have to get them specially written or only be able to read half the information. So get a 1571, this is the same drive as the one that is fitted internally into the C128D.

The 1571 is 40 track double sided, is capable of FM, MFM, or GCR, and can hold 200K, 400K, or 368K. This last mode is the double sided Commodore GCR format and is only really used by the C128 in Commodore Basic mode and when booting CPM. 200K is available in FM or *single density* mode and the 400K mode is MFM or *double density* mode. These two modes could make the C128 read 90% of all CP/M 2.2 disks ever written, but instead, the most popular nine are provided. This still covers the vast majority of CP/M disks, they are:

IBM 8 sector SS
IBM 9 sector SS
KayPro II
Osborne SS
IBM 8 sector DS
IBM 9 sector DS
KayPro IV
Osborne DS
Epson QX 10

The first four formats can be read by the 1570, all formats can be read by the 1571. It is interesting to note that the IBM 9 sector DS is the same format as used by IBM compatibles when using CPM-86. This was the Digital Research answer to MS-DOS that never really took off. However, many IBM compatibles retain the ability to read or write disks in this format and so *data only* transfers are possible. Another side point is that the Amstrad CP/M machines (CPC 464 with disks and CPC 664) and CP/M+ machines (CPC 6128, PCW 8256, PCW 8512) can read and write disks in this format.

Transient Commands and Friends

Last month I explained the concept and purpose of the transient commands along with some of the simpler ones that are only really extensions of the inbuilt or *resident* commands. After these come the utility programs that can either be considered as transient commands or as programs in their own right. They are usually used as commands when only one operation is needed, whilst for multiple operation the stand alone program mode is more useful.

The most commonly used, and indeed one of the most useful commands is known by the incredibly informative name of PIP. PIP stands for Peripheral Interchange Program, and has been called 'the most powerful command ever written'. This uses the definition of power that derives from making a lot happen from the fewest keystrokes possible. However, this is more to do with PIPs convoluted shorthand system than anything else. Effectively, what PIP does is to transfer a file from one device, perform some action on the file (or not as the case may be) and transfer it to another device.

This command is exceedingly useful, has to be included on the systems disk, and is rarely even documented in CP/M instructions supplied with any CP/M machine. So here is the minimum you will have to know to get it going.

PIPped at the Post

As mentioned earlier PIP is used to transfer files around. The transient way of using PIP is to be typed 'PIP xxx' where 'xxx' is the function that you want to happen. When this is completed or an error occurs you will then drop into the C/PM system prompt (A >). The programmed method of using PIP is just to type 'PIP' on its own. You then get the PIP prompt which is an asterisk (*5*) followed by the cursor. To use the earlier example, if you typed 'xxx' after this prompt it will be acted upon. The difference is that after it is finished or a recoverable error condition occurs, you will drop back into the '*5*' prompt ready for another command.

The format for the PIP instructions (I will assume from now on that all instruction are following the '*5*' prompt) is 'target becomes source operation'. Either the target or the source can be either a file name or a device and the operations will be detailed later. The file names can support all the wildcards and drive designations that the more complex transient commands have. So the most simple example of the PIP command is the disk copy 'a:*.* = b:*.*' will copy the contents of drive 'B' on to drive 'A'. Single files, and groups of files can be copied or even renamed; 'fred.txt = bill.txt' will change the text file 'bill' into the text file 'fred'.

The main use of PIP is to transfer information between devices. 'temp.txt=con:' will accept input from the keyboard and creat a quick text fild. 'LPT:=text.txt' will print out the text file and something like 'BBC.tmp=ios:' will read information from the serial port (perhaps from another computer) and create a file with it.

However, the most powerful function that PIP has is the operations at the end of each instruction. The examples above will do the transfer with no change in the file being transfered. However, the inclusion of a few letters after the instrucion in square brackets can change everything.

Z	:This zeroes the parity bit (bit 7) in ASCII files.
W	Overwrite, this will

	ignore the read-only (RO) attribute.
V	:Verify transfer. This will check the transfer to see that it's OK. Useful in disk copying.
U	:Converts to upper case all lower case letters.
Tx	:Expands all tab characters (Ctl-I) found in the file to whatever the value of 'x' is.
S$ ^ z	:Starts the transfer of the file at the designated string '$'. The string is ended with a Ctl-Z.
R	:Ignores the SYS attribute when reading files.
Q$ ^ z	:Similar to 'S' but stops copying at the specified string.
Px	:Inserts a form feed character (ASCII 12) every 'x' lines, defaults to 60.
O	:Object file copy. Use this for transfering non-COM non-ASCII files.
N	:Adds line numbers to the start of each line. 'N2' will insert a Tab character after each number and kill all leading zeroes.
L	:Converts all capitals to lower case.
H	:Use for transfering Hex files.
Gx	:Reads file from User Area 'x'.
F	:Removes all from feeds.
E	:Echoes all data transfered to the screen.
Dx	:Traunicates all lines to 'x' columns long.
B	:Buffer transfer. Reads all of file into a buffer until end of file or Ctl-S (stop) character is received. Useful for reading from RS232 or using drive 'E'.

All these operations can be compounded, so 'PIP a:=b:*.*[**VG6ER**]' is pefectely valid. The only problem with PIP is that it is a little convulated to use, you finde that there are usually programs on system disks that will do some of the functions of PIP (like copier programs for instance) with a little more regard for user friendliness, but none of them have the power and versatility that PIP can provide if it is understood properly.

Next Month

In the next issue, I shall reveal how some of the stranger CPM commands work and start to explain some of the utility programs. Also there will be a quick overview of the Commodore 64 CP/M 2.2 system and how it relates to the modern Commodore CP/M philosophy.

For everybody that is getting impatient to use batch proceesing (i.e. tell it to do half a dozen things and then leave it alone to get on with it whilst you watch 'EastEnders') or how to actually program the thing, all will be revealed later.

DISCOUNT SOFTWARE

C16/Plus 4

Title	RRP	OUR
Elite Hitpack	9.95	7.95
Grand Master Chess	8.95	7.25
Bridgehead (C16)	5.95	4.95
Bridgehead (Plus 4)	7.95	5.95
Yie Ar Kung Fu	7.95	5.95
Strip Poker	7.95	5.95
Blockbusters	7.95	5.95
Jump Set (Plus 4)	9.95	7.95
Jet Set Willy		2.99
Robo Knight		1.99

BUDGET SOFTWARE

We stock Mastertronic, Solar, Bug-Byte, Firebird, Players and Interceptor for all Commodore computers including Vic 20, CBM64, C16, Plus 4, all at Discount Prices.

SPECIAL OFFER ON SOLAR SOFTWARE

Chose any three of the following classic titles for **£4.50**
Quickdraw, Alien Attack, Mission Mars, Cruncher, Suicide Run, Meteorite, Knockout, Invasion 2,000.

Send Stamped Addressed Envelope for FREE List – State Micro.

Quickshot II	8.95
Plus 4 Power Pack.. special price	18.95
Konix Speed King	10.95

FREE C16 adaptors with each joystick.

All Prices include postage and packing in the UK. Overseas £1.00 extra. Payment with order by cheque or postal order please to:

GRAFFIX
114 West Main Street, Whitburn, West Lothian EH47 0QU

TELETEXT A world of information at your fingertips

For the very latest news, software reviews, sports results, whats on TV plus much much more – all at the touch of a button, hundreds of pages that are constantly updated. The Microtext Adaptor transforms your Commodore into a sophisticated Teletext receiver giving you free access to Oracle or Ceefax on your C64 or 128.

A page like some share prices or a recipe may be saved to disc or cassette or even printed out on your MPS801. The manual provides the information to allow your own programs to access and use Teletext providing possibilities limited only by your imagination.

The Adaptor fits neatly on the user port of the Commodore. The lead supplied then connects to the seldom used 'VIDEO OUT' socket on your video recorder. This concept means an extra aerial is not required, channel selection is done on the video which saves us components and so saves you money!

Just £69.95 inc P&P (Overseas add £2.00) only from:-

MICROTEXT
Dept YC, 7 Birdlip Place, Horndean, Hants. PO8 9PW
Tel: 0705-595694

Sorry! – Limited to one only per customer

FREE

large (100 disk capacity) *lockable* disk storage box worth £13.95 –

– When you buy 25 disks for only £19.95 **including postage and VAT!**

All disks supplied are superior Quadruple density 5¼" ,DS disks which are best for both 40 and 80 track drives.

Nebulae, Dept MA, FREEPOST, Kilroot Park
Industrial Estates, Carrickfergus, Co Antrim,
BT38 7BR TEL (09603) 65020

7 Day Delivery, One year guarantee, & 14 day money back period.

We accept orders from all government bodies, schools, universities, PLC's etc. We despatch on receipt of an offical purchase order.

BINDERS

FOR YOUR VALUABLE COLLECTION OF YOUR COMMODORE MAGAZINES
*SMART *EASY TO USE
*TOP QUALITY

£5.20 inc P&P

To ASP Readers Service, PO Box 35, Wolsey House, Wolsey Road, Hemel Hempstead, Herts HP2 4SS (0442-41221)
Please supply....Your Commodore Binders £5.20 inc. P&P
Total £......(Please make cheques payable to ASP Ltd.)
Years Required – 198.., 198.., 198..,198..
Name
Address
Please allow 21 days for delivery

Keypad Modifier

Now you can use your numeric keypad to type in lists of data statements.

By Mahmood Hassan Merchant

The Commodore 128 comes with an excellent keyboard which is complemented by a numeric keypad situated on the right. At first glance this would brighten any programmer's heart. You could be mistaken for thinking that it can be used for keying in data statements. But, on more careful examination, it becomes clear that the keypad has been primarily designed for accounting data entry with '+', '-' and '.' keys. Normal Basic data statements cannot be entered with it. Or can't they?

I realised, that with a little effort, the keypad could be redefined to meet this need. Hence the birth of the Keypad Modifier.

Purpose

This is a machine language utility which resides at the unused RAM at 5000. This start location is defined in line 40 as variable AD. The value of this can be changed if required and a working version of the program will be POKEd to that location and onwards.

The program redefines the '+' key as DEL. This is useful when you make a mistake in your data statements. The '+' key is located on the top right of the keypad just like the DEL key on the normal keyboard, and this makes it very convenient to use.

The '-' key, when depressed, prints the word DATA on the screen. The comma, required to separate the numbers in a data statement, is now available using the '.' key. The number and ENTER (or RETURN) keys act as usual.

Hints on Loading

The Basic loader accompanying the program POKES the data. If you own a disk drive, the loader will generate a binary file with the name you specify. Later, whenever you want to use this utility, just enter: BOOT "FILENAME" to load and activate the modifier.

Tape owners can enter the built-in MONITOR and save the machine code with: S"FILENAME",01+5000,+5067. The machine code can then be loaded with: LOAD "filename",1,1. You should then type NEW and SYS 5000 to activate.

In Use

The best way to use this utility is to first use the AUTO feature of Basic. Type in the first line number and press space. Now you can forget the main keyboard. Just press the '-' at the beginning of a new line, the number of which will be automatically printed if you are using AUTO. Then enter the numbers pressing '.' to separate them and press ENTER to enter the line. If you make a mistake press '+' to delete.

PROGRAM: 128 KEYPAD MOD

```
10 PRINT"[CLEAR]     128 KEYP
AD MODIFIER"
20 PRINT"[DOWN](-)  PRINTS 'D
ATA'":PRINT"(+)  DELETES CHAR
ACTERS"
30 PRINT"(.)  PRINTS COMMA"
40 AD=5000:FORI=0TO66:READA:X
=X+A:POKEI+AD,A:NEXT
45 H=INT(AD/256):L=AD-256*H:P
OKEAD+2,L+13:POKEAD+7,H
50 IFX<>8476THENPRINT"ERROR I
N DATA STATEMENTS":STOP
55 INPUT"TAPE OR DISK (T/D)";
Q$:IFQ$="T"GOTO80
60 INPUT"NAME FOR BINARY FILE
";F$:BSAVE(F$),B0,P(AD)TOP(AD
+67)
70 PRINT"TYPE: BOOT"+CHR$(34)
+F$+CHR$(34)+"  TO LOAD AND A
CTIVATE":END
80 PRINT"SYS"AD" TO ACTIVATE"
:END
100 DATA 120,169,149,141,60,3
,169,19
110 DATA 141,61,3,88,96,201,4
6,240
120 DATA 11,201,43,240,11,201
,45,240
130 DATA 11,76,173,198,169,44
,208,249
140 DATA 169,20,208,245,166,2
08,169,68
150 DATA 157,74,3,232,169,65,
157,74
160 DATA 3,232,169,84,157,74,
3,232
170 DATA 169,65,157,74,3,232,
134,208
180 DATA 76,196,198
```

Go FORTH & *

Tired of your old programming language? Want to try something new and exciting? Then it's about time you checked out FORTH.

By Allen Webb

The title of this first article may at first appear odd but it is, in fact, a motto used by the FORTH Interest Group (FIG) meaning "Go FORTH and multiply". What I intend to do is propose some arguments in favour of the use of FORTH as the alternative programming language.

Basic Disadvantages

The majority of Commodore users are probably programming in Basic. Whilst Basic adequately fulfils its original function as an aid to teaching programming, it has serious drawbacks which hinder its use for serious applications:

i) Basic lacks the structural constructs which ease the creation of logical and easily understood programs. If you've evr tried to understand, alter or debug a Basic program written by someone else, you'll know what I mean.
ii) Being an interpreted language, Basic is both slow and uses memory inefficiently.
iii) Basic is inflexible.

Two important points must be emphasised. First, the enhanced Basics available to BBC and IBM clone owners are more efficient to use but are obviously machine dependent. If you want to have a program which is transportable to other machines, forget it. Secondly, you can get compilers which will speed up routines and save space. They do not, however, make the job of programming easier.

For all these reasons, many people will eventually become dissatisfied with Basic and will seek an alternative. Those interested in arcade games will generally choose machine code. Those, however, who do not seek the highest speed execution will want an alternative high level language. For the C64/C128, the alternatives are limited to PASCAL and FORTH. Those of you who own an Amiga will also have the option of C.PASCAL (and its derivative MODULA) is a powerful and well structured language but for power, structure, speed and elegance, FORTH takes some beating.

Forth Advantages

I do not intend to describe the FORTH language in detail since the books listed later will do the job better than I can. Instead, I want to discuss the

Listing 1

```
HEX
DO21 CONSTANT SCREEN-COL-REG

:COLOURCHANGE
          1 SCREEN-COL-REG      +! ;
: FLASH FF 0
              DO
                   COLOURCHANGE
              LOOP ;
: MESSAGE FF 0
              DO
                 .    "FORTH RULES OK" FLASH
              LOOP   :
DECIMAL
```

FORTH philosophy and hopefully whet your appetite.

The main difference between FORTH and other languages is its approach to defining instructions or words. In Basic, instructions such as MID$, 3, PRINT etc. have fixed and clearly specified functions or meanings. Whilst FORTH uses a vocabulary of basic words (primitives), they are completely flexible and may be changed at will. If, for example, you want the instruction 3 to really represent 11, it is a trivial matter to make the change. This ability to define your own words and add them to the vocabulary gives programming an added dimension. It also makes the creation and use of Procedures both primitive and awkward.

Consider the example in Listing 1.

Here I have defined three words, COLOURCHANGE, FLASH and MESSAGE. Each definition is held in the section between the : and ;. COLOURCHANGE increments the screen colour (in $D021) by one. FLASH uses a loop to increment the screen colour 255 times. MESSAGE uses the flashing screen effect in conjuction with a printed message to give a nasty effect. The three words are added to the vocabulary and can be used in any subsequent words. In other words, a completely user defineable language.

If this flexibility wasn't enough, FORTH offers a combination of interpretor and compiler. When you write the program, you are in fact creating some form of text file using an editor. When any word is to be executed, the text is compiled. Since the primitives are efficiently defined in terms of simple machine code jumps, the compiled words are converted to a simple linked list of machine code instructions. This results in compact code which executes quickly.

Inside FORTH

Originally, FORTH was written using virtual memory held on disk. To do this, text is held in a series of screens each comprising of 1024 bytes. Within these screens, the text can be laid out in almost any format allowing the use of indenting and other tricks to give a well structured format as shown in Listing 1. Since many C64 users don't own a disk drive, many FORTHS use a RAM-disk approach to storing screens. Whilst the software is different, the perceived mode of operation is unchanged. This simplicity of text input is extremely satisfying since the use of virtual memory on disk presents no penalty for using explanatory comments. Listing 3 shows what can be done.

In terms of capabilities, standard FORTH offers all of the structure you could ask for. The standard constructs are:

DO.....LOOP
IF...ELSE...THEN
BEGIN.....UNTIL
BEGIN.....WHILE.....REPEAT

CASE is not standard but can be easily implemented. Using such constructs with the unique "word" system, it is remarkably easy to develop a linear approach to programming without recourse to unsatisfactory constructs such as GOTO. In addition, the ability to nest words is conducive to the analysis of a problem by use of top-down design.

Here are a couple of further examples. Listing 2 shows a routine for the calculation of the factorial of a number. The routine is recursive in that it calls itself via the word MYSELF.

Listing 2
```
: FACTORIAL (n -- factorial)
                DUP 1- IF
                     DUP 1- MYSELF *
                THEN      ;
```

Listing 3
```
: TEST (n -- n)
          2DUP<
          IF
               SWAP MYSELF
          ELSE
              DUP O=
              IF
                 DROP
              ELSE
                 SWAP OVER MOD MYSELF
              THEN
        THEN ;
```

Much of the speed and power of FORTH derives from its use of a stack to hold values currently in use. Not only does the stack allow the rapid manipulation of data, but values can be easily passed to words. The word DUP in Listing 2 is used to duplicate the value at the top of the stack. The functioning of the routine is as follows:

1. The routine is entered with the number on the top of the stack.
2. It is duplicated to preserve it and it is decremented.
3. If the number is greater than one, the routine calls itself.
4. If the number is equal to one, the results of each call itself are multiplied together.

You might find it interesting to compare Basic routine to do the job to Listing 2.

Listing 3 also uses recursion. Can you sort out what it does?

