YOUR
COMMODORE
OCTOBER 1988 £1.20

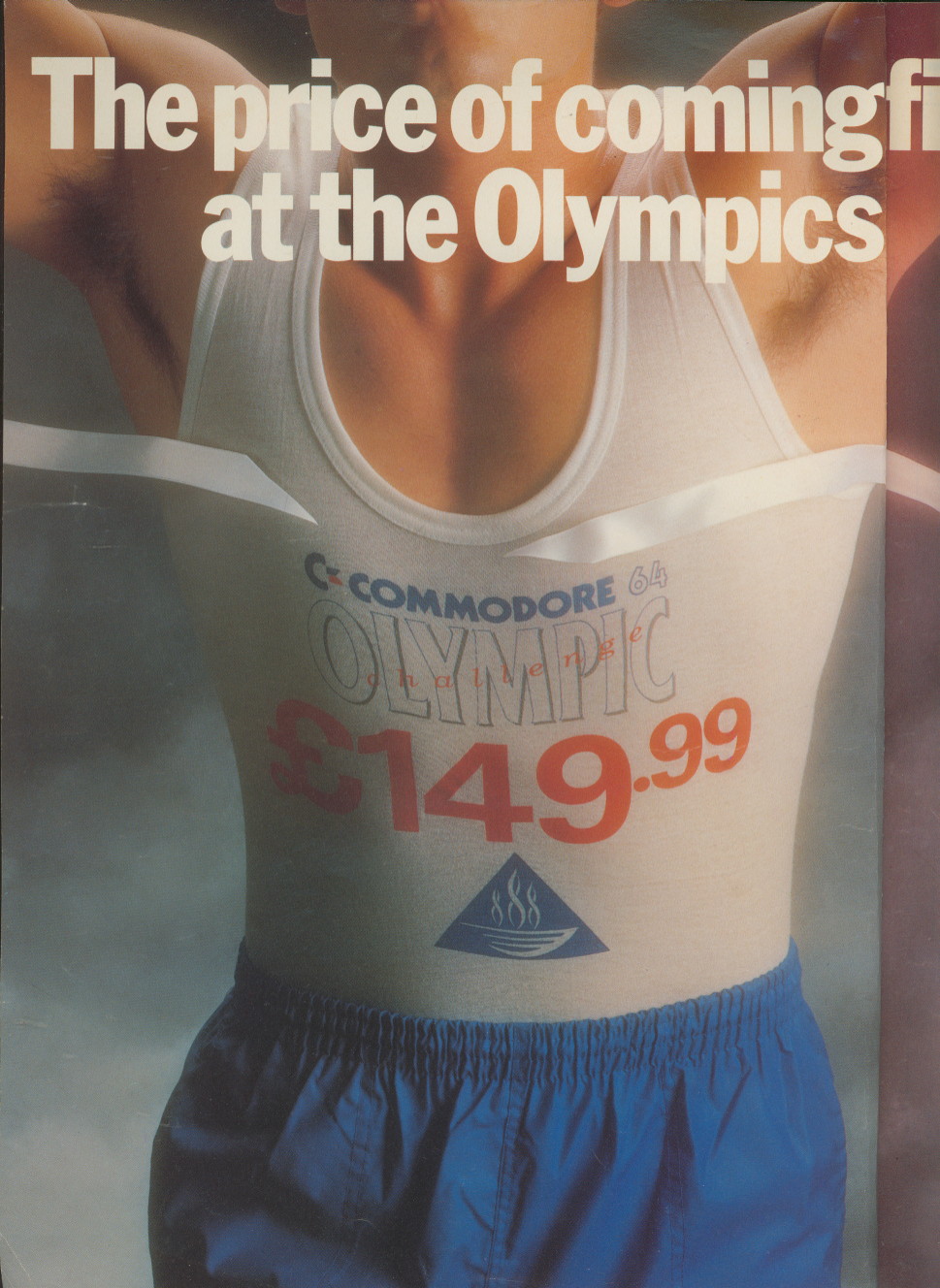
IRREGULAR ADD-ONS
a round-up of unusual accessories

Games Reviewed:
Dark Side
Football Manager II
The Games–Winter Edition
Netherworld
Fernandex Must Die

Alarm–programmer's time out

UNBEATABLE PROGRAMS:

JOYSTICK CURSOR ☐ FILE EXTENSION ☐ HI-RES FILL ☐ CODE RELOCATION


The price of comingfi
at the Olympics
COMMODORE 64
OLYMPIC
challenge
£149.99

gfirst
s

If you weren't selected for the Seoul Olympics, no need to feel out of the running.