Listing 4 gives a final example. This time I have a real application. Three example screens are shown for a music system on a Tandy TRS-80 Mk I using an AY-3-8910. Don't try to understand how it works – simply consider how neat the lay out is and how unlike a normal program it is. The use of normal English gives a user-friendly program which is easily altered by another user.

```
Listing 4

Screen 1

(Words for AY-3-8910 Programmable Sound Generator)

VOCABULARY MUSIC  MUSIC DEFINITIONS  BLK @ 2- LOAD ( PSG Words)

VARIABLE TEMPO       70 TEMPO !
: ON    254 7 >PSG ;  : VOLUME   8>PSG ;  3 VOLUME

: FREQ  CREATE ,  DOES> @ 256 /MOD
                  0  ( flag for use by DOTTED ) ;

: DOTTED  NOT ;  (DOTTED changes flag value left by a note )

1499 FREQ C0    1415 FREQ C#0    1335 FREQ D0
1260 FREQ Eb0   1190 FREQ E0     1123 FREQ F0
1060 FREQ F#0   1000 FREQ G0      944 FREQ Ab1
 891 FREQ A1     841 FREQ Bb1     794 FREQ B1
 749 FREQ C1     708 FREQ C#1     667 FREQ D1
 630 FREQ Eb1    594 FREQ E1      561 FREQ F1
 529 FREQ F#1    500 FREQ G1      471 FREQ Ab2
 445 FREQ A2     420 FREQ B2      396 FREQ B2
```

What's Avaliable

So you've had the sales pitch and you're lusting to start hacking in FORTH.There remains the question as to what is available.

First, there is the software. The first point to make is that FORTH users are a sensible lot when it comes to making systems available and it should be a simple matter to get hold of a public domain system. Try contacting the FORTH Interest Group. Alternatively, there are a few systems which can be obtained for cash.

Probably the most powerful system is *White Lightening* from Oasis. This was marketed as a games package and consequently offers a large number of graphics extensions. Both virtual memory on disk and RAM disk versions are available. Highly recommended.

Melbourne House publishes Abersoft's *FIG FORTH* for the 64. This offers some graphics extensions but is otherwise quite standard. Although it is simple to transfer it to disk, only RAM-disk is supported.

ROMIK (now defunct) offers no frills FORTH. This is quite a decent version and, if you shop around, you may pick it up cheap.

There are also versions from MPE and FORTHWITH but I have not evaluated either.

If you're really cool, trendy and lucky, you might be able to pick up a Jupiter Ace. For you who haven't heard of it, the Jupiter Ace was a FORTH based micro rather in the mould of the ZX81 (try Boldfield Ltd Computing).

Unfortunately, the instructions with most low cost FORTHs are poor and must be supplimented by bookware. The range of books is wide (the FORTH Interest Group has a bibliography) but two are worthy of comment. Both are by the same author, Leo Brodie: *Starting FORTH*, Prentice Hall, ISBN 0-12-842922-7; *Thinking FORTH*, Prentice Hall, ISBN 0-13-917568-7.

Both are worthy additions to any serious computer user's library and cater for users of all abilities.

I hope you have found this brief summary of FORTH of value. Unlike many languages, FORTH has the power and flexibility to grow with your own abilities and provide an effective and elegant solution to your programming programs.

Touchline

Boldfield Ltd Computing: *Sussex House, Hobson St, Cambridge.*

FORTH Interest Group: *Collins Walls, 54 Wild Briar, Wokingham, Berks RC11 4UL.*

FORTHWITH: *51 Rooley Moor Rd, Rochdale, Lancashire OL12 7AX.*

Microprocessor Engineering Ltd, *21 Hanley Road, Shirley, Southampton SO1 5AP.*

Melbourne House: *High Street, Hampton Wick, Kingston-upon-Thames, Surrey KT1 4DB.*

Oasis Software: *12 Walliscote Rd, Weston-Super-Mare, Avon BS23 1UG.*

```
Screen 2

(Music Vocabulary )

: NOTE  CREATE  ,
        DOES>    @ TEMPO @ *  (basic note duration )
                 SWAP IF 3 2 */ THEN >R ( adjust if dotted )
        1 >PSG 0 >PSG ON
        R> 0 DO LOOP  OFF
        10 0 DO LOOP         ;

256 NOTE BREVE            128 NOTE SEMI-BREVE
 64 NOTE MINIM             32 NOTE CROTCHET
 16 NOTE QUAVER             8 NOTE SEMI-QUAVER
  4 NOTE SEMI-DEMI-QUAVER 2 NOTE SEMI-DEMI-SEMI-QUAVER


100 TEMPO !

Bb2 DOTTED QUAVER         C2 SEMI-QUAVER
Bb2 QUAVER                Ab2 QUAVER
G1  QUAVER  Ab2 QUAVER  Bb2 CROTCHET
F1  QUAVER  G1  QUAVER  Ab2 CROTCHET
G1  QUAVER  Ab2 QUAVER  Bb2 CROTCHET
Bb2 DOTTED QUAVER  C2  SEMI-QUAVER
Bb2 DOTTED QUAVER  C2  SEMI-QUAVER
Bb2 QUAVER           Ab2 QUAVER
G1  QUAVER  Ab2 QUAVER  Bb2 CROTCHET
F1 CROTCHET Bb2 CROTCHET
G1 QUAVER    Eb1 QUAVER      ;
```

Expanding Systems

Many people who bought the Commodore Sound Expander may have found it too much for their novice status. Perhaps this Music Sales Composer Editor will help.

By S.J. Chance

Did you buy a Commodore *FM Sound Expander* Package earlier this year? Did you thrill to the Country Banjos riff and Telstar demonstration? Did you then find that your key-board talents, no matter how great, would not allow you to produce anything sounding half as good as what the machine could play on its own? Disillusioned, did you give up your Learn to Play Keyboards course, and leave your £150 investment gathering dust under your bed? If you have answered 'yes' to any of the above questions, then hear the good news: the long awaited *Composer/Editor* software for the *Sound Expander* has arrived, and even at the slightly painful price of £24.95, it's a must.

At the time of writing, only the disk version was available, and that only with a photo-copy of the instruction manual, but a cassette version should be with us soon.

The Composer

The disk contains two separate programs: the FM Composer and the FM Sound Editor. I will deal with the Compower first. This allows you to enter standard music notation on to a double stave, over nine channels. The notes can be input from the external five-octave keyboard, nothing new to MIDI fanatics, but to those of us who have struggled up through *Ulti-Synth, The Music Studio, The Sound System*, etc., this is a new experience in terms of ease and speed.

Of course, if you don't have the external keyboard, notes can be entered fromt he computer keyboard, though this is a much more cumbersome way of doing things. Having the computer keyboard operating as a music keyboard does mean that a lot of other functions are relegated to the remaining keys.

Dotted notes, ties, triplets, dynamics, variations in tempo, all are supported by the program, but they are entered via a system of using the function keys to scroll through the options, which I found irritatingly clumsy.

Another minor gripe is that to move the cursor fromt he beginning of a music-file to the end involves it lurching its way through all the music in between which, with a piece of any length, can take a couple of minutes. The thing to do here is to break the music down into smaller sections with the 'sequence' option.

Repeats in the music are supported, including repeats with different endings, which enables one to make optimum use of memory space, not that the program doesn't leave plenty of RAM available.

Once entered, your music can be saved (only to disk from the disk version), edited, and dumped to a Printer. The Print-out is more readable than some, and doesn't have the problem of over-lapping quavers appearing to be semi-quavers which occurs with *The Music Studio*.

The music can be played back, in whole or in part, at any stage, and in any of 64 different voices.

The Editor

Moving on to the Sound Editor, this does exactly what it says it does. The sounds from the existing library can be altered, or new ones created. There are quite a few parameters to muck about with, and you don't have to have a clue what you are doing to get some interesting results. If you are short on inspiration, there is also a Fruit Machine option which sets-up the Parameters at random.

The sounds can be played from the external keyboard, and it is possible to set a keyboard-split, in a similar way as with the original Sound Expander Package. There are also two extra sets of voices which were omitted from the cassette version of the original Sound Expander software.

Also within the editor porgram is a crude drum machine, using five drums over 32 program steps. This is not as sophisticated in sound or programming as dedicated drum machine add-ons, but is quite respectable nonetheless.

Both the Composer and Editor are MIDI compatible through a relevant interface. If reading about MIDI has given you a headache in the past, using both these programs with the Sound Expander may well open your ears, and eventually your wallet, to the potential that MIDI provides.

Letter Writer

If you write a lot of letters and get fed up of using boring paper and pen, try this novel way to communicate with fellow C64 owners.

By Les Allan

This routine provides a novel way to send a letter, or indeed any form of communication, to a friend or fellow 64 user by providing a musical accompaniment to a tele-text type format.

Using the Program

Simply type in your letter from the keyboard using all normal print commands to make alterations or emphasis parts of text in different text colours. In fact by experimentation quite pleasing results can be achieved; the routine can also be used to draw or provide simple animation sequences.

When you are quite satisfied with the finished product hit the F1 key twice to initiate the save process. This relocates the text, music and m/c routine to start of Basic with a relocation program to save a single file of 39 blocks in length.

The program works with either disk or tape; the device being selected by monitoring the current contents of $BA.

The program can be further compacted by TURBO CRUNCHing. The maximum text length is restricted to 4096 which provides sufficient room for most applications.