Because everything you need to compete in all the events is right here with the Commodore 64 Olympic Challenge pack. And at only £149.99, your gold medal's practically in the bag.

Here's the C64 Olympic line-up...

* **C64 Computer, the latest version of the world's best-selling computer.**
* **Cassette unit, for simple loading of programs.**
* **Joystick to put you in complete control of screen action.**
* **Plus all the excitement of 10 great sporting games.**

On day one, you can use all your skills and reflexes to race against the clock in the track and field events. Or take up the challenge of world series baseball, weightlifting, football, tennis and the championship title fights.

And when the Olympics are over, you can then go out and grab the best beat 'em ups, one-on-one, adventure and simulation games that really come alive on the C64.

There's only a few days to go before the opening ceremony, so make a dash for your local dealer and ask about the C64 Olympic Challenge pack. Or telephone 0800 800 477 for more details.

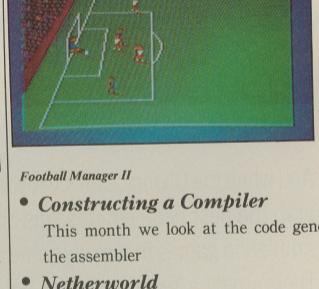
Commodore

Editor: Stuart Cooke
Deputy Editor: Sue Joyce
Technical Editor: Fred Reid
Advertisement Manager: Paul Kavanagh
Advertisement Copy Control: Andrew Selwood
Origination: Ebony Typesetting
Artist: Alan Batchelor
Designer: Neil Sweetman

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, 5 River Park Estate, Berkhamsted, Herts, HP4 1HL. U.S.A. Subscription Agent: Wise Owl Worldwide Publications, 4314 West 238th Street, Torrance CA 90505 U.S.A.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

REGULARS

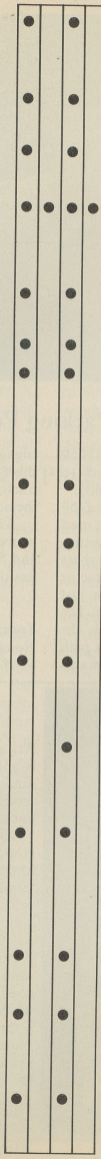


Football Manager II

	C64	C16	C128	+4
Data Statements	●	●	●	●
Games Update	●		●	
A Short Interlude	●		●	
May I Interrupt	●		●	
Football Manager II	●		●	
Constructing a Compiler	●		●	
Netherworld	●		●	
Making Music	●		●	
Dark Side	●		●	
The President is Missing	●		●	
Competition	●		●	
Interceptor	●		●	

FEATURES

PROGRAMS

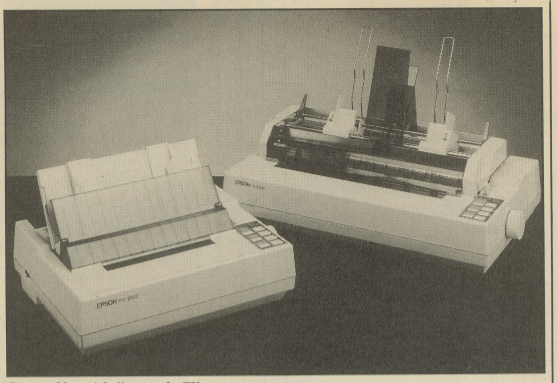


VOLUME 5 NUMBER 1

ARGUS PRESS GROUP

NOV ISSUE AVAILABLE 7th OCTOBER 1988

ISSN 0269-8277



Epson add special effects to the FX

FX Parking Permit

The Epson FX850 and FX1050 printers have been upgraded to incorporate a paper parking facility.

The new units, which retail at £459 and £599 respectively, can now be used with a minimum of fuss when continuous stationery is swapped for sheet feeding. Instead of unlacing the tractor feed manually, new owners can just flick a lever and press a switch. The actions automatically withdraw the paper out of the printer's paper path but the tractor sprocket remains engaged. This means that, after the sheet feeding has been completed, tractor feed can be resumed without the need to relace the paper by hand.