The program must be typed in exactly as listed and saved prior to running. Error trap routines are included to ensure that the data as read is correct. The program when run stores the relevant code at a temporary address of $8000 and when prompted relocates the working program to basic ($0801) and saves the program to disk.

```
PROGRAM: LETTER BOOT
55  10 M1=32768:M2=40096:CK=0
97  11 PRINTCHR$(144)CHR$(147)
C8  12 POKE52,120:POKE56,120:POKE
    53280,15:POKE53281,12
94  13 PRINT
8F  14 PRINTSPC(8)CHR$(18)"[SU,S*
    22,SI]
26  15 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
84  16 PRINTSPC(8)CHR$(18)"[S-,SP
    C4]DATA  STATEMENT[SPC3,S-]
3C  17 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
E5  18 PRINTSPC(8)CHR$(18)"[S-]
    TO MEMORY  ROUTINE  [S-]
4A  19 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
22  20 PRINTSPC(8)CHR$(18)"[S-,SP
    C5]BY LES ALLAN[SPC5,S-]
50  21 PRINTSPC(8)CHR$(18)"[S-,SP
    C22,S-]
6C  22 PRINTSPC(8)CHR$(18)"[SJ,S*
    22,SK]
A0  23 PRINT:PRINTCHR$(155)
42  24 PRINT" THIS ROUTINE READS
    THE DATA STATEMENT,"
80  25 PRINT
17  26 PRINT" CONVERTS FROM  HEX
    TO BINARY AND POKES"
82  27 PRINT
C4  28 PRINT" CODE BACK  TO THE
    AREA OF MEMORY FROM"
84  29 PRINT
19  30 PRINT" WHICH  IT  WAS  PRE
    VIOUSLY  GENERATED."
59  31 PRINT:PRINT
D0  32 READCODE$
8B  33 LB=ASC(RIGHT$(CODE$,1))-48
    :IFLB>9THENLB=LB-7
CF  34 HB=ASC(LEFT$(CODE$,1))-48:
    IFHB>9THENHB=HB-7
32  35 PRINTSPC(5)CHR$(5)"READING
     MEMORY BLOCK ...";M1:PRINTCH
    R$(145);
28  36 POKEM1,HB*16+LB:M1=M1+1:CK
    =CK+HB+LB:IFM1<M2THEN32
D9  37 IFCK=101151THEN39
13  38 PRINT"CHECK SUM ERROR - CH
    ECK DATA STATEMENTS!":PRINTCH
    R$(19):END
EC  39 PRINT"  HIT RETURN TO SAVE
     COMPLETED PROGRAM"
D1  40 GETKEY$:IFKEY$<>CHR$(13)TH
    EN40
6B  41 SYS40000
10  42 :
CE  43 :::::::::::::::::: DATUM S
    TATEMENTS ::::::::::::::::
16  44 :
AD  45 DATA 00,08,08,00,00,9E,32,
    30,36,31,00,00,00,20,44,E5
28  46 DATA A9,0C,8D,20,D0,8D,21,
    D0,EA,A9,36,85,01,4C,40,23
44  47 DATA 31,34,37,29,3A,99,00,
    4F,08,0C,00,99,A6,36,29,22
22  48 DATA 12,90,D5,C3,1A,EB,C9,
    00,77,08,0D,00,99,A6,36,29
61  49 DATA 22,12,90,DD,20,1A,EB,
    DD,00,9F,08,0E,00,99,A6,36
9C  50 DATA 29,22,12,90,DD,20,1A,
    EB,DD,00,C7,08,0F,00,99,A6
8B  51 DATA 36,29,22,12,90,DD,20,
    06,EB,4C,45,54,54,45,52,20
F9  52 DATA 20,57,52,49,54,45,52,
    20,06,EB,DD,00,EF,08,10,00
13  53 DATA 99,A6,36,29,22,12,90,
    DD,20,1A,EB,DD,00,17,09,11
C3  54 DATA 00,99,A6,36,29,22,12,
    90,DD,20,1A,EB,DD,00,3F,09
AD  55 DATA 12,00,99,A6,36,29,22,
    12,90,DD,20,06,EB,42,59,20
6D  56 DATA 03,EB,4C,45,53,20,41,
    4C,4C,41,4E,20,06,EB,DD,00
46  57 DATA 67,09,13,00,99,A6,36,
    29,22,12,90,DD,20,1A,EB,DD
F7  58 DATA 00,8F,09,14,00,99,A6,
    36,29,22,12,90,DD,20,1A,EB
67  59 DATA DD,00,B7,09,15,00,99,
    A6,36,29,22,12,90,CA,C3,1A
98  60 DATA EB,CB,00,BF,09,16,00,
    99,3A,99,00,EE,09,17,00,99
20  61 DATA 22,9B,20,20,54,48,49,
    53,20,52,4F,55,54,49,4E,45
60  62 DATA 20,43,52,45,41,54,45,
    53,20,41,20,4E,4F,56,45,4C
BE  63 DATA 20,57,41,59,20,20,54,
    4F,22,00,1C,0A,18,00,99,22
9F  64 DATA 20,20,43,52,45,41,54,
    45,20,41,20,4C,45,54,54,45
E9  65 DATA 52,20,4F,4E,20,44,49,
    53,48,20,4F,52,20,54,41,50
A3  66 DATA 45,20,20,46,4F,52,22,
    00,4A,0A,19,00,99,22,20,20
C9  67 DATA 41,20,46,52,49,45,4E,
    44,20,4F,52,20,49,4E,44,45
ED  68 DATA 45,44,20,41,4E,59,20,
    4F,54,48,45,52,20,50,55,52
51  69 DATA 50,4F,53,45,22,00,78,
    0A,1A,00,99,22,20,26,E8,22
77  70 DATA 00,A6,0A,18,00,99,22,
    20,20,53,49,4D,50,4C,59,20
73  71 DATA 54,59,50,45,20,49,4E,
    20,59,4F,55,52,20,4C,45,54
56  72 DATA 54,45,52,20,55,53,49,
    4E,47,20,41,4C,4C,22,00,D4
CA  73 DATA 0A,1C,00,99,22,20,20,
    4B,45,59,42,4F,41,52,44,20
3C  74 DATA 43,4F,4D,4D,41,4E,44,
    53,2E,20,41,4E,59,20,4D,49
AB  75 DATA 53,54,41,4B,45,53,20,
    20,43,41,4E,22,00,02,0B,1D
C7  76 DATA 00,99,22,20,20,42,45,
    20,43,4F,52,52,45,43,54,45
27  77 DATA 44,20,55,53,49,4E,47,
    20,44,45,4C,20,4F,52,20,43
3F  78 DATA 55,52,53,4F,52,20,48,
   45,59,22,00,34,0B,1E,00,99
E9 79 DATA 3A,99,3A,99,22,05,20,
   03,EB,50,52,45,53,53,20,52
ED 80 DATA 45,54,55,52,4E,20,54,
   4F,20,49,4E,49,54,49,41,4C
38 81 DATA 49,53,45,20,50,52,4F,
   43,45,53,53,22,00,4A,0B,1F
16 82 DATA 00,A1,4B,24,3A,8B,4B,
   24,B3,B1,C7,28,31,33,29,A7
6F 83 DATA 33,31,00,56,0B,20,00,
   9E,31,32,AC,32,35,36,00,03
AF 84 DATA EB,48,80,00,00,A0,00,
   00,EE,A1,EB,A2,00,BD,00,0D
A8 85 DATA 9D,3C,03,E8,E0,A0,D0,
   F5,4C,3C,03,EE,F0,EB,A9,00
C8 86 DATA A8,85,FB,85,FD,A9,0E,
   85,FC,A9,08,85,FE,B1,FB,91
E2 87 DATA FD,C8,D0,F9,E6,FC,E6,
   FE,A5,FC,C9,27,D0,EF,4C,0D
AC 88 DATA 08,EE,DD,EB,00,08,08,
   00,00,9E,32,30,36,31,00,03
21 89 DATA EB,20,44,E5,A9,0C,8D,
   20,D0,8D,21,D0,EA,A9,36,85
DF 90 DATA 01,4C,AF,1F,34,37,2C,
   30,3A,97,34,38,2C,31,33,3A
C8 91 DATA 97,34,39,2C,30,3A,97,
   35,30,2C,31,33,00,49,08,08
F6 92 DATA 00,53,B2,35,34,32,39,
   36,3A,58,B2,30,00,67,08,0C
B9 93 DATA 00,97,35,32,2C,31,34,
   33,3A,97,35,31,2C,32,35,35
1D 94 DATA 3A,97,35,33,32,37,32,
   2C,32,39,00,99,08,0D,00,97
63 95 DATA 32,30,34,2C,31,3A,97,
   35,33,32,38,30,2C,30,3A,97
FC 96 DATA 35,33,32,38,31,2C,30,
   3A,97,35,33,30,36,39,2C,33
A1 97 DATA 32,3A,97,35,33,30,37,
   30,2C,32,30,38,00,BE,08,0E
19 98 DATA 00,97,37,38,30,2C,30,
   3A,97,37,38,31,2C,31,34,34
6B 99 DATA 3A,9E,35,31,30,03,ED,
   3A,97,35,33,32,37,32,2C,32
A6 100 DATA 37,00,CF,08,0F,00,99
   ,C7,28,35,29,C7,28,31,34,37
15 101 DATA 29,3B,00,DA,08,10,00
   ,9E,34,39,31,35,32,00,F3,08
50 102 DATA 11,00,8B,53,46,B2,32
   ,A7,97,31,36,33,38,34,AA,58
BF 103 DATA 2C,30,3A,89,32,32,00
   ,05,09,12,00,A1,41,24,3A,8B
67 104 DATA 41,24,B2,22,22,A7,31
   ,36,00,20,09,13,00,8B,41,24
A9 105 DATA B2,C7,28,31,33,33,29
   ,A7,53,46,B2,53,46,AA,31,3A
89 106 DATA 89,31,36,00,53,09,14
   ,00,41,B2,C6,28,41,24,29,3A
F8 107 DATA 99,41,24,3B,3A,97,31
   ,36,33,38,34,AA,58,2C,41,3A
EF 108 DATA 58,B2,58,AA,31,3A,3A
   ,53,46,B2,30,3A,8B,58,B1,34
2D 109 DATA 30,39,36,A7,32,32,00
   ,5B,09,15,00,89,31,36,00,72
4F 110 DATA 09,16,00,9E,36,35,33
   ,37,31,3A,9E,36,34,37,38,39
BA 111 DATA 3A,97,53,2C,30,00,A8
   ,09,17,00,97,35,33,32,37,32
EA 112 DATA 2C,32,31,3A,99,C7,28
   ,35,29,C7,28,31,34,37,29,C7
35 113 DATA 28,31,37,29,C7,28,31
   ,35,37,29,58,22,42,59,54,45
1B 114 DATA 53,20,4F,46,20,54,45
   ,58,54,2E,22,00,C0,09,18,00
9F 115 DATA 99,3A,99,3A,85,22,46
   ,49,4C,45,4E,41,4D,45,20,22
F9 116 DATA 3B,46,24,00,D0,09,19
   ,00,8B,C3,28,46,24,29,B2,30
DC 117 DATA A7,32,38,00,F7,09,1A
   ,00,81,5A,B2,31,A4,C3,28,46
B7 118 DATA 24,29,3A,97,34,39,35
   ,33,35,AA,5A,2C,C6,28,CA,28
D2 119 DATA 46,24,2C,5A,2C,31,29
```

```
   ,29,3A,82,00,08,0A,18,00,97
6E 120 DATA 34,39,34,39,31,2C,C3
   ,28,46,24,29,00,13,0A,1C,00
BD 121 DATA 9E,34,39,34,30,38,00
   ,FF,ED,00,FF,ED,00,F0,ED,42
01 122 DATA 00,90,50,20,00,00,53
   ,00,90,54,18,00,00,58,00,06
19 123 DATA ED,41,80,00,FF,8F,00
   ,FF,ED,00,FF,ED,00,FF,ED,00
58 124 DATA FF,ED,00,FF,ED,00,FF
   ,ED,00,FF,ED,00,FF,ED,00,FF
E8 125 DATA ED,00,FF,ED,00,FF,ED
   ,00,FF,ED,00,FF,ED,00,FF,ED
30 126 DATA 00,FF,ED,00,FF,ED,00
   ,FF,ED,00,FF,ED,00,FF,ED,00
35 127 DATA FF,ED,00,FF,ED,00,FF
   ,ED,00,FF,ED,00,FF,ED,00,FF
CC 128 DATA ED,00,FF,ED,00,FF,ED
   ,00,3C,42,99,A1,A1,99,42,3C
13 129 DATA 06,0E,02,1E,3E,66,C6
   ,00,FC,FE,02,FC,86,FE,FC,00
97 130 DATA 7C,FE,00,C0,C0,FE,7C
   ,00,FC,FE,02,C6,C6,FE,FC,00
28 131 DATA FE,FE,00,F0,C0,FE,FE
   ,00,FE,FE,00,F8,C0,03,ED,00
49 132 DATA 7C,FE,00,DE,C6,FE,7C
   ,00,C6,C6,02,FE,C6,03,ED,00
C2 133 DATA 3C,3C,00,18,18,3C,3C
   ,00,FE,FE,00,18,D8,F8,70,00
7C 134 DATA CC,D8,00,F0,D8,CC,C6
   ,00,C0,C0,00,C0,C0,FE,FE,00
B6 135 DATA C6,EE,02,D6,C6,03,ED
   ,00,C6,C6,02,D6,CE,C6,C6,00
C8 136 DATA 7C,FE,02,C6,C6,FE,7C
   ,00,FC,FE,02,FC,C0,03,ED,00
52 137 DATA 7C,FE,02,C6,C6,CE,7E
   ,01,FC,FE,02,FC,D8,CC,C6,00
95 138 DATA 7C,FE,00,FC,06,FE,7C
   ,00,7E,7E,00,18,04,ED,00,C6
BF 139 DATA C6,02,C6,C6,FE,7C,00
   ,C6,C6,02,C6,C6,6C,38,00,C6
D2 140 DATA C6,02,C6,D6,EE,C6,00
   ,C6,6C,00,30,38,6C,C6,00,CC
8E 141 DATA CC,00,78,30,03,ED,00
   ,FE,FE,00,38,70,FE,FE,00,3C
CB 142 DATA 30,05,ED,3C,00,0C,12
   ,30,7C,30,62,FC,00,3C,0C,05
C9 143 DATA ED,3C,00,00,18,3C,7E
   ,18,04,ED,00,10,30,7F,7F,30
44 144 DATA 10,00,09,ED,18,04,ED
   ,00,00,18,00,66,03,ED,00,05
85 145 DATA ED,66,66,FF,66,FF,66
   ,66,00,18,3E,60,3C,06,7C,18
03 146 DATA 00,62,66,0C,18,30,66
   ,46,00,3C,66,3C,38,67,66,3F
88 147 DATA 00,06,0C,18,00,05,ED
   ,0C,18,30,03,ED,18,0C,00,30
D7 148 DATA 18,0C,03,ED,18,30,00
   ,00,66,3C,FF,3C,66,00,03,ED
CF 149 DATA 18,18,7E,18,18,00,07
   ,ED,18,18,30,00,03,ED,7E,00
03 150 DATA 09,ED,18,18,00,00,03
   ,06,0C,18,30,60,00,7C,FE,0E
F6 151 DATA D6,E6,C6,FE,7C,08,08
   ,00,08,08,18,03,ED,FC,FE,02
9E 152 DATA 06,1C,70,FE,FE,FC,FE
   ,02,3C,3C,02,FE,FC,18,18,D8
E2 153 DATA D8,FE,18,03,ED,FE,FE
   ,00,80,FC,06,FE,FC,7C,FE,00
BF 154 DATA C0,FC,C6,FE,7C,FE,FE
   ,06,0C,18,10,30,30,7C,FE,06
7F 155 DATA C6,7C,C6,FE,7C,7C,FE
   ,06,C6,7E,06,FE,7C,00,00,18
12 156 DATA 00,00,18,00,04,ED,18
   ,00,00,18,18,30,0E,18,30,60
A2 157 DATA 30,18,0E,00,03,ED,7E
   ,00,7E,00,03,ED,70,18,0C,06
FA 158 DATA 0C,18,70,00,3C,66,06
   ,0C,18,00,18,00,04,ED,FF,FF
D9 159 DATA 00,03,ED,08,1C,3E,7F
   ,7F,1C,3E,00,18,08,ED,00,03
C6 160 DATA ED,FF,FF,00,05,ED,FF
```

```
   ,FF,00,05,ED,FF,FF,00,09,ED
10 161 DATA FF,FF,00,00,30,08,ED
   ,0C,08,ED,00,03,ED,E0,F0,38
E3 162 DATA 18,04,ED,1C,0F,07,00
   ,03,ED,18,18,38,F0,E0,00,03
1A 163 DATA ED,C0,06,ED,FF,FF,C0
   ,E0,70,38,1C,0E,07,03,03,07
76 164 DATA 0E,1C,38,70,E0,C0,FF
   ,FF,C0,06,ED,FF,FF,03,06,ED
C8 165 DATA 00,3C,7E,04,ED,3C,00
   ,06,ED,FF,FF,00,36,7F,03,ED
D3 166 DATA 3E,1C,08,00,60,08,ED
   ,00,03,ED,07,0F,1C,18,18,C3
E1 167 DATA E7,7E,3C,3C,7E,E7,C3
   ,00,3C,7E,66,66,7E,3C,00,18
C2 168 DATA 18,66,66,18,18,3C,00
   ,06,08,ED,08,1C,3E,7F,3E,1C
B8 169 DATA 08,00,18,03,ED,FF,FF
   ,18,03,ED,C0,C0,30,30,C0,C0
0B 170 DATA 30,30,18,08,ED,00,00
   ,03,3E,76,36,36,00,FF,7F,3F
B6 171 DATA 1F,0F,07,03,01,00,08
   ,ED,F0,08,ED,00,04,ED,FF,05
F8 172 DATA ED,00,0E,ED,FF,C0,08
   ,ED,CC,CC,33,33,CC,CC,33,33
D8 173 DATA 03,08,ED,00,04,ED,CC
   ,CC,33,33,FF,FE,FC,F8,F0,E0
7F 174 DATA C0,80,03,08,ED,18,03
   ,ED,1F,1F,18,03,ED,00,04,ED
9E 175 DATA 0F,04,ED,18,03,ED,1F
   ,1F,00,06,ED,F8,F8,18,03,ED
DC 176 DATA 00,06,ED,FF,FF,00,03
   ,ED,1F,1F,18,06,ED,FF,FF,00
67 177 DATA 06,ED,FF,FF,18,06,ED
   ,F8,F8,18,03,ED,C0,08,ED,E0
DF 178 DATA 08,ED,07,08,ED,FF,FF
   ,00,06,ED,FF,03,ED,00,0A,ED
86 179 DATA FF,03,ED,03,06,ED,FF
   ,FF,00,04,ED,F0,04,ED,0F,04
F3 180 DATA ED,00,04,ED,18,03,ED
   ,F8,F8,00,03,ED,F0,04,ED,00
97 181 DATA 04,ED,F0,04,ED,0F,04
   ,ED,C3,BD,66,5E,5E,66,BD,C3
58 182 DATA F9,F1,FD,E1,C1,99,39
   ,FF,03,01,FD,03,79,01,03,FF
F4 183 DATA 83,01,FF,3F,3F,01,83
   ,FF,03,01,FD,39,39,01,03,FF
D4 184 DATA 01,01,FF,0F,3F,01,01
   ,FF,01,01,FF,07,3F,03,ED,FF
84 185 DATA 83,01,FF,21,39,01,83
   ,FF,39,39,FD,01,39,03,ED,FF
63 186 DATA C3,C3,FF,E7,E7,C3,C3
   ,FF,01,01,FF,E7,27,07,8F,FF
9E 187 DATA 33,27,FF,0F,27,33,39
   ,FF,3F,3F,FF,3F,3F,01,01,FF
17 188 DATA 39,11,FD,29,39,03,ED
   ,FF,39,39,FD,29,31,39,39,FF
84 189 DATA 83,01,FD,39,39,01,83
   ,FF,03,01,FD,03,3F,03,ED,FF
49 190 DATA 83,01,FD,39,39,31,81
   ,FE,03,01,FD,03,27,33,39,FF
F3 191 DATA 83,01,FF,03,F9,01,83
   ,FF,81,81,FF,E7,04,ED,FF,39
E3 192 DATA 39,FD,39,39,01,83,FF
   ,39,39,FD,39,39,93,C7,FF,39
86 193 DATA 39,FD,39,29,11,39,FF
   ,39,93,FF,CF,C7,93,39,FF,33
CF 194 DATA 33,FF,87,CF,03,ED,FF
   ,01,01,FF,C7,8F,01,01,FF,C3
1F 195 DATA CF,05,ED,C3,FF,09,ED
   ,C3,F3,05,ED,C3,FF,19,ED,E7
F3 196 DATA 04,ED,FF,FF,E7,FF,99
   ,03,ED,FF,15,ED,9D,99,F3,E7
8E 197 DATA CF,99,89,FF,C3,99,C3
   ,C7,98,99,C0,FF,F9,F3,E7,FF
0C 198 DATA 05,ED,F3,E7,CF,03,ED
   ,E7,F3,FF,CF,E7,F3,03,ED,E7
62 199 DATA CF,FF,FF,99,C3,00,C3
   ,99,FF,03,ED,E7,E7,81,E7,E7
3D 200 DATA FF,07,ED,E7,E7,CF,FF
   ,03,ED,81,FF,09,ED,E7,E7,FF
B3 201 DATA FF,FC,F9,F3,E7,CF,9F
```