The machines also feature three internal character fonts, 246cps draft and 54cps NLQ speeds, all done with less than 55dBA of noise.

Touchline: *Epson (UK), 388 High Road, Wembley, Middlesex HA9 6UH.* **Tel:** *01-902 8892.*

Ingrid, star of Level 9's Gnome II

Level Gnome

At Level 9, Gnome is where the heart is and to prove it Ingrid's Back. The diminutive star of Gnome Ranger returns to battle against Jasper Quickbuck in Gnome II.

Quickbuck is planning a Yuppie Homes development in a quiet corner of the gnome counties. Only one thing stands between him and his dreams of suburbia — Ingrid Bottomlow and her accident prone ways.

Also nearing completion is Pete Austin's megaproject Lancelot. After months of research, Austin has combined hi-tech programming with Mallory's Morte D'Arthur to produce a three part adventure which follows Lancelot's knighting, his fall from grace with Guinever and the search for the Holy Grail.

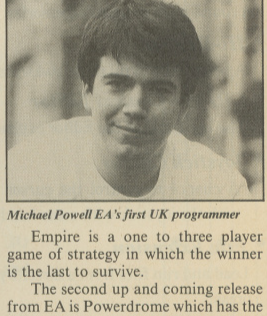
Touchline: *Level 9, 5 Mendip Road, Crown Wood, Bracknell, Berkshire RG12 3XG.* **Tel:** *0344 487597.*

Arts Trek

Electronic Arts are releasing the 'Wargame of the Century' and its simply called Empire. The objective is to search out alien lifeforms and blast them to bits.

This may sound like a corruption of Star Trek so far but there's more. The player takes the roll of Captain William P Brown of the UGAS Britannia, an enterprising chap who wishes to seek out the evil Krellans who cling on to large tracts of real estate known as the Krellan Empire.

William P Brown has to boldly go into the heartlands of the Krellans, completely phase them into submission and escape scot free as he checks off another conquered world, leaving bare bones and shouting a battle cry of 'Ooh, hurrah!' at the death of the Krellans. Then, realising that he spoke too soon, he heads off into uncharted space to do battle once more.



Michael Powell EA's first UK programmer

Empire is a one to three player game of strategy in which the winner is the last to survive.

The second up and coming release from EA is Powerdrome which has the distinction of being the first EA game to be penned entirely in the UK.

This November launch for the Amiga features solid 3D graphics of a jet racer championship of the future. The Powerdrome series consists of six races, each at different tracks which feature differing weather conditions.

A special feature is included in the two player game which requires two Amigas to be linked together. Once the union is made, the two combatants can race against each other after tuning up and getting a suspensor grid position through speed trials at the start of the race.

Touchline: *Electronic Arts, 11-49 Station Road, Langley, Berkshire SL3 8YN. Tel: 0753 49442.*

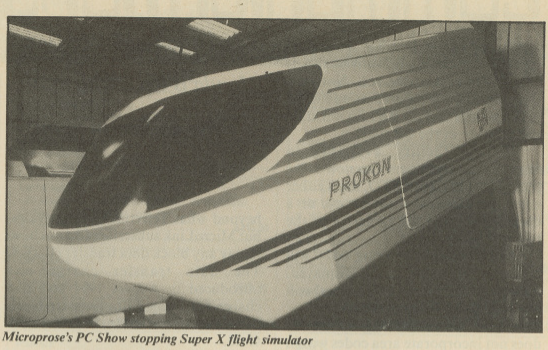
Gung Ho Prose

Glasnost is a word which doesn't appear to feature in Wild Bill Stealey's vocabulary down at Microprose HQ. Once more it's time to loose the dogs of war on the Commie threat as Red Storm Rising makes a transition from book to game.

Tom Clancy's best seller concerns events in a future world war between the Russians and Americans in which a lone nuclear submarine has the task of wiping out the USSR's underwater fleet.

Microprose's leading programmer and designer, Steve Meier, has been given the task of converting words into bytes. Meier promises that the new simulation will be far more advanced than Microprose's highly acclaimed Silent Service.