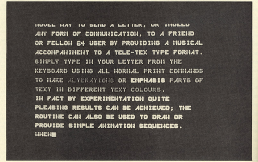
```
    ,FF,83,01,F1,29,19,39,01,83
54  202 DATA F7,F7,FF,F7,F7,E7,03
    ,ED,03,01,FD,F9,E3,8F,01,01
39  203 DATA 03,01,FD,C3,C3,FD,01
    ,03,E7,E7,27,27,01,E7,03,ED
A6  204 DATA 01,01,FF,7F,03,F9,01
    ,03,83,01,FF,3F,03,39,01,83
E7  205 DATA 01,01,F9,F3,E7,EF,CF
    ,CF,83,01,F9,39,83,39,01,83
30  206 DATA 83,01,F9,39,81,F9,01
    ,83,FF,FF,E7,FF,FF,E7,FF,04
85  207 DATA ED,E7,FF,FF,E7,E7,CF
    ,FF,0A,ED,81,FF,81,FF,08,ED
09  208 DATA C3,99,F9,F3,E7,FF,E7
    ,FF,04,ED,00,00,FF,03,ED,F7
AB  209 DATA E3,C1,80,80,E3,C1,FF
    ,E7,08,ED,FF,03,ED,00,00,FF
E9  210 DATA 05,ED,00,00,FF,05,ED
    ,00,00,FF,09,ED,00,00,FF,FF
EA  211 DATA CF,08,ED,F3,08,ED,FF
    ,03,ED,1F,0F,C7,E7,04,ED,E3
D8  212 DATA F0,F8,FF,03,ED,E7,E7
    ,C7,0F,1F,FF,03,ED,3F,06,ED
EC  213 DATA 00,00,3F,1F,8F,C7,E3
    ,F1,F8,FC,FC,F8,F1,E3,C7,8F
6E  214 DATA 1F,3F,00,00,3F,06,ED
    ,00,00,FC,06,ED,FF,C3,81,04
3F  215 DATA ED,C3,FF,06,ED,00,00
    ,FF,C9,80,03,ED,C1,E3,F7,FF
91  216 DATA 9F,08,ED,FF,03,ED,F8
    ,F0,E3,E7,E7,3C,18,81,C3,C3
F6  217 DATA 81,18,3C,FF,C3,81,99
    ,99,81,C3,FF,E7,E7,99,99,E7
48  218 DATA E7,C3,FF,F9,08,ED,F7
    ,E3,C1,80,C1,E3,F7,FF,E7,03
F8  219 DATA ED,00,00,E7,03,ED,3F
    ,3F,CF,CF,3F,3F,CF,CF,E7,08
D5  220 DATA ED,FF,FF,FC,C1,89,C9
    ,C9,FF,00,80,C0,E0,F0,F8,FC
3C  221 DATA FE,FF,08,ED,0F,08,ED
    ,FF,04,ED,00,05,ED,FF,0E,ED
E9  222 DATA 00,3F,08,ED,33,33,CC
    ,CC,33,33,CC,CC,FC,08,ED,FF
D6  223 DATA 04,ED,33,33,CC,CC,00
    ,01,03,07,0F,1F,3F,7F,FC,08
28  224 DATA ED,E7,03,ED,E0,E0,E7
    ,03,ED,FF,04,ED,F0,04,ED,E7
C0  225 DATA 03,ED,E0,E0,FF,06,ED
    ,07,07,E7,03,ED,FF,06,ED,00
E8  226 DATA 00,FF,03,ED,E0,E0,E7
    ,06,ED,00,00,FF,06,ED,00,00
FD  227 DATA E7,06,ED,07,07,E7,03
    ,ED,3F,08,ED,1F,08,ED,F8,08
9E  228 DATA ED,00,00,FF,06,ED,00
    ,03,ED,FF,0A,ED,00,03,ED,FC
B5  229 DATA 06,ED,00,00,FF,04,ED
    ,0F,04,ED,F0,04,ED,FF,04,ED
9D  230 DATA E7,03,ED,07,07,FF,03
    ,ED,0F,04,ED,FF,04,ED,0F,04
93  231 DATA ED,F0,03,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
4A  232 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
53  233 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
99  234 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
89  235 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
28  236 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
B8  237 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
E0  238 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
C5  239 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
3F  240 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
07  241 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
02  242 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
D6  243 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
86  244 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
E7  245 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
CD  246 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
A5  247 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
2C  248 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
84  249 DATA ED,00,FF,ED,00,5F,ED
    ,93,00,F0,00,12,03,01,0F,03
79  250 DATA 41,02,19,0A,2C,14,01
    ,04,00,0E,64,08,28,11,01,AD
F3  251 DATA 18,AD,18,AD,18,AF,18
    ,AF,10,AF,10,B0,18,B0,18,B0
A9  252 DATA 18,B2,18,B2,10,B2,10
    ,10,02,04,05,08,14,14,F5,0E
76  253 DATA 0A,11,01,AD,18,AD,18
    ,AD,18,AF,18,AF,10,AF,10,B0
00  254 DATA 18,B0,18,B0,18,B2,18
    ,B2,10,B2,10,10,04,02,2C,0E
0E  255 DATA 96,11,01,13,01,A1,08
    ,A8,08,AD,08,12,03,A3,08,A6
87  256 DATA 08,A8,08,AF,10,A8,10
    ,13,01,A4,08,AB,08,B0,08,12
19  257 DATA 03,AD,08,A6,08,A1,08
    ,A6,10,B2,10,10,06,02,2C,04
D0  258 DATA 08,03,51,0E,00,14,F8
    ,13,01,11,01,A1,18,A3,18,A4
4C  259 DATA 18,A6,18,A8,08,A6,08
    ,A4,08,A3,08,A4,18,A6,18,A8
59  260 DATA 18,A8,18,AD,08,A8,08
    ,AA,08,A6,08,10,04,11,01,A4
2A  261 DATA 10,A6,08,A8,10,A9,08
    ,A8,08,AE,20,AD,18,A9,0F,00
B1  262 DATA 01,10,04,14,FA,03,41
    ,02,19,04,00,0E,64,11,01,AD
BE  263 DATA 18,AD,18,AD,18,AF,18
    ,AF,10,AF,10,B0,18,B0,18,B0
57  264 DATA 18,B2,18,B2,10,B2,10
    ,10,06,00,01,00,01,03,41,02
79  265 DATA 19,0A,0E,14,01,04,00
    ,0E,32,08,96,13,01,11,01,AD
B3  266 DATA 08,10,09,11,01,A8,08
    ,10,10,11,01,AD,08,10,07,12
52  267 DATA 02,03,41,08,C8,02,2C
    ,14,F5,11,01,04,00,C5,08,C3
A2  268 DATA 08,C5,08,C7,08,C8,08
    ,C7,08,C5,08,C7,48,C8,10,C8
82  269 DATA 08,CA,08,CC,08,CA,08
    ,C8,08,CA,20,CA,08,C5,08,C3
4D  270 DATA 08,C2,10,C5,08,C3,08
    ,C5,08,C7,08,C8,08,C7,08,C5
EF  271 DATA 08,C7,48,C8,10,C8,08
    ,CA,08,CC,08,CA,08,C8,08,CA
F4  272 DATA 20,CA,08,CE,08,CF,08
    ,D1,10,13,01,D1,08,D3,08,D4
88  273 DATA 08,D4,10,D3,08,D1,08
    ,D3,48,D4,18,D4,08,CF,08,CD
30  274 DATA 08,CC,10,CA,18,CA,08
    ,CE,08,CF,08,D1,10,12,02,08
31  275 DATA 64,10,02,11,01,07,03
    ,05,04,C8,10,C5,10,C0,10,C5
65  276 DATA 10,C3,10,C7,10,CA,10
    ,CD,10,CF,10,CC,10,C8,10,C3
84  277 DATA 10,C2,10,C5,10,CA,10
    ,C5,10,10,02,08,14,04,02,0E
01  278 DATA 64,02,1F,11,01,14,04
    ,B4,08,07,00,B7,08,B9,08,BC
F0  279 DATA 10,B9,08,B7,08,B9,20
    ,B7,08,B9,08,B7,08,B4,08,B2
69  280 DATA 08,B4,08,B2,08,B0,08
    ,B0,10,B2,08,B4,08,B2,20,B2
FA  281 DATA 08,B6,08,B7,08,B9,08
    ,BE,08,04,01,10,02,04,02,11
E4  282 DATA 01,C0,08,BE,08,BC,08
    ,B9,10,BC,08,BE,08,B8,20,B8
06  283 DATA 08,BC,08,BE,08,C0,08
    ,C1,08,C3,08,C1,08,C0,08,BC
99  284 DATA 10,BE,08,C0,08,BE,20
    ,BE,08,C2,08,C0,08,BE,08,B9
77  285 DATA 08,04,04,10,02,04,02
    ,02,2C,03,51,04,08,0E,00,11
8A  286 DATA 01,A8,08,A8,08,AA,08
    ,A8,10,AD,08,AE,08,B2,20,B0
01  287 DATA 18,AD,10,10,02,14,F8
    ,11,01,03,11,C0,08,BE,08,BC
71  288 DATA 08,B8,10,B9,08,B7,08
    ,B5,20,B5,18,B9,0F,00,01,14
18  289 DATA 04,10,02,03,41,02,19
    ,14,06,04,00,0E,32,13,01,11
A3  290 DATA 01,AD,08,10,09,11,01
    ,A8,08,10,10,11,01,AD,08,10
B1  291 DATA 07,12,02,03,41,08,C8
    ,02,2C,09,0A,13,01,11,01,0D
79  292 DATA 64,B9,63,BC,18,0F,01
    ,10,04,BC,08,0F,00,B9,08,B7
6A  293 DATA 08,B5,08,B4,08,B5,08
    ,B7,08,BC,10,B9,08,B7,08,B4
84  294 DATA 08,B6,08,B7,08,B9,08
    ,BC,10,B9,08,B7,08,B6,08,04
29  295 DATA 03,0E,64,12,02,04,00
    ,11,01,AD,08,01,0E,10,09,11
AD  296 DATA 01,A8,08,01,0D,10,10
    ,11,01,AD,08,01,0C,10,07,11
6C  297 DATA 01,AD,08,01,0B,10,09
    ,11,01,A8,08,01,0A,10,10,11
4E  298 DATA 01,AD,08,01,09,10,07
    ,11,01,00,62,10,88,00,01,03
2A  299 DATA 41,02,18,0A,0E,04,00
    ,0E,50,14,01,08,64,13,01,11
4B  300 DATA 01,BC,63,C0,08,08,01
    ,10,09,11,01,BB,63,BE,08,10
23  301 DATA 07,11,01,BC,63,C0,08
    ,10,09,04,01,11,01,BE,63,C2
DF  302 DATA 08,10,05,C3,08,C2,08
    ,12,0C,03,21,14,04,13,01,11
B2  303 DATA 01,BC,63,C0,08,08,01
    ,10,09,11,01,BB,63,BE,08,10
9B  304 DATA 07,11,01,BC,63,C0,08
    ,10,09,11,01,BE,63,C2,08,10
A1  305 DATA 05,C3,08,C2,08,12,04
    ,13,01,11,01,BC,63,C0,08,08
CF  306 DATA 01,10,03,11,01,BB,63
    ,C0,08,10,04,11,01,BE,63,BA
7C  307 DATA 08,10,04,11,01,BC,63
    ,B9,07,00,01,10,05,12,04,03
9C  308 DATA 41,14,06,13,01,11,01
    ,BC,63,C0,08,08,01,10,09,11
F2  309 DATA 01,BB,63,BE,08,10,07
    ,11,01,BC,63,C0,08,10,09,04
F8  310 DATA 01,11,01,BE,63,C2,08
    ,10,05,C3,08,C2,08,12,0C,00
69  311 DATA 89,07,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
DC  312 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
AB  313 DATA 00,FF,ED,00,FF,ED,00
    ,2D,ED,42,41,53,49,43,31,00
39  314 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
E3  315 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
03  316 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
06  317 DATA FF,ED,00,FF,ED,00,FF
    ,ED,00,FF,ED,00,FF,ED,00,FF
0A  318 DATA ED,00,FF,ED,00,FF,ED
    ,00,FF,ED,00,FF,ED,00,FF,ED
A2  319 DATA 00,FF,ED,00,FF,ED,00
    ,FF,ED,00,FF,ED,00,FF,ED,00
9F  320 DATA 20,ED,EA,12,ED,38,20
    ,0A,E5,81,D1,48,A5,D1,85,FD
2E  321 DATA A5,D2,18,69,D4,85,FE
    ,AD,86,02,91,FD,A9,A0,91,D1
9C  322 DATA A9,05,85,03,A9,00,85
    ,02,C6,02,D0,FC,C6,03,D0,F4
25  323 DATA 68,91,D1,60,00,BF,ED
    ,A9,08,85,FC,A9,00,A8,85,FB
58  324 DATA 91,FB,C8,D0,FB,E6,FC
```

```
       ,A6,FC,E0,28,D0,F3,A2,00,BD
39  325 DATA 00,C2,9D,00,08,E8,D0
       ,F7,A2,00,A9,00,A8,85,FB,85
DE  326 DATA FD,BD,00,C3,85,FC,BD
       ,08,C3,85,FE,B1,FB,91,FD,C8
06  327 DATA D0,F9,E6,FC,E6,FE,A5
       ,FC,DD,10,C3,D0,EE,E8,E0,04
8D  328 DATA D0,D8,A5,BA,AA,A8,20
       ,BA,FF,A9,06,A2,80,A0,C1,20
54  329 DATA BD,FF,A9,01,85,2B,A9
       ,08,85,2C,A9,2B,A2,00,A0,2E
61  330 DATA 20,D8,FF,4C,0D,08,00
       ,11,ED,57,52,49,54,45,52,00
C9  331 DATA 78,ED,08,08,00,00,9E
       ,32,30,36,31,00,03,ED,A2,00
58  332 DATA A9,00,A8,85,FB,85,FD
       ,BD,40,08,85,FC,BD,48,08,85
E5  333 DATA FE,B1,FB,91,FD,C8,D0
       ,F9,E6,FC,E6,FE,A5,FE,DD,50
38  334 DATA 08,D0,EE,E8,E0,04,D0
       ,D8,4C,00,CE,00,06,ED,1E,15
A2  335 DATA 11,09,00,04,ED,40,C7
       ,90,20,00,04,ED,50,D0,94,30
CE  336 DATA 00,AC,ED,20,90,C7,40
       ,00,04,ED,09,11,15,1E,00,04
E1  337 DATA ED,30,94,D0,50,00,FF
       ,ED,00,FF,ED,00,FF,ED,00,EF
D6  338 DATA ED,A9,01,8D,19,D0,AD
       ,12,D0,C9,00,F0,0D,A9,17,8D
21  339 DATA 11,D0,A9,00,8D,12,D0
       ,4C,81,EA,A9,18,8D,11,D0,A9
28  340 DATA F9,8D,12,D0,AD,FF,CF
       ,D0,03,20,CA,C7,A9,00,8D,FF
49  341 DATA 3F,4C,D3,C7,EA,05,ED
       ,4C,9D,C7,4C,47,C7,4C,51,C7
F9  342 DATA 4C,2F,C8,4C,29,C8,78
       ,85,FA,86,FB,20,CA,C7,58,60
A5  343 DATA 8D,33,CD,8E,2F,CD,A9
       ,00,8D,C3,CC,8D,C2,CC,8D,C1
6C  344 DATA CC,8D,E0,CC,8D,D9,CC
       ,8D,0B,CD,8D,DE,CC,8D,DD,CC
90  345 DATA 8D,F3,CC,8D,F7,CC,8D
       ,A7,CC,98,7E,6D,33,CD,8D,A2
F4  346 DATA CC,A9,01,8D,37,CD,8D
       ,FE,CF,AD,2B,CD,09,70,8D,2B
DA  347 DATA CD,A9,F3,8D,2A,CD,A9
       ,7F,8D,29,CD,60,85,FA,86,FB
3A  348 DATA 20,A9,C7,58,4C,F0,C7
       ,60,78,A9,18,8D,11,D0,A9,00
DE  349 DATA 8D,14,03,A9,C7,8D,15
       ,03,A2,00,8E,0E,DC,E8,8E,1A
EC  350 DATA D0,8E,19,D0,EA,05,ED
       ,20,85,CC,20,E0,CA,4C,8F,CC
45  351 DATA 20,2F,C8,4C,31,EA,50
       ,ED,60,78,20,34,C8,58,60,A9
9E  352 DATA 01,8D,19,D0,AD,FF,CF
       ,F0,F5,20,85,CC,A2,7C,B5,2E
52  353 DATA 9D,BC,CC,E8,10,F8,20
       ,C8,C8,A2,7C,BD,BC,CC,95,2E
A8  354 DATA E8,10,F8,20,8F,CC,AD
       ,33,CD,CD,A2,CC,D0,13,A9,00
C8  355 DATA 8D,FE,CF,8D,2A,CD,8D
       ,29,CD,AD,2B,CD,29,0F,8D,2B
4A  356 DATA CD,A2,00,20,BB,C8,A2
       ,07,20,BB,C8,A2,72,BD,9A,CC
9E  357 DATA 9D,8E,D3,E8,10,F7,AD
       ,FE,CF,D0,12,A2,0E,20,BB,C8
86  358 DATA A2,79,BD,A1,CC,9D,95
       ,D3,E8,10,F7,30,12,A2,15,A0
DB  359 DATA 0E,20,BD,C8,A2,79,BD
       ,A8,CC,9D,95,D3,E8,10,F7,A2
DF  360 DATA 7C,BD,AC,CC,9D,99,D3
       ,E8,10,F7,60,8A,A8,BD,C7,CC
1B  361 DATA F0,08,A9,00,99,04,D4
       ,9D,C7,CC,60,EE,A3,CC,A2,00
07  362 DATA AD,FE,CF,18,69,03,8D
       ,80,CA,BC,59,CD,84,AC,86,AD
36  363 DATA B9,A8,CC,18,7D,A4,CC
       ,99,A8,CC,FE,E0,CC,8D,E0,CC
89  364 DATA D9,AC,CC,90,10,BD,E4
       ,CC,18,69,01,29,03,9D,E4,CC
53  365 DATA A9,01,9D,E0,CC,B9,C9
       ,CC,18,69,01,99,C9,CC,BD,30
42  366 DATA CD,85,AA,BD,2C,CD,85
       ,AB,A0,00,B1,AA,38,E9,01,C9
DD  367 DATA 14,B0,1D,0A,A8,B9,7A
       ,CD,8D,38,C9,B9,7B,CD,8D,39
FD  368 DATA C9,A0,01,B1,AA,A4,AC
       ,20,3A,CB,20,95,CC,4C,1B,C9
1B  369 DATA A6,AC,A4,AD,BD,A8,CC
       ,D0,03,4C,E3,C9,BD,C9,CC,DD
27  370 DATA C8,CC,90,08,BD,C4,CC
       ,F0,03,20,20,CC,BD,0E,CD,18
0B  371 DATA 79,08,CD,9D,0E,CD,90
       ,03,FE,0F,CD,A4,AD,20,E3,CB
1A  372 DATA BD,AD,CC,F0,35,C9,06
       ,90,0F,B9,E4,CC,29,01,D0,22
85  373 DATA BD,AD,CC,38,E9,05,10
       ,14,BD,C9,CC,C9,02,90,13,BD
9C  374 DATA A8,CC,F0,05,DD,C9,CC
       ,90,09,BD,AD,CC,A8,B9,5C,CD
60  375 DATA D0,03,BD,AA,CC,9D,10
       ,CD,A4,AD,BD,AE,CC,F0,34,C9
BB  376 DATA 02,D0,06,20,70,CC,4C
       ,E3,C9,C9,04,D0,0D,BD,0F,CD
05  377 DATA 18,7D,08,CD,9D,0F,CD
       ,4C,E3,C9,B9,E4,CC,29,01,D0
EF  378 DATA 0F,BD,C5,CC,9D,0D,CD
       ,BD,C6,CC,9D,0C,CD,4C,E3,C9
BC  379 DATA 20,63,CC,A6,AD,A4,AC
       ,DE,34,CD,BD,34,CD,F0,03,4C
43  380 DATA 93,CA,A9,01,99,C7,CC
       ,A9,00,99,0E,CD,99,C9,CC,BD
A2  381 DATA 04,CD,99,11,CD,BD,F8
       ,CC,99,12,CD,BD,00,CD,99,0F
8F  382 DATA CD,A0,00,B1,AA,F0,37
       ,C9,80,90,39,18,7D,F0,CC,A2
F5  383 DATA 07,C9,8C,90,06,E9,0C
       ,CA,4C,21,CA,E9,7F,0A,A8,B9
60  384 DATA 62,CD,8D,56,CD,B9,63
       ,CD,8D,57,CD,E0,00,F0,0A,4E
68  385 DATA 56,CD,6E,57,CD,CA,4C
       ,3B,CA,A6,AD,4C,54,CA,8D,56
3B  386 DATA CD,8D,57,CD,AD,56,CD
       ,A4,AC,99,0D,CD,99,A8,CC,AD
AA  387 DATA 57,CD,99,0C,CD,99,A9
       ,CC,A0,01,B1,AA,A4,AC,9D,34
D2  388 DATA CD,20,95,CC,BD,34,CD
       ,C9,63,D0,0F,B9,A9,CC,99,C6
89  389 DATA CC,B9,A8,CC,99,C5,CC
       ,4C,11,CA,BD,FC,CC,99,10,CD
B6  390 DATA 99,AA,CC,BD,34,CD,C9
       ,01,B0,08,B9,10,CD,29,FE,99
DE  391 DATA 10,CD,A6,AD,A5,AA,9D
       ,30,CD,A5,AB,9D,2C,CD,E8,E0
6D  392 DATA 03,B0,03,4C,D9,C8,A0
       ,00,B1,FA,18,65,FA,08,CD,30
24  393 DATA CD,90,02,28,60,C8,28
       ,B1,FA,65,FB,CD,2C,CD,D0,0F
32  394 DATA A9,00,8D,FF,CF,A2,60
       ,A9,00,9D,AC,CC,E8,10,FA,60
D3  395 DATA A2,7C,A9,01,8D,97,CA
       ,9D,B8,CC,E8,10,FA,A5,FA,18
94  396 DATA 69,04,8D,30,CD,A5,FB
       ,69,00,8D,2C,CD,A2,7E,A0,00
4C  397 DATA B1,FA,18,6D,30,CD,9D
       ,B3,CC,08,C8,28,B1,FA,6D,2C
11  398 DATA CD,9D,AF,CC,C8,E8,10
       ,E8,A9,01,8D,FF,CF,A9,00,8D
CC  399 DATA FE,CF,AA,9D,A1,CC,E8
       ,10,FA,60,8D,2B,CD,60,9D,FC
A8  400 DATA CC,60,9D,04,CD,60,9D
       ,F8,CC,60,8D,54,CD,8D,E8,CC
0F  401 DATA D0,08,A9,01,9D,E8,CC
       ,AD,54,CD,9D,3C,CD,DE,3C,CD
94  402 DATA BD,3C,CD,F0,08,BD,44
       ,CD,85,AA,BD,48,CD,85,AB,60
9C  403 DATA A9,00,9D,E8,CC,60,A5
       ,AA,9D,44,CD,A5,AB,9D,48,CD
24  404 DATA 60,8D,54,CD,BD,EC,CC
       ,D0,08,A9,01,9D,EC,CC,AD,54
A2  405 DATA CD,9D,40,CD,DE,40,CD
       ,BD,40,CD,F0,08,BD,4C,CD,85
BC  406 DATA AA,BD,50,CD,85,AB,60
       ,A9,00,9D,EC,CC,60,A5,AA,9D
00  407 DATA 4C,CD,A5,AB,9D,50,CD
       ,60,9D,F0,CC,60,9D,08,CD,60
83  408 DATA 9D,A4,CC,60,9D,F4,CC
       ,60,9D,00,CD,60,C9,64,90,07
D1  409 DATA 38,E9,64,8D,97,CA,60
       ,99,AB,CC,60,99,AC,CC,60,99
4E  410 DATA AD,CC,60,99,AE,CC,60
       ,99,C4,CC,60,99,CA,CC,60,99
6A  411 DATA C8,CC,60,BD,C9,CC,DD
       ,C8,CC,90,F7,AD,A3,CC,29,07
E1  412 DATA 4A,F0,1A,C9,01,F0,4E
       ,C9,03,F0,4A,BD,A9,CC,18,7D
4B  413 DATA CA,CC,9D,0C,CD,BD,A8
       ,CC,69,00,4C,1C,CC,BD,A9,CC
E9  414 DATA 38,FD,CA,CC,9D,0C,CD
       ,BD,A8,CC,E9,00,9D,0D,CD,60
12  415 DATA C9,01,D0,36,BD,C5,CC
       ,DD,A8,CC,90,1C,D0,08,BD,C6
9A  416 DATA CC,DD,A9,CC,90,12,BD
       ,A9,CC,18,79,F4,CC,9D,A9,CC
6B  417 DATA 90,03,FE,A8,CC,4C,63
       ,CC,BD,A9,CC,38,F9,F4,CC,9D
32  418 DATA A9,CC,B0,03,DE,A8,CC
       ,4C,63,CC,C9,03,F0,EA,C9,04
D9  419 DATA F0,D4,60,BD,A8,CC,9D
       ,0D,CD,BD,A9,CC,9D,0C,CD,60
DC  420 DATA B9,E4,CC,29,01,D0,EC
       ,BD,A8,CC,4A,9D,0D,CD,BD,A9
82  421 DATA CC,6A,4C,6C,CC,A5,01
       ,8D,58,CD,A9,00,85,01,60,AD
80  422 DATA 58,CD,85,01,60,A5,AA
       ,18,69,02,85,AA,90,02,E6,AB
0A  423 DATA 60,00,00,F6,00,04,ED
       ,04,59,41,00,04,ED,27,11,41
31  424 DATA 00,04,ED,41,84,81,00
       ,10,ED,06,14,00,34,26,00,0F
36  425 DATA 06,FF,00,05,ED,07,00
       ,08,ED,01,03,ED,00,02,03,ED
D6  426 DATA 00,03,ED,01,00,05,ED
       ,01,01,00,03,ED,64,00,00,2A
0B  427 DATA 2A,0E,00,41,41,81,00
       ,01,01,00,00,19,1F,03,00,96
76  428 DATA 1E,00,00,59,04,84,04
       ,41,19,2A,11,27,84,01,41,1F
EE  429 DATA 2A,84,41,00,00,81,03
       ,0E,00,0A,ED,0F,90,91,92,00
D4  430 DATA 72,4A,14,00,09,18,03
       ,01,00,06,ED,0F,00,03,ED,11
F5  431 DATA 00,6A,08,10,00,90,91
       ,92,00,2E,06,84,00,90,91,91
4B  432 DATA 00,28,00,27,11,37,00
       ,07,0E,15,41,21,11,81,51,83
32  433 DATA 68,8B,39,93,80,9C,45
       ,A5,90,AF,69,B9,D7,C4,E3,D0
08  434 DATA 99,DD,00,EA,25,F8,10
       ,2A,CB,32,CB,2E,CB,88,CB,BC
F1  435 DATA CB,03,ED,CF,CB,D3,CB
       ,DF,CB,36,CB,DB,CB,B0,CB,B4
FE  436 DATA CB,AC,CB,D7,CB,3A,CB
       ,66,CB,71,CB,9D,CB,A8,CB,03
D2  437 DATA 88,03,00,07,0E,15,0A
       ,08,28,64,14,0B,00,00,41,21
AC  438 DATA 11,81,00,B2,87,B7,00
       ,02,00,03,ED,14,1E,24,00,64
FF  439 DATA 03,ED,00,14,0C,34,00
       ,64,66,68,00,83,68,8B,39,93
29  440 DATA 80,9C,45,A5,90,AF,69
       ,B9,D7,C4,E3,D0,99,DD,00,EA
6B  441 DATA 25,F8,10,00,03,ED,77
       ,00,16,ED,20,5B,FF,20,15,FD
3C  442 DATA 5A,20,60,CF,7A,A9,00
       ,3A,85,FD,A9,40,85,FE,FA,DA
4F  443 DATA A9,1B,5A,8D,11,D0,8D
       ,18,D0,20,60,CF,20,60,CF,20
A2  444 DATA 60,CF,A9,C8,8D,16,D0
       ,78,5A,A9,0B,8D,20,D0,A9,00
26  445 DATA 8D,21,D0,A2,90,EA,EA
       ,FA,20,38,C7,DA,20,60,CF,7A
D0  446 DATA 7A,A9,01,8D,86,02,A9
       ,7E,8D,78,C7,A9,F6,8D,29,03
AE  447 DATA 7A,58,20,60,CF,20,60
```

```
   ,CF,07,60,3A,03,ED,A9,FF,85
F3 448 DATA 00,20,2E,CF,A0,00,B1
   ,FD,C9,FF,D0,08,A9,20,8D,89
DE 449 DATA CF,4C,20,CF,C9,FE,D0
   ,08,A9,16,8D,89,CF,4C,20,CF
91 450 DATA C9,FD,DA,D0,08,A9,0C
   ,8D,89,CF,4E,20,CF,C9,FC,D0
E6 451 DATA 09,A9,02,8D,89,CF,4C
   ,20,CF,7A,C9,FB,D0,05,A9,01
AA 452 DATA 4C,61,CF,C9,FA,D0,05
   ,A9,05,4C,61,CF,C9,F9,5A,D0
D2 453 DATA 05,A9,19,4C,61,CF,C9
   ,00,D0,5D,3A,EE,8C,CF,A9,F8
52 454 DATA 8D,00,C0,A9,00,AA,A8
   ,E8,D0,FD,C8,D0,FA,EE,00,C0
71 455 DATA AD,00,C0,D0,F2,A9,93
   ,20,D2,FF,4C,03,CE,D0,F0,EE
CC 456 DATA D7,CE,AD,D7,CE,C9,30
   ,D0,E6,88,5A,D0,D8,78,3A,A9
86 457 DATA FF,8D,0E,D4,A9,81,8D
   ,12,D4,4C,00,CE,85,03,A0,00
1F 458 DATA 84,02,AD,18,D4,91,02
   ,C8,D0,F8,E6,03,A5,03,C9,CF
45 459 DATA D0,F0,6C,18,CF,E2,FC
   ,20,D2,FF,20,26,CF,4C,67,CE
FC 460 DATA 7A,E6,FD,D0,02,E6,FE
   ,60,38,20,0A,E5,DA,B1,D1,48
82 461 DATA A5,D1,85,02,A5,D2,18
   ,69,D4,85,03,AD,86,02,91,02
03 462 DATA A9,A0,91,D1,A9,00,8D
   ,20,D0,AE,89,CF,CA,F0,08,AD
8D 463 DATA 12,D0,D0,FB,4C,52,CF
   ,68,91,D1,60,8D,8B,CF,FA,AD
FE 464 DATA 89,CF,8D,8A,CF,3A,A9
   ,20,8D,89,CF,20,2E,CF,CE,8B
12 465 DATA CF,D0,F8,AD,8A,CF,8D
   ,89,CF,AD,8C,CF,D0,03,4C,20
38 466 DATA CF,7A,60,20,20,00,1C
   ,45,00,CA,C0,00,07,ED,AC,00
31 467 DATA 66,ED,01,A2,00,8D,F1
   ,1F,9D,10,01,E8,D0,F7,A2,34
C2 468 DATA 8D,58,20,9D,00,03,E8
   ,D0,F7,EA,EA,A2,FF,9A,A9,00
```

```
01 469 DATA 85,2D,38,E9,01,85,FE
   ,A9,D0,85,2E,E9,00,85,FF,A9
6C 470 DATA AE,85,FC,A9,1F,85,FD
   ,AD,21,D0,85,FB,4C,52,01,00
C3 471 DATA 07,E8,39,08,0A,00,97
   ,34,33,2C,30,31,3A,97,34,34
1E 472 DATA 2C,38,3A,97,34,35,2C
   ,30,3A,97,34,36,2C,31,33,3A
10 473 DATA 97,48,C6,FC,A5,FC,C9
   ,FF,D0,02,C6,FD,68,60,48,AD
14 474 DATA 20,D0,49,03,8D,20,D0
   ,C6,FE,A5,FE,C9,FF,D0,02,C6
AD 475 DATA FF,68,60,A0,00,B1,FC
   ,C9,ED,D0,18,EA,03,E8,20,30
90 476 DATA 01,B1,FC,AA,20,30,01
   ,B1,FC,91,FE,20,3D,01,CA,D0
D9 477 DATA F8,F0,05,91,FE,20,3D
   ,01,A6,FC,CA,86,FC,E0,FF,D0
CE 478 DATA 02,C6,FD,A5,FE,C9,1F
   ,A5,FF,E9,08,B0,C8,A5,FB,8D
CD 479 DATA 20,D0,A9,37,85,01,20
   ,60,A6,20,8E,A6,A2,1F,BD,10
CC 480 DATA 01,9D,00,08,CA,D0,F7
   ,A9,ED,4C,34,03,4C,AE,A7,EE
A3 481 DATA A2,00,BD,82,23,9D,10
   ,01,E8,D0,F7,A2,34,BD,E9,23
84 482 DATA 9D,00,03,E8,D0,F7,EA
   ,EA,A2,FF,9A,A9,90,85,2D,38
4C 483 DATA E9,01,85,FE,A9,26,85
   ,2E,E9,00,85,FF,A9,3F,85,FC
8E 484 DATA A9,23,85,FD,AD,21,D0
   ,85,FB,4C,52,01,00,00,00,00
C0 485 DATA 00,00,00,19,08,0A,00
   ,97,35,33,32,38,30,2C,31,35
2F 486 DATA 3A,97,35,33,32,38,31
   ,2C,31,32,00,27,08,08,00,99
AD 487 DATA C7,28,48,C6,FC,A5,FC
   ,C9,FF,D0,02,C6,FD,68,60,48
FE 488 DATA AD,20,D0,49,03,8D,20
   ,D0,C6,FE,A5,FE,C9,FF,D0,02
C7 489 DATA C6,FF,68,60,A0,00,B1
   ,FC,C9,E8,D0,18,EA,EA,EA,20
88 490 DATA 30,01,B1,FC,AA,20,30
```

```
   ,01,B1,FC,91,FE,20,3D,01,CA
0F 491 DATA D0,F8,F0,05,91,FE,20
   ,3D,01,A6,FC,CA,86,FC,E0,FF
4A 492 DATA D0,02,C6,FD,A5,FE,C9
   ,1F,A5,FF,E9,08,B0,C8,A5,FB
02 493 DATA 8D,20,D0,A9,37,85,01
   ,20,60,A6,20,8E,A6,A2,1F,BD
AD 494 DATA 10,01,9D,00,08,CA,D0
   ,F7,A9,E8,4C,34,03,4C,AE,A7
17 495 DATA EE,EE,EE,EE,EE,EE,EE
   ,EE,EE,EE,EE,EE,EE,EE,EE,EE
16 496 DATA EE,EE,EE,EE,EE,EE,EE
   ,EE,EE,EE,EE,EE,EE,EE,EE,EE
78 497 DATA A9,00,A8,85,FB,85,FD
   ,A9,80,85,FC,A9,08,85,FE,B1
85 498 DATA FB,91,FD,C8,D0,F9,E6
   ,FC,E6,FE,A5,FC,C9,A0,D0,EF
0F 499 DATA A5,BA,AA,A8,20,BA,FF
   ,A9,0D,A2,8C,A0,9C,20,BD,FF
0A 500 DATA A9,01,85,28,A9,08,85
   ,2C,A9,28,A2,20,A0,24,20,D8
3D 501 DATA FF,4C,66,FE,EE,EE,EE
   ,EE,EE,EE,EE,EE,4C,45,54,54
0D 502 DATA 45,52,20,57,52,49,54
   ,45,52,EE,EE,EE,EE,EE,EE,EE
C2 503 :
C3 504 :
FA 505 :::::::::::::::::::::::::
   :::::::::::
F8 506 :
              :
D1 507 :   LETTER WRITER   BY LE
   S ALLAN    :
01 508 :
              :
FF 509 :   28 ATKINSON DRIVE NEW
   PORT IW    :
FF 510 :
              :
48 511 :::::::::::::::::::::::::
   :::::::::::
```



```
NOVEL WAY TO SEND A LETTER, OR INDEED
ANY FORM OF COMMUNICATION, TO A FRIEND
OR FELLOW 64 USER BY PROVIDING A MUSICAL
ACCOMPANIMENT TO A TELE-TEX TYPE FORMAT.
SIMPLY TYPE IN YOUR LETTER FROM THE
KEYBOARD USING ALL NORMAL PRINT COMMANDS
TO MAKE ALTERATIONS OR EMPHASIS PARTS OF
TEXT IN DIFFERENT TEXT COLOURS.
IN FACT BY EXPERIMENTATION QUITE
PLEASING RESULTS CAN BE ACHIEVED; THE
ROUTINE CAN ALSO BE USED TO DRAW OR
PROVIDE SIMPLE ANIMATION SEQUENCES.
WHEN█
```