In the meantime, the PC Show's centrepiece was provided by Microprose in the form of a highly advanced simulation machine. The Super X Prokon flight simulator combines sensitive mechanical control with a wide angle computer generated visual display to give its 14 passengers the sensation that they're really flying.



Microprose's PC Show stopping Super X flight simulator

Touchline: *Microprose, 2 Market Place, Tetbury, Gloucester GL8 8DA.* **Tel:** *0666 54326.*

Vive la micro

The French are preparing for their second Festival de la Micro show on 14-16th of October at Espace Champerret, Paris. This is only the second year that the show has been held but it is rapidly establishing itself as the Gallic equivalent to the PC Show.

The festival is hosted by Neo Media press group and it was developed through necessity rather than by design. Neo Media organised an Amstrad show in 1986. It proved so successful that Amstrad France decided to run the show themselves by registering the name Amstrad Expo and forbidding Neo Media from using the Amstrad name.

Jean Kaminsky, Neo Media's managing director and show organiser, was not deterred so easily and in October last year the Festival de la Micro attracted over 20,000 visitors. Apple, Atari, Amstrad, Commodore and Sega all took stands at the show and they will also be there again this year.

The only question that remains is whether Amstrad will be the biggest draw again this year or will Commodore or Atari pull the larger share of the crowd?

Touchline: *Festival de la Micro, Espace Champerret, Porte de Champerret, Paris*
Organiser: *Neo Media, 5-7 Rue de l'Amiral Courbet, 94160 Sainte Mande.*

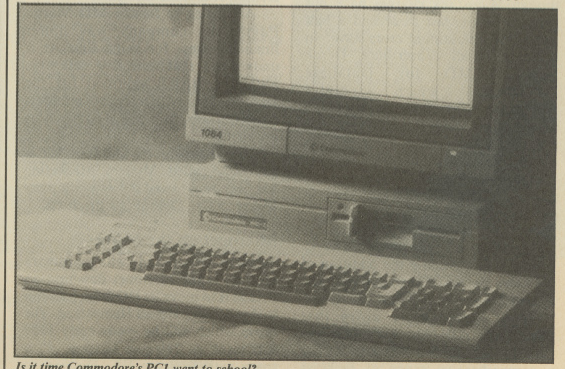
PC Plod

Commodore are to be commended for sticking with their PC compatibles and at last persistance may be paying off. With their prices at an all time low, the company is now promoting its discount schemes for educational establishments.

Under the scheme, PC1s retailing at £315 (mono) and £430 (colour) are being supplied for £299 and £369 respectively. At the top end of the range the savings are even greater with PC60-80HD Enhanced Colour Display 80386 clone costing £4299, a saving of £1160 on the normal RRP.

Now that prices have come down so far, it could be time for schools to re-examine their microcomputer policies with a thought to using the industry standard PC instead of the charming but remote BBC Micro. The fact that the PC is used in almost every computerised establishment would give the computer student a distinct advantage in gaining employment when cast from the academic world into that of commerce.

Touchline: *Commodore Business Machines (UK) Ltd, The Switchback, Gardner Road, Maidenhead, Berkshire SL6 7XA.* **Tel:** *0628 770088.*



Is it time Commodore's PC1 went to school?

COMMUNICATIONS CORNER

Our roving reporter David Janda is back with more news and views in the world of comms

One major problem associated with calling bulletin boards is the cost of the call. Not only that, but many BB numbers published in magazines and on BB's do not state the location of the BB itself.

A new facility available to MicroLink subscribers can now solve that problem. Called STD, users either enter the name of a town/city, or a dialing code and the exclusive of the two will be displayed.

As an example, entering '0424' will result in 'Hastings' being displayed. Alternatively, entering 'Hastings' will result in '0424' being displayed.

At the time of writing the service does not incorporate area codes within a city but this will be introduced at a later date. International dialing codes and associated country names will also be introduced.

Prestel/Micronet subscribers have a similar facility within the British Telecom database on Prestel. Located at page 383614 is an area code locator. This is used by entering the first three digits of the area code. This will display a list of the areas covered by that exchange. Major cities are covered, so it is possible to get a breakdown of area codes within a major conurbation such as London.

The Price of Microlink

Shortly after the new Tariff changes for Prestel/Micronet were announced, MicroLink issued a statement that it would not be increasing its prices.