Red Boxes

Now there's a home control system available for the C64, which will switch on the kettle and the telly or even warn of intruders.

By Mycroftt Appleby

Home control has always been promoted as one of the major uses of computers in the coming years. However, in the past home control systems were expensive, difficult to use, and were only available on micros with good, complex interfacing systems like the BBC Micro. More common computers like the Commodore 64 were not really used at all. One unbuffered user port that doubled as an RS232, and an obscure custom serial system, isn't really the stuff that interfacing dreams are made of.

Finally, there is now on the market an easy to use home control system that is available across a range of micros including the Commodore 64. The starter pack for *Red Boxes* comprises the main controller — called 'Red Leader', and two control units — an infra-red detector (red two) and a plug actuator (red one). The concept behind the *Red Boxes* is the controller unit 'talking' to all the other units via a modulated serial link via the mains.

Red Leader is a computer in itself. Comprising a 6502 derivative processor just like the C64, 8K of RAM, and a BBC-like control Basic. The Commodore 64 connects to this and is used as a terminal. The way this is done is extremely clever. A wire is connected on the C64. Press 'Run/Stop' and the Red Leader behaves just like a cassette player, sending cassette-type signals to the Commodore 64.

After a short time the terminal program is loaded into the computer and the link between the Red Leader and the Commodore 64 turns into a proper two-way serial link. You will then drop into the control program mode.

This mode is the simplest operating method on the *Red Boxes* system (the other being Red Basic, but more of that later). You are presented with a menu where you can log-on devices (i.e. tell Red Leader that they exist) type in their code addresses, turn them on or off and set them up to turn on or off at specific times. You can even relate the input of one to the output of another so that a movement on the infra-red detector will activate an alarm for instance.

This program, whilst being extremely simple, is also quite powerful and lets you perform all the major actions that you would want to in a quick and easy manner. However for complex, multi-unit, interaction you need to get down to some planning and programming. For this you need to use Red Basic and probably need to get hold of the Projects Manual (good value at £9).

Documentation

The manual supplied gives you some simple information on the Basic, but is really aimed at tbe inexperienced user so goes into more detail about the menu program. The Projects Manual on the other hand, is one of the better tomes that I have read. Going into enough detail for the experienced programmer out to do something really flashy, or the beginner who is au fait with Commodore Basic and wants to get down to using Red Basic.

If you have ever used a BBC micro you will be immediately used to Red Basic as Red Basic is a subset of BBC Basic, with a lot of extra commands added to handle the control aspect of the system. If you think that Red Basic being the same as BBC Basic is a little strange, then you won't when you hear about the Founder of General Information Systems (the people who make Red Boxes). Chris Curry (for it is he) started Acorn many years ago and this is one of the first projects that he has embarked on since the Acorn shake up.

As well as most of the BBC Basic commands and instructions — which includes most of the structured programming aids (repeat, gosub name, long variable names etc.) there are commands to log-on devices and manipulate them. As this Basic is a lot more advanced than the Commodore 64 Basic, you should have no trouble at all in telling units to do whatever you want, especially with the real-time commands. These are commands that are very similar to some commands on the Amstrad. Sections of program are executed when an external device instructs them. So if the timer section of your program is controlling the heating and a burglar trips the infra-red motion detector then the 'alarm' section of your program can be activated.

8K may not sound like a lot, but try and think of the last time that you wrote a program that was actually 8K in length. Remember, you don't have to worry about screen or colour memory, or sprites, or sound. The Commodore 64 handles all of that. And if Basic is a bit tight you can always switch to machine code.

The Red Leader uses a 6502 processor, and you can program it in machine code by pokeing code into memory and then executing it. The Projects manual carrys a list of operating system functions which are very similar in a lot of ways to the Commodore Kernal system. The Basic has the same memory management aids as the original BBC Basic with pseudo-variables like Page and Top to indicate when the Basic program is going to sit, and Lomem and Himem to reserve space for the machine code area. The operating system and memory areas are also very similar to the BBC, even down to where the system memory ends.

The Basic can also save any programs written under it to a tape connected to the Commodore 64. To do this, the Red Leader first transfers the contents of its memory to the C64. You must then disconnect Red Leader and connect up a tape recorder, and write to tape. Then re-connect everything up.

The main plugs of this system is that when you have a program debugged and working to your satisfaction, you can unplug the Commodore 64 from Red Leader completely and use it for something else or whatever. Yet, Red Leader will just sit there executing your program forever. However, you can leave your Commodore 64 connected if you want to — if you need to see information displayed on the screen for instance — though the power consumption over a period of time would be offputting. The Red Leader on its own uses up very little power, and it is feasible to leave it switched on all the time.

Reds One and Two

The two units supplied with the starter pack are Red One and Red Two (sounds a bit like something out of Apocalypse Now). Red One is the actuator. This is a unit that plugs into the mains at one end and then has a mains socket at the other. Anything you like can be connected to this and turned on and off from Red Leader. There is also a manual override on the unit to toggle it on and off as you see fit. An LED on the box tells you whether it is on or off.

Red Two is an infra-red motion detector. One end plugs into the mains (as usual) and at the other end is a small box about half the size of Red One and Red Leader. In this is a large window. If anything that is at a different temperature than the surrounding air moves within 16 feet of it then a signal is sent back to Red Leader.

All three units come with wall mounting brackets with all screws and Rawlplugs, though they don't need to be wall mounted, it is excellent that these are included. The cables are also very long, over six feet in most cases. This is just about the right length. Usually on systems such as these the cables are not quite long enough. I think that they got it right this time.

In the near future GIS will be releasing an alarm unit and an analog input unit. These will allow you to build up an alarm system more easily or control a thermostat for heating. Next in line are temperature probes and an RS232 link.

This last unit will allow your computer to talk to a printer in another room, or even another building, by sending its information down the mains line. This could also be used in networking computers in a simple and easy manner.

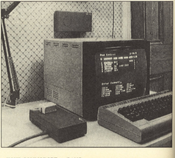
If anyone is worrying about the mains system, don't. It is perfectly safe and very well worked out. Each unit has its own unique serial number and the Red Leader has to know what it is. So whilst you could control your next door neighbour's heating system, you'd have to know his encryption code first. However, if you wanted to communicate with a friend down the road, as long as you were on the same local ring main, and within a few hundred yards, you could do it.

Verdict

On the whole this is a brilliant system. One of my main interests in computers is in the field of real event control. And this is the easiest to use, safest, and most well thought out system that I have ever seen. This only obstacles in its path are public resistance to this sort of thing, and the price which, though low for a control system, is still high for the average Commodore owner. I will watch this with interest.

Touchline

Company: *General Information Systems, 1 White Hart Yard, London SE1 1NX.* ***Price:*** *£129 (starter pack).*



Letters

Your opinions are what counts. Let us know how you feel about anything connected with Commodore computers.

Pat on the Back

May I congratulate you on the new layout and style of *Your Commodore*. It is a great improvement. I am glad to see you have stayed away from the craze in other magazines for catering for games players at the expense of the rest of us. The contents seem to me now to be just about right. The magazine is well laid out, with a good clear typeface and the type-in listings are much clearer.

There is only one fault. Did your proof reader once work for *The Guardian?* I ask this as I have spotted a number of typographical errors throughout the magazine.

Your Commodore must now go to the top of the class for getting the formula right. I buy most magazines for the Commodore including some American and Canadian ones. *Your Commodore* is now the best for lay out the content.

The free tape has gone into my collection of utilities. I already had most of the utilities but not in two such useful programs. I will be using them often.

As an ancient in my mid-forties, I find using my computer for letter writing and working on a novel (for enjoyment not for publication) very relaxing after a hard days work on the roads as a council worker. Keep up the good work.

David Peacock, Fleetwood

Thank you for your all too well deserved praise, David (well, why be modest?). Our proof reader has been soundly whipped and demoted to tea lady until such time as she sees the error of her ways!
Ed.

Labour of Love

Having recently received my copy of *Your Commodore* January '87, I was interested in an article by Stuart Cooke on Fault Finding. I am sure that a lot of readers will find it very helpful.

It wasd not long after purchasing my first computer that I came up against a problem which I found very frustrating. It was the difficulty of typing in listings without making mistakes. Although I can type about 35 words per minute when writing a letter, it is quite a different problem trying to read the listing and type at the same time. I have to see the keys and see where my fingers are going. Thus when constantly having to stop and read the listing, then remember it, the task could be quite infuriating.

After giving the matter some thought I devised a method that has worked perfectly for myself, and perhaps it may be of use to others.

I record the whole program on a tape recorder at such a speed that when played back, it allows me to sit comfortable and type merrily away without having to take my eyes off the keyboard. If a foot switch is inserted in the control line for stop and start of the recorder it is possible to stop at once correct the mistake, or if the recording has got a little ahead of your typing catch up before operating the foot switch once more.

It does take time to record the listing, but the elimination of constant mistakes in typing and most of all the frustration of continually correcting them, has been a great boon.

I hope that this suggestion will be of value to other readers.

Flight Lieutenant C.Lee RAF (ret'd)
Harlepool.

If any other readers have ingenious time saving ideas, perhaps they would like to pass on their pearls of wisdom for the enlightenment of the masses.
Ed.

Disillusioned

I refer to the letter from H.Jenkins in your January issue. I am afraid that I do not share his enthusiasm for the C16/Plus/4 User Club.

Having paid up subscription in mid-November, I am still waiting for the so called 'magazine' for November, December and January. '20 User' did appear in August, September and October as very poor 8" X 6" pamphlets.

Unfortunately, this is not the first time I have lost out on clubs who start in a blaze of enthusiasm and disappear within a month or so. My experience is probably shared by hundreds of other computer owners whose eagerness is blunted by being ripped off in a similar fashion.

I can only suggest that your readers think twice before parting with their cash, particularly if the publication is not available at a newsagent like your own magazine.

David Jackson, Luton

We would like to recommend to readers that they check out the reputation of computer clubs as far as possible before parting with any money. If you have any reason at all to doubt the reliability of a club then don't send any money. ICPUG is probably the most well known Commodore club and they may be able to give you information as to specific groups or clubs which they have checked out themselves. Contact: ICPUG, 30 Brancaster Road, Newbury Park, Ilford, Essex IG2 7EP.

Double Print

If you want to attract someone's attention to something, then the bigger the better. This utility allows you to use double height characters on a C64.

By Bruce Durant

When printing text on the screen of a Commodore 64 you are normally stuck with the standard small size character set. Should you require to attract someone's attention to a piece of text then you can change the colour, reverse it etc.

This program, for the C64, makes it possible to highlight your text with double size characters (16×16) adding a new dimension to your text displays. The program is written entirely in machine code. The version printed here is presented in the form of a Basic loader which POKEs the machine code and the new character set into memory.

Also printed here is a demonstration program which is automatically loaded by the machine code loader.

In Use

This program makes it possible to have both the new expanded character set and the normal C64 character set on screen at any one time. Switching between the two character sets is extremely easy. Insert a CONTROL-D character into a print statement and the text will appear in double size print. A CONTROL-N character will return things to normal. The demonstration program makes this a little clearer.

The machine code program has four sections.

a) A machine code routine that turns off the interrupts, wedges in the new vectors for the double height program and moves the new character set from $0800 to $1000.

b) The new interrupt routine. This looks for raster interrupts at predefined lines that correspond to the text lines. When the interrupt occurs the character set and next raster line are set.

c) The new print routine. This first establishes that output is to the screen, then it fixes the character set and outputs using the C64's KERNAL print routine.

d) The new character set. This is initially stored at $C200 to $CA00 until moved by routine (a).

The whole program can be saved as a machine code routine from $C000 to $CA00 provided that any program that uses it moves the start of Basic up to $1000. Use SYS 49152 to start the program.

```
PROGRAM:DBLPRINT LOADER

85  0 REM ***********************
    *********
8E  1 REM *
          *
C2  2 REM *     DOUBLE PRINT LOA
    DER   *
8C  3 REM *
          *
56  4 REM *  COPYRIGHT B.R.DURAN
    T 1986  *
8A  5 REM *
          *
3F  6 REM ***********************
    *********
92  10 POKE53280,0:POKE53281,0:P
    RINT"[CLR,CYAN]";:PRINTTAB(1
    0)"DOUBLE PRINT LOADER"
7E  20 PRINT:PRINT" RESETS START
     OF BASIC TO $1000 & THEN"
D8  30 PRINT"AUTO LOADS & RUNS B
    OTH DOUBLE PRINT &[SPC3]THE
    MAIN PROGRAM."
41  40 PRINT" THE MAIN PROGRAM S
    HOULD SET THE SCREEN"
51  50 PRINT"COLOURS & 'SYS49152
    ' IN ITS 1ST LINE."
80  60 PRINT" THIS TEXT CAN BE D
    ELETED OR MODIFIED TOTASTE."

92  70 PRINT" TO USE DOUBLE PRIN
    T EITHER INSERT A"
0F  80 PRINT"[CTRL/D] IN THE PRI
    NT STRING OR CHR$(4).";
56  90 PRINT" TO SWITCH BACK USE
     [CTRL/N] OR CHR$(14)OR CHR$
    (142)."
82  100 PRINT" WHEN LOADED THE M
    AIN M/C ROUTINE LIES @$C000
    TO $C200.";
04  110 PRINT"THE NEW CHARACTER
    SET 1STOCCUPIES $C200 TO $CA
    00,WHEN ACTIVATED";
7A  120 PRINT"  IT IS MOVED TO $
    0800 TO $1000."
88  130 PRINT" A PROGRAM USING D
    OUBLE PRINT SHOULD BE IN 2 P
    ARTS :-"
CA  140 PRINT" 1.LOADER TO RESET
     BASIC & LOAD M/CODE "
16  150 PRINT"[SPC3]DATA THEN LO
    AD & RUN PART2":PRINT" 2.MAI
    N PROGRAM"
91  160 PRINTTAB(8)"[C@25]"
27  170 PRINTTAB(8)"[RVSON]PRESS
     ANY KEY TO CONTINUE"
E2  180 GETA$:IFA$=""THEN180
BA  190 REM LOAD M/CODE
78  200 GOSUB300
5F  210 PRINTTAB(8)"[RVSON]PRESS
     ANY KEY TO CONTINUE"
21  220 GETA$:IFA$=""THEN220
43  230 PRINT"[CLR,BLACK]":REM C
    LEAR & BLACK SCREEN
C1  240 REM SETUP BASIC & KEYBOA
    RD BUFFER
21  250 POKE44,16:POKE4096,0:POK
    E631,131:POKE632,13:POKE198,
    2
CB  252 REM IF USING DISK CHANGE
     ABOVE LINE TO
D9  253 REM POKE44,16:POKE4096,0
    :LOAD "DBL PRINT SAMPLE",8
48  254 REM THEN RUN THIS PROGRA
    M WHEN LOADED
61  260 NEW:END
BF  300 REM M/CODE DATA LOADER &
     ERROR TRAP
37  310 PRINT"[CLR,CYAN]";:PRINT
    TAB(10)"DOUBLE PRINT LOADER"
    :PRINT
8B  320 PRINT"[SPC8]DATA LOADER
    & ERROR TRAP":PRINT
27  330 PRINT"[SPC5]PLEASE WAIT
    FOR M/CODE TO LOAD":PRINT
2A  340 PRINT"[SPC6]LEAVE PLAY O
    N TAPE DEPRESSED":PRINT
C6  350 READSA:READEA:READLN:REA
    DIN
DA  360 FORN=SATOEASTEP16:T=0:FO
    RI=0TO15
27  370 IFN+I>EATHENI=15:GOTO390

FC  380 READP:POKEN+I,P:T=T+P
C3  390 NEXTI:READP:IFT<>PTHENPR
    INT"ERROR IN LINE"LN:END
1B  400 LN=LN+IN:NEXTN:PRINT"FIN
```

```
    ISHED LOADING":RETURN
1E  500 REM DBLPRINT M/CODE
DE  501 DATA 49152, 51712, 502,
    1
CC  502 DATA 120,169,127,141,13,
    220,169,1,141,26,208,141,18,
    208,169,255, 2126
88  503 DATA 133,251,173,17,208,
    41,127,141,17,208,169,125,14
    1,20,3,169, 1943
62  504 DATA 192,141,21,3,169,19
    7,141,38,3,169,192,141,39,3,
    169,0, 1618
02  505 DATA 133,90,169,202,133,
    91,169,0,133,95,169,194,133,
    96,169,0, 1976
FB  506 DATA 133,88,169,16,133,8
    9,32,191,163,88,96,19,19,21,
    21,21, 1299
C5  507 DATA 19,19,19,19,19,19,1
    9,19,19,19,19,19,21,23,23,23
    , 318
38  508 DATA 23,21,21,21,58,66,7
    4,82,90,98,106,114,122,130,1
    38,146, 1310
C5  509 DATA 154,162,170,178,186
    ,194,202,210,218,226,234,242
    ,1,173,25,208, 2783
CA  510 DATA 141,25,208,41,1,240
    ,20,230,251,166,251,189,75,1
    92,141,24, 2195
EA  511 DATA 208,189,100,192,141
    ,18,208,224,24,240,3,76,188,
    254,169,255, 2489
42  512 DATA 133,251,76,49,234,6
    4,0,0,0,0,0,0,0,0,0,0,0, 807
D5  513 DATA 0,0,0,0,0,91,92,93,
    94,95,219,220,221,222,223,0,
     1570
4F  514 DATA 0,0,0,0,192,72,165,
    154,201,3,240,3,76,213,241,1
    04, 1664
D6  515 DATA 133,215,72,138,72,1
    52,72,166,215,164,214,138,41
    ,127,201,32, 2152
08  516 DATA 176,58,173,136,2,10
    ,10,41,240,224,147,208,23,16
    0,0,132, 1740
D2  517 DATA 211,132,214,9,5,153
    ,75,192,200,192,25,144,248,1
    38,32,172, 2142
52  518 DATA 193,76,168,230,224,
    14,240,235,224,142,208,4,9,7
    ,208,229, 2411
A9  519 DATA 224,4,208,4,9,3,208
    ,221,224,13,208,225,185,75,1
    92,41, 2044
D8  520 DATA 4,208,218,224,13,20
    8,6,138,32,172,193,208,208,1
    65,215,201, 2413
95  521 DATA 64,144,21,201,91,14
    4,25,201,191,176,2,105,96,19
    7,192,144, 1994
2E  522 DATA 4,201,219,144,11,76
    ,168,230,41,31,168,185,165,1
    92,240,245, 2320
6A  523 DATA 72,169,0,133,199,16
    4,211,192,39,144,8,169,13,32
    ,172,193, 1910
2E  524 DATA 32,172,193,166,214,
    224,24,144,10,169,17,32,172,
    193,169,145, 2076
9E  525 DATA 32,22,231,104,32,15
    8,193,56,233,32,133,215,166,
    214,164,211, 2196
FB  526 DATA 192,40,48,8,160,38,
    32,153,193,76,168,230,136,13
    6,232,32, 1874
FE  527 DATA 153,193,169,145,133
    ,215,76,29,231,32,12,229,165
    ,215,32,172, 2201
82  528 DATA 193,165,199,73,1,13
    3,199,165,215,76,172,193,72,
```

```
    41,127,201, 2225
9E  529 DATA 19,240,60,165,214,2
    01,24,144,54,165,218,9,128,1
    33,218,165, 2157
38  530 DATA 217,41,127,133,217,
    165,241,9,128,133,241,104,32
    ,22,231,72, 2113
4F  531 DATA 165,217,16,19,138,7
    2,162,1,189,75,192,202,157,7
    5,192,232, 2104
72  532 DATA 232,224,25,208,243,
    104,170,165,217,9,128,133,21
    7,104,96,104, 2379
71  533 DATA 32,22,231,96,0,0,0,
    234,1,234,1,234,227,238,234,
    72, 1856
22  534 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,7,12,24, 43
9F  535 DATA 24,24,24,24,24,27,2
    8,24,0,0,0,0,0,3,6,12, 220
0F  536 DATA 0,0,0,0,0,7,12,24,0
    ,0,0,0,0,7,12,24, 86
BF  537 DATA 1,3,3,3,3,15,3,3,0,
    0,0,0,0,7,12,24, 77
78  538 DATA 12,12,12,12,12,13,1
    4,12,0,0,1,1,0,1,1,1, 104
0A  539 DATA 0,0,0,0,0,0,0,0,6,6
    ,6,6,6,6,7,6, 49
26  540 DATA 12,12,12,12,12,12,1
    2,12,0,0,0,0,0,110,49,49, 30
    4
F8  541 DATA 0,0,0,0,0,13,14,12,
    0,0,0,0,0,3,6,12, 60
AB  542 DATA 0,0,0,0,0,13,14,12,
    0,0,0,0,0,7,12,24, 82
7E  543 DATA 0,0,0,0,0,13,14,12,
    0,0,0,0,0,7,12,12, 70
04  544 DATA 0,6,6,31,6,6,6,6,0,
    0,0,0,0,12,12,12, 103
5E  545 DATA 0,0,0,0,0,24,24,12,
    0,0,0,0,0,96,97,99, 352
9D  546 DATA 0,0,0,0,0,12,6,3,0,
    0,0,0,0,8,12,4, 45
5E  547 DATA 0,0,0,0,0,15,0,0,3,
    12,24,24,24,24,27,30, 183
72  548 DATA 1,3,5,1,1,1,1,1,3,1
    2,8,0,0,0,0,3, 40
03  549 DATA 7,8,0,0,0,3,0,0,0,0
    ,0,1,3,4,6,12, 44
04  550 DATA 0,0,0,0,0,0,0,0,48,
    48,116,152,0,0,0,0, 364
90  551 DATA 24,24,48,224,0,0,0,
    0,0,0,16,224,0,0,0,0, 560
3B  552 DATA 48,48,116,152,0,0,0
    ,0,192,0,32,192,0,0,0,0, 780

91  553 DATA 0,0,0,0,0,0,0,0,48,
    48,112,176,48,48,112,192, 78
    4
A2  554 DATA 48,48,48,48,0,0,0,0
    ,128,128,128,128,0,0,0,0, 70
    4
58  555 DATA 96,96,96,96,96,96,9
    6,192,32,32,16,16,0,0,0,0, 9
    60
DC  556 DATA 0,0,64,128,0,0,0,0,
    140,140,140,140,0,0,0,0, 752

9F  557 DATA 48,48,48,48,0,0,0,0
    ,48,48,96,192,0,0,0,0, 576
DE  558 DATA 48,48,48,192,0,0,0,
    0,48,48,112,176,48,52,56,48,
     924
EF  559 DATA 0,0,0,0,0,0,0,0,224
    ,48,48,224,0,0,0,0, 544
C8  560 DATA 0,0,64,128,0,0,0,0,
    48,48,52,216,0,0,0,0, 556
8C  561 DATA 96,192,192,128,0,0,
    0,0,216,216,120,48,0,0,0,0,
    1208
EE  562 DATA 128,192,96,48,0,0,0
    ,0,96,192,128,128,128,0,0,0,
     1136
```

```
F0  563 DATA 128,0,0,240,0,0,0,0
    ,24,24,48,192,0,0,0,0, 656
36  564 DATA 128,128,128,192,0,0
    ,0,0,0,0,0,248,0,0,0,0, 824
9A  565 DATA 24,24,48,224,0,0,0,
    0,96,248,96,96,0,0,0,0, 856
90  566 DATA 3,12,24,24,24,0,0,1
    ,1,3,3,2,6,6,4,15, 128
73  567 DATA 63,24,24,24,24,31,2
    4,24,7,14,24,48,48,48,48,48,
     523
C8  568 DATA 63,24,24,24,24,24,2
    4,24,63,24,24,24,24,31,24,24
    , 469
81  569 DATA 63,24,24,24,24,31,2
    4,24,3,14,28,48,48,48,48,48,
     523
CE  570 DATA 60,24,24,24,24,31,2
    4,24,3,1,1,1,1,1,1,1, 245
C9  571 DATA 3,0,0,0,0,0,0,0,60,
    24,24,25,27,30,30,27, 250
B9  572 DATA 30,12,12,12,12,12,1
    2,12,48,56,60,54,51,49,48,48
    , 528
0F  573 DATA 28,12,14,14,13,13,1
    2,12,3,12,24,24,24,24,24,24,
     277
13  574 DATA 31,12,12,12,12,15,1
    2,12,3,12,24,24,24,24,24,24,
     277
56  575 DATA 63,24,24,24,24,31,2
    7,25,7,12,12,12,12,7,1,0, 30
    5
75  576 DATA 31,16,1,1,1,1,1,1,6
    0,24,24,24,24,24,24,24, 281
31  577 DATA 56,24,8,12,12,4,6,6
    ,120,48,48,40,48,49,25,27, 5
    41
F8  578 DATA 120,48,24,12,6,3,3,
    7,56,24,12,6,3,1,1,1, 327
D6  579 DATA 31,16,0,0,0,1,3,6,7
    ,6,6,12,12,15,8,0, 123
C9  580 DATA 3,6,12,12,12,15,12,
    12,15,8,0,0,0,0,1,1, 109
1D  581 DATA 3,6,12,12,6,7,12,24
    ,7,12,24,24,24,12,7,0, 192
1A  582 DATA 128,128,128,128,0,1
    28,128,0,48,16,24,28,0,0,0,0
    , 884
B0  583 DATA 24,24,48,224,0,0,0,
    0,0,8,16,224,0,0,0,0, 568
70  584 DATA 48,96,224,192,0,0,0
    ,0,0,0,16,240,0,0,0,0, 816
D1  585 DATA 0,0,0,0,0,0,0,0,24,
    24,48,224,0,0,0,0, 320
BF  586 DATA 48,48,48,120,0,0,0,
    0,128,128,128,192,0,0,0,0, 8
    40
C7  587 DATA 192,192,192,128,0,0
    ,0,0,128,192,96,248,0,0,0,0,
     1368
6B  588 DATA 0,0,16,240,0,0,0,0,
    12,12,12,30,0,0,0,0, 322
50  589 DATA 112,112,48,56,0,0,0
    ,0,24,24,48,192,0,0,0,0, 616

01  590 DATA 0,0,0,0,0,0,0,0,152
    ,88,48,208,12,0,0,0, 508
FD  591 DATA 128,192,96,240,0,0,
    0,0,24,24,24,240,0,0,0,0, 96
    8
72  592 DATA 128,128,128,192,0,0
    ,0,0,48,48,96,192,0,0,0,0, 9
    60
DF  593 DATA 64,192,192,128,0,0,
    0,0,120,56,24,24,0,0,0,0, 80
    0
10  594 DATA 96,48,24,60,0,0,0,0
    ,128,128,128,192,0,0,0,0, 80
    4
59  595 DATA 0,0,16,240,0,0,0,0,
    24,24,48,224,0,0,0,0, 576
D4  596 DATA 24,24,48,224,0,0,0,
     0,0,0,0,0,0,0,0,0, 320
10   597 DATA 24,24,48,224,0,0,0,
     0,48,48,96,192,0,0,0,0, 704
F3   598 DATA 0,0,0,0,0,0,0,0,0,0
     ,0,0,0,176,240,48, 464
F3   599 DATA 0,0,0,0,0,224,48,24
     ,0,0,0,0,0,224,16,0, 536
A0   600 DATA 48,48,48,48,48,176,
     240,48,0,0,0,0,0,192,96,96,
     1088
45   601 DATA 192,32,0,0,0,192,0,
     0,0,0,0,0,0,176,240,48, 880
48   602 DATA 0,0,0,0,0,224,48,48
     ,0,0,128,128,0,128,128,128,
     960
B4   603 DATA 0,0,96,96,0,96,96,9
     6,0,0,0,32,64,128,192,64, 96
     0
BA   604 DATA 0,0,0,0,0,0,0,0,0,0
     ,0,0,0,120,140,140, 400
D8   605 DATA 0,0,0,0,0,224,112,4
     8,0,0,0,0,0,192,96,48, 720
43   606 DATA 0,0,0,0,0,192,48,48
     ,0,0,0,0,0,176,240,48, 752
34   607 DATA 0,0,0,0,0,192,32,0,
     0,0,0,0,0,224,48,0, 496
E1   608 DATA 0,0,0,128,0,0,0,0,0
     ,0,0,0,0,48,48,48, 272
E0   609 DATA 0,0,0,0,0,48,48,96,
     0,0,0,0,0,12,12,140, 356
72   610 DATA 0,0,0,0,0,48,96,192
     ,0,0,0,0,0,48,48,96, 528
64   611 DATA 0,0,0,0,0,240,96,19
     2,192,48,24,24,120,216,24,24
     , 1200
58   612 DATA 128,128,128,128,128
     ,128,128,128,192,48,24,24,24
     ,48,192,128, 1704
28   613 DATA 192,48,24,24,48,224
     ,48,24,96,224,224,224,96,96,
     96,96, 1784
4C   614 DATA 0,0,0,0,0,0,0,0,24,
     24,12,7,0,0,0,0, 67
F3   615 DATA 24,24,30,27,0,0,0,0
     ,12,12,6,3,0,0,0,0, 138
C8   616 DATA 24,24,12,7,0,0,0,0,
     31,24,12,7,0,0,0,0, 141
00   617 DATA 3,3,3,3,0,0,0,0,24,
     24,12,7,0,0,0,7, 94
86   618 DATA 12,12,12,12,0,0,0,0
     ,1,1,1,1,0,0,0,0, 52
5D   619 DATA 0,0,0,0,0,0,4,3,6,6
     ,6,6,0,0,0,0, 31
F3   620 DATA 12,12,12,7,0,0,0,0,
     49,49,49,49,0,0,0,0, 239
8E   621 DATA 12,12,12,12,0,0,0,0
     ,12,12,6,3,0,0,0,0, 81
08   622 DATA 12,12,14,13,12,12,1
     2,12,24,24,12,7,0,0,0,0, 166

81   623 DATA 12,12,12,12,0,0,0,0
     ,7,0,0,7,0,0,0,0, 70
10   624 DATA 6,6,6,3,0,0,0,0,12,
     12,6,3,0,0,0,0, 54
74   625 DATA 12,6,6,3,0,0,0,0,54
     ,54,60,24,0,0,0,0, 219
E6   626 DATA 1,3,6,12,0,0,0,0,2,
     3,1,1,1,3,3,6, 42
B0   627 DATA 1,3,6,15,0,0,0,0,24
     ,24,12,3,0,0,0,0, 88
48   628 DATA 1,1,1,3,0,0,0,0,7,1
     2,24,31,0,0,0,0, 80
98   629 DATA 0,0,8,7,0,0,0,0,24,
     31,0,0,0,0,0,0, 70
99   630 DATA 224,48,24,24,24,48,
     192,128,128,192,192,64,96,96
     ,32,240, 1752
0A   631 DATA 192,96,48,48,96,224
     ,48,24,224,16,8,0,0,0,0,0, 1
     024
5B   632 DATA 192,224,96,48,48,48
     ,48,48,240,16,0,0,64,192,64,
     0, 1328
7C   633 DATA 240,16,0,0,64,192,6
     4,0,224,48,24,0,0,0,0,120, 9
     92
E6   634 DATA 120,48,48,48,48,240
     ,48,48,192,128,128,128,128,1
     28,128,128, 1736
78   635 DATA 240,192,192,192,192
     ,192,192,192,240,96,192,128,
     0,0,0,0, 2240
20   636 DATA 0,0,0,0,0,0,0,0,12,
     28,60,100,204,140,12,12, 576

88   637 DATA 120,48,48,48,48,48,
     176,176,192,48,24,24,24,24,2
     4,24, 1096
AA   638 DATA 224,48,48,48,48,224
     ,0,0,192,48,24,24,24,24,24,2
     4, 1024
A5   639 DATA 192,96,48,48,96,192
     ,0,128,192,96,48,0,0,192,224
     ,48, 1600
8F   640 DATA 248,136,128,128,128
     ,128,128,128,120,48,48,48,48
     ,48,48,48, 1608
CB   641 DATA 28,24,16,48,48,32,9
     6,96,30,12,12,12,12,140,152,
     216, 974
DC   642 DATA 60,24,48,96,192,128
     ,128,192,60,24,48,192,128,12
     8,128,128, 1704
BE   643 DATA 240,48,96,192,192,1
     28,0,0,240,16,0,0,0,224,48,2
     4, 1448
BC   644 DATA 224,16,0,0,0,224,48
     ,24,240,48,48,96,64,192,128,
     128, 1480
BF   645 DATA 192,96,48,48,96,224
     ,48,24,192,96,48,48,48,48,24
     0,48, 1544
FA   646 DATA 1,1,1,1,0,1,1,0,12,
     8,24,56,0,0,0,0, 106
51   647 DATA 24,24,24,63,0,0,0,0
     ,48,24,14,7,0,0,0,0, 228
84   648 DATA 24,24,24,63,0,0,0,0
     ,24,24,24,63,0,0,0,0, 270
BB   649 DATA 24,24,24,60,0,0,0,0
     ,48,24,14,7,0,0,0,0, 225
1D   650 DATA 24,24,24,60,0,0,0,0
     ,1,1,1,3,0,0,0,0, 138
EB   651 DATA 0,0,8,7,0,0,0,0,25,
     24,24,60,0,0,0,0, 148
26   652 DATA 12,12,12,31,0,0,0,0
     ,48,48,48,120,0,0,0,0, 331
94   653 DATA 12,12,12,30,0,0,0,0
     ,24,24,12,3,0,0,0,0, 129
B6   654 DATA 12,12,12,30,0,0,0,0
     ,25,24,12,3,0,0,0,0, 130
7D   655 DATA 24,24,24,60,0,0,0,0
     ,0,12,12,7,0,0,0,0, 163
BF   656 DATA 1,1,1,3,0,0,0,0,24,
     24,12,7,0,0,0,0, 73
9F   657 DATA 2,3,3,1,0,0,0,0,30,
     28,24,24,0,0,0,0, 115
74   658 DATA 6,12,24,120,0,0,0,0
     ,1,1,1,3,0,0,0,0, 168
92   659 DATA 6,12,24,31,0,0,0,0,
     0,0,8,7,0,0,0,0, 88
46   660 DATA 12,12,6,3,0,0,0,0,3
     ,6,6,6,0,0,0,0, 54
DB   661 DATA 24,24,12,7,0,0,0,0,
     0,0,8,7,0,0,0,0, 82
AF   662 DATA 159, 159
```