However, it appears that even though MicroLink charges have not gone up in the last three and a half years, the operational costs have. In a letter to all subscribers, Derek Meakin, MD for Database Publications which operates MicroLink said that the company could no longer subsidise its customers. As a result, the minimum monthly standing charge of £3 has been increased to £5. This brings the standing charge in line with the rest of Telecom Gold.

In the letter Meakin also promised a number of enhancements to MicroLink, including the addition of yet more gateways both national and international.

Your Commodore notes that MicroLink still represents excellent value for money. Not only does it offer a comprehensive range of facilities beyond what Telecom Gold provides, but MicroLink subscribers do *not* have to pay any block data transfer charges. The data transfer charge was introduced in August 1987 and is a charge for every 512 character-block of data sent/received to/from Telecom Gold.

The Magazine Grows!

Xtra! The magazine suppliment area on Micronet has a new section called Voltage.

The area will cater for those interested in Hi-fi and consumer electronics by providing the readers with news, reviews and features on the latest gadgets for the Hi-tech yuppies among you.

Voltage will be updated on a regular basis and reading it incurs no extra charge for Micronet subscribers. Prestel only subscribers can read Voltage, but are time charged at different rates depending on what time of day the section is read.

The Deamon Dies!

Dataphone Ltd of Peterborough is no more. The company manufactured and sold modems including the Demon II and the Designer.

According to former MD Martin Payne the company was under financial stress for some time. It is understood that extensive delays in obtaining BABT approval for the Demon II and Designer modems contributed to the companies problems.

New backing in the form of a company called Modem Marketing has been sought and the new company will be selling Dataphone products.

Micronet on the Move

Telemap Group Ltd, who's promary product is the Micronet database on Prestel is to move its HQ from London to Apsley near Hemel Hempstead. The move which will be made early 1989 will result in Telemap sharing office space with Dialcom UK. Dialcom is part of British Telecom and incorporates Prestel, Telecom Gold, and a host of other value added services.

According to Micronet the move will result in better communications between The Net and Prestel.

However, *Your Commodore* has received information from several reliable sources who suggest that British Telecom (who currently have a 40% share in Telemap Group Ltd) will buy out the two other Telemap share holders. These are EMAP and Bell Canada.

This would be a logical move on BT's part as it would mean that Micronet (which is the largest IP on Prestel) would be under its control.

Although this information has not been confirmed by the top management at Telemap (who were not available for comment) this writer believes it to be the case.

More Amiga Coverage

Editorial coverage for the Amiga on Micronet has been rather thin until now.

Before, coverage was supplied by the contributors of the 16/32 area. This has all changed as the Solely CBM area provides information for Amiga owners as does the ST/Amiga area which now has a full time member of Micronet's staff writing for it.

At present, there is no seperate microbase on Micronet for Amiga owners, but this may change if the number of Amiga owners subscribing to Micronet increases.

Gateways from Microlink (c) Database Publications

1 : Mnematics
2 : Echo
3 : AIMS Database
4 : Infocheck
5 : Jordan Watch
6 : Official Airways Guide
7 : World Reporter
8 : FinTech – Financial Times Pubs
9 : Petroleum Monitor
10 : Lotus
11 : Kompass
12 : BIS Infomat Newsfile
13 : Wall Street Journal
14 : Grants to UK Industry
15 : Marketing Week

1-15 R(edisplay Q(uit Select :

DIMENSION computers l.t.d.

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

THE MIDLAND'S LARGEST COMPUTER STORE

CANON PJ1080A COLOUR INK JET
- Virtually silent operation
- Seven colour text and high resolution colour graphics printing (640 dots per line)
- Uses plain, single sheet or roll paper
- Supplied with AMIGA printer driver software £499.95

AMIGA BUSINESS PACK
- Amiga A500 computer
- 1084 high resolution colour monitor
- Citizen 120D printer
- Monitor and printer cables
- The works-integrated spreadsheet, wordprocessor and database
- Transformer-PC Emulator £779.00

302C 1Mb A500 3.5" External Drive £99.95
Cumana 1Mb 3.5" External Drive £109.95
Internal A2000 2nd Drive £79.95
Amiga Midi Interface £34.95
Digiview Colour Digitiser £139.95
Supra 20Mb A500 Hard Disc including Diskmaster Software £649.00
2Mb genlock A500/A2000 ..... £219.95
2Mb Internal RAM Expansion £449.00
A500 512K RAM Upgrade £109.95
Future Sound Digitiser, including microphone £169.95
Perfect Sound Digitiser, with stereo recording facility £74.95
Audiomaster Sampling Software £39.95
Prowrite V2 Wordprocessor £79.95

AMIGA RANGE

AMIGA A2000 PACK OFFER
Amiga A2000 1Mb with Mouse, Workbench, Workbench Extras, GW Basic and 20Mb A2090/2092 Hard Disc
With 1081/1084 Monitor ..... £1379.00 + VAT
Without Monitor ..... £1169.00 + VAT

AMIGA A500 PACK 1
with Mouse, Workbench, Basic, DPAINT, TV Modulator, 40 Disc Storage Box, Dust Cover and 10 Games/Utility Discs £415.00

AMIGA A500 PACK 2
with Mouse, Workbench, Basic and DPAINT Software £379.00

COMMODORE 1084 COLOUR MONITOR
High RES, Non Reflective Screen £229.00

PIXMATE
TOTAL IMAGE PROCESSING SYSTEM
Manipulates images produced by most Amiga graphics packages, including DPAINT.
With over 3000 special effects £44.95

Express Paint £39.95
Pageflipper Animator £22.95
Introcad CAD System £39.95
Marauder 2 (back-up utility) £29.95
Diskmaster (File Manager) £39.95
Grabitt (Screen Dumper) £21.95
Digipaint £59.95
Photon Paint £69.95

AMIGA A500 with PHILIPS 8833 HIGH RES COLOUR MONITOR with STEREO SOUND OUTPUT, Mouse, Workbench, Basic, plus DPAINT Software £629.00

AMIGA A500 with COMMODORE 1084 HIGH RES COLOUR MONITOR Mouse, Workbench, Basic, plus DPAINT Software £599.00

STAR LC10 COLOUR DOT MATRIX
- 120 cps Draft, 30 cps NLQ
- 6 Resident Fonts and 6 Print Pitches
- Draft and NLQ in all Fonts and Colours
- 7 Colours plus Multiple Shade Graphics

Includes AMIGA Printer Lead £229.95

THE WORKS
Spreadsheet, Wordprocessor and Database £69.95

PHILIPS 8833 COLOUR MONITOR £259.00

DIGIPIC
REAL TIME VIDEO DIGITISER
Captures images at 1/50th of a second from video source. Powerful software allows modification of images plus export to DPAINT and many other programs £239.95

Aegis Draw-Plus £149.50
Aegis Animator/Images £84.95
Aegis Images £23.50
Aegis Impact £51.95
Aegis Sonix £46.95
Aegis Audiomaster £35.95
PUBLISHER PLUS
Desktop Publishing Package £79.95

PRINTLINK
Allows AMIGA to use CBM Serial or Standard Centronics Printers, with the Bonus of a 60K Buffer.
CBM Serial only £34.95
CBM Serial plus User Port to Centronics £44.95

THE NEW STAR LC10 DOT MATRIX PRINTER
- 120 cps Draft, 30 cps NLQ
- Friction and Tractor Feed
- Paper Parking Facility
- 6 Resident Fonts and 6 Different Print Pitches Selectable from Front Mode Select Panel

Commodore Serial or Centronics £199.95
Commodore 64/128 Colour Version £229.95
Including FREE GEOS worth £26.95 with CBM version

1541C DISC DRIVE £169.95

OCEANIC OC 118N £129.95
Commodore Compatible Disc Drive
Both include GEOS, plus either:
Software Pack A
6 Disc Adventure Games plus 5 Disc Arcade Games
Software Pack B
Easyfile Database, and Future Finance Planning Package

SUPER G
CBM to Centronics Printer Interface £34.95
FINAL CARTRIDGE 3 ..... £39.95

MPS 803 TRACTOR FEED UNIT £29.95

CBM 64/128 MUSIC EXPANSION SYSTEM
Including Keyboard, Synthesiser and Software £75.00

COMPOSER/EDITOR SOFTWARE
For Music Expansion System, Tape or Disc £24.95

ACTION REPLAY Mk IV PRO
Tape to Disc Back-up Cartridge £32.95

NEOS MOUSE
With CHEESE Software, Tape or Disc £24.95

COMMODORE C2N DATA RECORDER £29.95

PRINTER RIBBON OFFER
MPS 801, 802, Citizen 120D and Star NL10 Ribbons £5.95
MPS 803 & MPS 1000 ..... £4.95
DPS 1101 Multi Strike £3.50
BUY FOUR AND GET ONE FREE!