PROGRAM: DBLPRINT DEMO

```
87   10 REM DBLPRINT SAMPLE SETUP

BF   20 SYS49152
8D   25 REM CAPITALS [CTRL D] & S
     HIFT KEY
3D   30 PRINT"[CLR,CYAN] [REV D,S
     D,SO,SU,SB,SL,SE] [SP,SR,SI,
     SN,SI] [SS,SA,SM,SP,SL,SE]"
14   35 REM RESET TO NORMAL [CTRL
      N]
88   40 PRINT"[REV N,DOWN]ALL CUR
     SOR & COLOUR CONTROLS ARE US
     EABLE";
FC   50 PRINTSPC(4)"& ONLY MOVE A
      STANDARD DISTANCE."
6F   55 REM CAPITALS [CTRL D] & S
     HIFT KEY
CD   60 PRINT"[REV D,DOWN,SA,SB,S
     C,SD,SE,SF,SG,SH,SI,SJ,SK,SL
     ,SM,SN,SO,SP,SQ,SR,SS,ST,SU,
     SV,SW,SX,SY,SZ]"
EE   65 REM LOWER CASE [CTRL D] W
     ITHOUT THE       SHIFT KEY
88   70 PRINT"ABCDEFGHIJKLMNOPQRS
     TUVWXYZ"
75   80 PRINTTAB(9)"[DOWN]1234567
     890?"
34   90 PRINTTAB(9)"[REV N,CY22]"

A8   95 REM STANDARD LOWER CASE
07   100 PRINTCHR$(142)"  BOTH EX
     ISTING CHARACTERS SETS CAN B
     E[SPC3]MIXED WITH DOUBLE".
23   110 PRINT" PRINT BUT NOT ON
     THE  SAME LINE";
F0   120 PRINT" '[ST,SA,SB](X) $
     [SS,SP,SC](X)' ALSO WORK."
C5   130 PRINT:PRINTCHR$(14)"[RVS
     ON]!WARNING! SOFTWARE CHANGE
     S IRQ. & OUTPUTVECTORS.";
FF   140 PRINT"[RVSON] HIT 'RUN/S
     TOP & RESTORE' BEFORE LOAD,S
     AVE & LIST ETC:[RVSOFF]";
55   150 PRINTSPC(1)"[RVSON]'←'TO
      ESCAPE.(C)[HOME]"
45   160 GETA$:IFA$<>"←"THEN160
C9   165 REM CAPITALS [CTRL D] &
     SHIFT KEY
D1   170 PRINT"[CLR,CYAN] [REV D,
     SD,SO,SU,SB,SL,SE] [SP,SR,SI
     ,SN,SI] [SS,SA,SM,SP,SL,SE]"

1F   180 PRINTTAB(7)"[REV N]DOUBL
     E PRINT ALSO SCROLLS"
42   190 PRINTTAB(7)"[RVSON]PRESS
      ANY KEY TO CONTINUE"
87   200 GETA$:IFA$=""THEN200
59   210 PRINTCHR$(4):FORN=65TO90
     :PRINTCHR$(N)CHR$(17);:NEXT:
     PRINT
F5   220 PRINT"[CYAN,RIGHT,REV D,
     SD,SO,SU,SB,SL,SE] [SP,SR,SI
     ,SN,SI] [SS,SA,SM,SP,SL,SE]"

CB   230 PRINTTAB(12)"GOOD BYE"
BC   240 PRINTTAB(11)"[REV N,SJ,S
     C16,SK]"
```

PLEASE NOTE: TO ENTER [REV D] & [REV N] HOLD DOWN CTRL AND PRESS THE LETTER

Contributions

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

Your 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 in 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 £800.00.

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 rate 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.

Listings

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

You 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. Fret no more, it's all part of our easy entry aid.

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 these 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 two spaces appear in a statement then this will be printed as [SPC4] or, exceptionally, [SSPC4]. 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,LEFT5,BLUE, F3,C3]

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 BLUE 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 & 2) and delete it. This gets the computer out of quotes mode. Hold down CTRL and press the number nine key (RVSON), type the relevant number of reversed T's and then hold down CTRL and press zero (RVSOFF). Next 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 pi. This may appear when its value is needed in a calculation so this may look something like:

:CC=2*[PI]*R:

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

PROGRAM: SYNTAX CHECKER

```
5 REM SYTAX CHECKER - ERIC DOYLE

10 BL=10   :LN=70   :SA=49152
20 FOR L=0 TO BL:CX=0:FOR D=0 TO
 15
30 READ A:IF A>255THENPRINT"NUMB
ER TO LARGE";LN+(L*10):STOP
40 CX=CX+A:POKE SA+L*16+D,A:NEXT
 D
50 READ A:IF A><CX THENPRINT"ERR
OR IN LINE";LN+(L*10):STOP
60 NEXT L:SYS 49152:NEW
70 DATA 173,5,3,201,165,208,31,1
20,169,9,141,32,208,141,33,208,1
847
80 DATA 169,7,141,134,2,169,13,3
2,210,255,169,64,141,4,3,169,168
2
90 DATA 192,141,5,3,88,96,120,16
9,124,141,4,3,169,165,141,5,1566

100 DATA 3,169,14,141,134,2,141,
32,208,169,6,141,33,208,88,96,15
85
110 DATA 32,124,165,72,138,72,15
2,72,162,0,165,20,133,254,165,21
,1747
120 DATA 24,101,254,133,254,189,
0,2,240,18,69,254,133,254,232,18
9,2348
130 DATA 0,2,240,8,24,101,254,13
3,254,232,208,233,169,1,141,134,
2134
140 DATA 2,165,254,74,74,74,74,3
2,156,192,32,210,255,165,254,41,
2054
150 DATA 15,32,156,192,32,210,25
5,169,13,32,210,255,169,13,32,21
0,1995
160 DATA 255,169,7,141,134,2,104
,168,104,170,104,96,24,105,48,20
1,1832
170 DATA 58,16,1,96,24,105,7,96,
0,0,0,0,0,0,0,0,403
```

by Eric Doyle

Checksum Program

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.

Type in the Checksum Program, make sure that you've not made 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 brown 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 SYS49152 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 another out are so remote that we believe our listings are more reliable than any other magazine in the world. So get typing!

Mnemonic	Symbol	Keypress
[RIGHT]	]	CRSR left/right
[LEFT]	▌	SHIFT & CRSR left/right
[DOWN]	●	CRSR up/down
[UP]	Q	SHIFT & CRSR 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]	L	SHIFT & f7 key
[HOME]	S	CLR/HOME
[CLR]	♥	SHIFT & CLR/HOME
[RVSON]	R	CTRL & 9
[RVSOFF]	▁	CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]	┐	CTRL & 1
[WHITE]	E	CTRL & 2
[RED]	£	CTRL & 3
[CYAN]	◥	CTRL & 4
[PURPLE]	▞	CTRL & 5
[GREEN]	↑	CTRL & 6
[BLUE]	←	CTRL & 7
[YELLOW]	π	CTRL & 8
[POUND]	£	
[LARROW]	←	
[UPARROW]	↑	
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

YOUR COMMODORE

Lineage: 45p per word.
(52p incl. VAT).
Semi display: £9.70 per single column centimetre (plus VAT) minimum 2cm. Ring for information on series bookings/discounts.

All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

01-437 0699
EXT. 292

Send your requirements to:
NICOLA BATY
ASP LTD, 1 GOLDEN SQUARE,
LONDON W1

SOFTWARE

Due to manufacturers price increase we can no longer hold pre-Christmas offer price.
STILL EXCELLENT VALUE AT £31.99 + £3 p+ p

OPERATE YOUR COMMODORE IN COMFORT

These fully adjustable posture chairs are designed and manufactured for use in a punishing office environment. British made, with over 10,000 having been sold nationwide. NOW AVAILABLE DIRECT TO YOU!!!

Upholstered in either Dark Brown or Charcoal Grey hard wearing contract tweed. (Meets B.S.5852 cigarette and butane flame test). Comes to you packed in a box with full instructions for easy assembly.

Full 12 Month guarantee.

Only **£31.99** + £3 p&p & ins. (m.r.r.p. **£46.98**)

qty .... **P.C.1 (Dark Brown Tweed)**
qty .... **P.C.2 (C/Coal Grey Tweed)**

We will endeavour to despatch all orders within 14 days, but please allow up to 28 days for delivery.

Please make Cheques/P.O.'s payable to: **HARVEC SUPPLIES**
AND SEND TO: HARVEC SUPPLIES, P.O.BOX 41,
BLACKBURN BB1 1ND.

SOFTWARE

MAKE YOUR COMMODORE EARN!

Yes, making money becomes incidental when you know how.
Your Micro is, if only you knew it, a gold mine, the size and make is **irrelevant**.
Make the initial effort **now** by starting your own
HOME BASED BUSINESS

REMEMBER: You'll never get rich digging someone else's "ditch".
It's more rewarding than playing games.
The benefits are many and varied. Full or partime, for **FREE**.

Details S.A.E. to:
HOME BASED BUSINESS
97 PILTON PLACE (YC8),
KING AND QUEEN STREET,
WALWORTH, LONDON SE17 1DR.

HARDWARE

★ TAPE BACK-UP BOARDS FOR CBM-64/128 VIC-20 ★

Connect a second CBM type cassette deck to your computer with our BACK-UP BOARD Mk.1 and you can easily make a back-up copy as you load your original program. Works for all types of fast loaders etc. **£9.50** inc P&P. Thousands already sold.

The BACK-UP BOARD Mk.2 can be used two ways. Switched to 'NORMAL' it operates as a Mk.1. Switched to 'GENERATE' 64/128 owners can use our special transfer software to regenerate a copy of a program on the second deck as it loads from the first. This method can produce a better quality copy than the original. Mk.2 & software **£14.50** inc P&P. Now outselling our very popular Mk.1. Return your Mk.1 to be modified to Mk.2 for **£4.50** inc software & P&P.

AZIMUTH HEAD ALIGNMENT TAPE by INTERCEPTER for '64'. Use this test tape with your '64' to adjust the heads of your decks to make a perfectly matched pair. Full instructions and screwdriver supplied. **£8.50** inc P&P.

ROM SWITCH/RESET BOARD. Fitted in the expansion port of your '64' you can reset ALL programs that a standard reset switch can't. A socket for a 2764 8K eprom is also included. Full instructions supplied. **£8.95** inc P&P.

ALL PRODUCTS GUARANTEED FOR 12 MONTHS.

Send your cheque/P.O. or stamp for details to:- TURBOTRONIC,
46, Ripon Street, Parkinson Lane, HALIFAX, West Yorkshire. HX1 3UG.
Tel. (0422) 52020
(Overseas customers inside Europe add 50p outside Europe add £1.50)

COMPUTER SERVICES

ALEXANDER MICROS
MAIL ORDER
SOFTWARE, HARDWARE, PERIPHERALS AND REPAIRS
We can offer the top titles from **£6.95** incl p+p.
Many budget titles from **£1.99** incl of p+p.
Atari, Amstrad, BBC and Commodore computers, printers, disk drives and monitors.
WE CAN OFFER PERSONAL LOCAL DELIVERY OF HARDWARE
S.A.E. for price list to:
Alexander Micros,
Gatwick Press Buildings, Lowfield Heath, Crawley, Sussex
Phone: Crawley (0293) 22210 for fast service.

SPECIAL OFFER

A.B. COMPUTERS & ELECTRONICS LTD
Tel: 01-568-7149
Telex: 8950511 ONE ONE G.
Ref: AB COMP.

AMIGA SYSTEMS 1 and 2

PLUS £250 WORTH FREE SOFTWARE - OF YOUR CHOICE!!

64, 128, 128D Software and parts, printers monitors and disc drives ALL AVAILABLE AT DISCOUNT PRICES!!!

173 THORNBURY ROAD,
OSTERLEY, ISLEWORTH,
MIDDLESEX TW7 4QG.

ACCOUNTS & PAYROLL
For Commodore 64, 128, 8000 series etc, and larger computers.
Very comprehensive but easy to use.
Available on 21 days approval.
Also contract programming.
E A SOFTWARE
Dept YC1, 62 High Street,
Evesham, Worcs WR11 4HG.
Telephone: 0386 49339.

EDUCATIONAL SOFTWARE

SCHOOL SIMULATOR. Tables to Long Multiplication. Paperless individual instruction. CBM 64. Turbo cassette £6.50. Manhood Maths, 79 Hillfield Road, Selsey, PO20 0LF.

WHY NOT ADVERTISE UNDER THIS NEW CLASSIFICATION?

SPECIAL OFFER

COMMODORE CHIPS
FOR SALE

6510 £15.00	6526 £13.00
6569 R3 £13.00	901226 £10.00
901227 £10.00	

Prices inc. P&P + VAT.
BOWES ELECTRONICS INTERNATIONAL LTD.
24 Potters Lane, Kiln Farm,
Milton Keynes, MK11 3AS.
Tel: (0908) 568476

FOOTBALL MANAGEMENT

NOW! 3 Classic Football games for all Football enthusiasts available on the C64/128 — Packed with GENUINE FEATURES.

PREMIER LEAGUE — AN EXCITING AND COMPREHENSIVE GAME with these features:- Full Home & Away Programme, Transfer Market, Full Team Selection, Named/Recorded Goal Scorers, Substitutes, Injuries, 5 Skill Levels, Half/Full Time scores all matches, Financial Problems, Save Game, Printer Option, Training, Team Styles, Change Names, Bank Loans plus MUCH MORE!
Price £6.50 inc. P&P.

WORLD CHAMPIONS — A COMPLETE AND EXCITING WORLD CUP SIMULATION:- Takes you from the first warm up friendlies through to the qualifying group and onto the finals. Select from squad of 25 players, 2 In-Match substitutes allowed, 7 Skill Levels, plus MUCH MORE. WORLD CHAMPIONS includes a full text match simulation including — Goal Times, Injury Time, Extra Time, Penalties, Injuries, Sending Off, Match Clock, Corners, Free Kicks, Named/Recorded Goal Scorers & MORE!
Price £7.95 inc P&P.

EUROPEAN II — CAPTURES THE FULL ATMOSPHERE OF EUROPEAN COMPETITION:- Home and away legs, Away goals count double, Full penalty shoot out (with sudden death), 7 Skill Levels, Two In-Match Substitutes, Discipline Table, Disallowed goals, Includes Full Text Match Simulation.
Price £7.95 inc. P&P.

FANTASTIC VALUE
Buy any 2 games — Deduct £2 from total.
Buy all 3 games — Deduct £3 from total.
All games available by Mail Order only, and ready for IMMEDIATE DESPATCH by First Class Post.
E & J Software, Room C4,
Westmoor Road, ENFIELD, Middlesex,
EN3 7LE.

DISCOUNT SOFTWARE: Latest titles for CBM64/128 at 50% off R.R.P.: S.A.E. To: A.O.W. 104 Hollywell Road, Lincoln, LN5 9BY.

WANTED

WANTED: Your non-working Sinclair computers and equipment for cash. Ring D.M.R. Electonics, Bradford, (0274) 882892.

WARNING NOTICE

Advertisements placed in this magazine are to be in strict compliance with our standard conditions (copies of which conditions are available on request) and on the clear understanding that the advertiser warrants that his advertisement(s) does not infringe any copyright or condition of sale of any interested party in the advertised product.

Further, the advertiser indemnifies the proprietors of this magazine in respect of costs, damages, or any other claims brought against them as a result of legal action arising from the publication of the advertisement.

Any breach of these terms or the said conditions may result in prosecution of the advertiser by the proprietors.

REPAIRS

COMPUTER REPAIRS

Fixed price repairs on all popular home computers

C64	£26.00
C16/VIC 20	£22.00
Cassette Units	£13.00
C64 PSU	£22.00

★ ★ ★ **OFFERS** ★ ★ ★

CBM Cassette Unit	£24.95
1541 Speed D.O.S.	S.A.E. for details

Disc Drive printers also repaired.
Please add VAT to above prices.
Send cheque or PO with computer,
or — **SEND NO MONEY** — C.O.D. service available.
For a fast quality service please send to:

MICROMEND
THE OLD SCHOOL, MAIN STREET, FARCET,
PETERBOROUGH PE7 3DB
Tel: (0733) 241718

(TRADE ENQUIRIES WELCOME)

FAST COMPUTER REPAIR CENTRE — LONDON

- BBC Micro, Commodore, Spectrum
- Amstrad, Others
- We sell spare parts
- Used Micro Bought and Sold
- Eprom Programming Service

PHONE 01-863 7166

PROMPT ELECTRONICS
Unit 4, 15 Springfield Road,
Harrow, Middx, HA4 1QF
Entrance in Amersham Road

The 1st choice

EXPRESS COMMODORE REPAIRS!

WHY PAY HIGH 'FIXED' PRICES

Commodore repairs between £14 and £35

1st

FOR PROFESSIONALISM — "Of all the repair companies 'Sinclair User' spoke to, **MANCOMP** seemed the MOST PROFESSIONAL when it came to advice and a helpful attitude" AUG 85.

COMMODORE CHIPS

906114	£23.00
6510	£23.00
6526	£23.00

(includes VAT and P&P)

WHY DELAY – OUR ESTIMATES ARE FREE AND WITHOUT OBLIGATION. IF YOU DO NOT LIKE OUR ESTIMATE WE WILL RETURN THE COMPUTER **AND** REFUND THE POSTAGE INCURRED!

MANCOMP LTD
(Dept YC9)
Printworks Lane, Levenshulme,
Manchester M19 3JP
OPEN MON - SAT 9am to 7pm
061 224 1888/9888

COMMODORE REPAIRS

Commodore repairs by Commodore approved engineers. Repair prices: Vic 20 modulator **£8.05**, Vic 20 **£15.00**, CBM 64 from **£20.00**, C2N from **£9.00**, 1541 from **£20.00**, C64 psu **£13.50**, Spectrum **£16.50**, Dragon **£32.00**, Electrons, Atari. For more information SAE or telephone:

G.C. BUNCE & SON,
36 Burlington Road, Burnham,
Bucks SL1 7BQ.
Tel: (06286) 61696.
9am-6pm Mon-Fri.

A.B. COMPUTERS & ELECTRONICS LTD

Cheap repairs for C16's, 64's, 128 and 128 D – From £12.00. (Also BBC, Amstrad, Atari, Spectrum).

173 THORNBURY ROAD, OSTERLEY,
ISLEWORTH, MIDDLESEX TW7 4QG.
Tel: 01-568-7149
Telex: 8950511 ONE ONE G.
Ref: AB COMP.

Oasis — For all genuine Commodore Spares, and computer repairs. 906114-01 £12.20. Tel: 0980-24599.

FOR HIRE

HIRE HIRE

STAFFS COMPUTER LIBRARY

CBM 64 OWNERS

Join the friendly Library. We give you what you want. If a title is not on our list then we will get it, if it's still available. (Games only)

- All the latest Titles
- Full 7 Days Hire
- Low Hire Cost. From 75p
- Up to 4 Games per week
- All games original
- Lots of American Titles
- Low Hard and Software prices
- Membership ONLY £5.00

Free m/c Monitor on joining

Send your cheques/postal orders payable to:

STAFF COMPUTERS
The Newlands, Greensome Lane, Stafford

VIC-20/CBM-64 SOFTWARE HIRE

Free Membership. Hundreds of Titles to choose from. Send S.A.E. for your Free Hire Kit:

VSH (YM), PO BOX 65, NOTTINGHAM NG1

FILL IN THE COUPON BELOW FOR A QUICK SALE!

SERVICES

STOP PLAYING GAMES

Use your computer to make money. Turn your hobby into a home-based income. Full and part time opportunities to cash in on this tremendous market. High earnings easily possible. Open to any amateur micro user and gamer. Write for free details.

Westlink Promotions (YC)
108 George Street
Edinburgh EH2 4LH.

RE-USE YOUR OLD PRINTER RIBBONS! We will re-ink your old fabric ribbon cassette far more cheaply than the price of a new one. Send your dry fabric ribbon (stating printer make & model) with £2 and we'll re-ink it & quote for future re-inkings. **ALADDINK, (Dept COM), 4 Hurkur Crescent, Eyemouth, Berwickshire, TD14 5AP. Phone 08907 50965.**

YOUR

COMMODORE

CLASSIFIED ADVERTISING COUPON

Post to: Your Commodore, 1 Golden Square, London W1R 3AB
Rates: 52p per word (min. charge £7.80 (VAT incl). Semi display (min. 2cms) £9.70 (+ VAT) per single column centimetre.

Please debit my Access/Barclaycard No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Expiry date.........

£.....................for.....................insertions.

Or I enclose my cheque/PO for £.......for.......insertions.

Please use BLOCK CAPITALS and include post codes.

Classification...

Name (Mr/Mrs/Miss/Ms) ....
(delete accordingly)

Address...

....

Signature .... **Date** ....

Daytime Tel. No. ....

BREAK

Oops!

There is a slight correction required in our Hex Date Entry program, published March 1987 *Your Commodore*. This only needs to be changed if the start address ends in a one eg 0801. Line 665 at present reads:

```
CH=CH+CA-8
```

The correct version should in fact be:

```
CH=CH+CA-9
```

We hope that this will sort out any problems which you may have encountered whilst using this listing.

Adrian Antics

The Growing Pains of Adrian Mole, is not only a popular book and TV series it is doomed also to enter the world of computer games published by the Virgin Games. If you're already currently experiencing the hell on earth, affectionately known as your teens, then you may find a lot to identify with in this comedy game. If you left this phase of your life behind a long time ago, then it may serve to refresh your memory.

The game has been programmed by Level 9 in conjunction with Mosaic Publishing and will be available for the C64/128 at £9.95.

This month we've decided to run a caption competition in connection with Adrian's growing pains so have a good look at the accompanying picture (published courtesy of **Thames Television**) and see if you can come up with an apt witty caption to describe Adrian's obvious domestic bliss. The best caption will win £5.

Bug Finder

At *Your Commodore*, we try to publish high quality programs that are of benefit to as many readers as possible. This generally means that the programs are often very large and can be prone to typing errors. In order to make your life a little easier, we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get the program to run, then send us the following:

Two copies of your program on tape or disk.

A description of your problem.

If possible, a listing of your work (you may omit this).

A stamped, self addressed envelope for return of the program to you.

Should any of the above be missing then we will not be able to deal with your query.

We will try to point out where you have made any errors and place a corrected copy of the program back on to your tape or disk before we return it to you.

Do not send a program to us as soon as it stops working. Check it yourself first, if you don't, it only wastes valuable time that could be spent working on the magazine.

We do get a large number of queries in the office, so it may take a little time for yours to be processed.

Note: We can only deal with problems concerning programs published in *Your Commodore*.

Editor: Stuart Cooke
Assistant Editor: Marie Curry
Editorial Assistant: Stuart Kirkham
Senior Advertising Manager: Peter Chandler
Advertisement Copy Control: Laura Champion
Origination: Ebony Typesetting
Design: Argus Design

Your Commodore incorporating Your 64 is a monthly magazine appearing on the first Friday of each month.

Argus Specialist Publications Limited Editorial & Advertisement Office, Your Commodore, No 1 Golden Square, London W1R 3AB. Telephone: 01-437 0626 Telex: 8811896.

Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.

The contents of this publication including all articles, designs, plans, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Limited. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Limited and any reproduction requires the prior written consent of the Company. ©1987

Distribution by: Argus Press Sales & Distribution Ltd. 12-18 Paul Street, London EC2A 4JS. Printed by Chase Web, Plymouth.

ISSN 0269-8277

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Announcing the launch of

ROMULUS

Fast multi-directional scrolling and shoot-em-up action. Romulus has more than one surprise in store for the unwary gamer. Great sound effects and music.

For the Commodore 64: £8.95

QUICKSILVA

Victory House, Leicester Place,
London, WC2H 7NB
Telephone: 01-439 0666

CBM 64/128
uses 40 Column Mode on 128
Rhythm
KING
HI-HAT
CYMBAL
COWBELL
HANDCLAP
LO TOM
HI TOM
SNARE
BASS DRUM
PETE Young
programmable
digital drum machine
PRO SYSTEM
(includes software and cartridge)

*8 digitally recorded drum sounds in each kit
*2 kits supplied, additional kits available
*Songs and patterns can be saved and reloaded
*Keyboard or joystick operation
*Polyphonic
*Simple to use, no musical knowledge required
*Up to 64 patterns and 16 songs in memory
*Real-time or step-time recording
*Powerful pattern editor
*RHYTHM KING software is easy to learn, easy to use

AVAILABLE NOW !

£39.95

CBM 64/128 - disk or tape

SUPERSOFT

Winchester House Canning Road
Wealdstone Harrow HA3 7SJ
01 861 1166

programmable
digital drum machine
PRO SYSTEM
(includes software and cartridge)

no musical
uired

s and 16
ry

ep-time

n editor

software is
asy to use

AVAILABLE NOW !

£39.95

CBM 64/128 - disk or tape

SUPERSOFT

Winchester House Canning Road
Wealdstone Harrow HA3 7SJ
01 861 1166

YOUR COMMODORE APRIL 1987

VOL 3 NO 7

YOUR
COMMO

AN ARGUS SPECIALIST PUBLICATION

SPLIT SPRITE

UP TO 32
SPRITES ON
YOUR C64

■ 50 C16 GAMES TO BE WO
PLUS/4 ■ PROTECTOR-PROG