REMARKABLE COMMODORE PC1 OFFER
Unbeatably priced PC/XT compatible, including extremely compact base unit, detachable keyboard and monitor. Compatible with all major PC/XT software, the PC1 now represents the lowest price for specification PC compatible in the UK.
- 8088/4.77MHz Processor
- 512K RAM
- Serial and Parallel Ports
- MSDOS 3.2 and GW Basic included

For a limited period, the PC1 also includes ABLE ONE Integrated Spreadsheet, Wordprocessor and Database package (usual price £113.00)
PC1 with Mono Monitor ..... £299.99 + VAT
PC1 with CGA Colour Monitor ..... £449.00 + VAT
PC1 Package without Monitor. Compatible with CBM 1084 and most CGA/Hercules monitors ..... £269.00 + VAT

CITIZEN 120D DOT MATRIX PRINTER
Commodore version (with 64/128 Printer Lead) £159.95
Centronics version (with AMIGA Printer Lead) £159.95
Commodore 1901 Colour Monitor £219.95
Philips 64/128 Green Screen Monitor £89.95
MPS 1200P Dot Matrix Printer, Centronics £219.95
MPS 1500C 7 Colour Dot Matrix, Centronics £339.95
1581 3½" Disc Drive including 10 x 3½" Discs £199.95

PRECISION
Superscript 64 ..... £24.95
Superbase 64 ..... £24.95
Superscript 64 & Superbase 64 ..... £44.95
Superscript 128 ..... £29.95
Superbase 128 ..... £29.95
Superscript 128 & Superbase 128 ..... £54.95
Superbase, The Book £11.95

GEOS Version 1.3
CBM 64/128 Operating System
Including: Desktop, Geowrite, Geopaint, and Desk Accessories, Disc
CBM64 ..... £26.95
CBM128 ..... £34.95

GEODEX/DESKPACK
Combined Database with powerful Mailmerge function. Also contains Artgrabber Graphic Images, Calendar and Icon Editor £21.95
GEOCALC Spreadsheet £24.95
GEOCALC 128 ..... £34.95
GEOPUBLISH Desktop Publisher £34.95
WRITERS WORKSHOP £21.95
WRITERS WORKSHOP 128 ..... £34.95
FONT PACK 1 ..... £16.95
GEOFILE Database £24.95
GEOFILE 128 ..... £34.95
GEOSPELL Spellcheker £16.95

I CONTROLLER*
Geos-compatible Joystick. Fits onto keyboard £12.95
*FREE OF CHARGE WITH PURCHASES OF TWO OR MORE GEOS PACKAGES

CBM 64/128 and PLUS 4 COMPANIES PACK
Sales/Purchase/Nominal Ledgers with Invoicing and Stock Control, Disc £24.95

PERSONAL CALLERS AND EXPORT ENQUIRIES WELCOME
ALL OFFERS STRICTLY SUBJECT TO AVAILABILITY
ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE
ALL PRICES INCLUDE VAT UNLESS OTHERWISE STATED

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. YC 10, Dimension Computers Ltd., 27/29 High Street, Leicester LE1 4FP.
Tel: (0533) 517479/21874 Fax: (0533) 511638

Item	Quantity	Price
	Total	

Name.....
Address.....
.....
Telephone:.....

Gizmos - expandi
Commodor

By Tony Hetherington

For a lot of Commodore users 64K of memory, a joystick and a good selection of games will be enough to occupy all their computing time. But, for others who see their C64 or C128 as a means to explore the world of sound, graphics, teletext and even robotics will find the following pages an invaluable source to all add-ons, gizmos, cartridges and circuit boards that you can use to expand your Commodore.

As with other fields in computing the world of Gizmos is almost totally dominated by a single company. If you think of adventures you think first of Infocom, if you're looking for a printer Epson spring to mind. Similarly in the world of Gizmos, Datel Electronics is the name.

Although Datel still has competition in many areas, its success is a fine example of the potential success waiting for third party companies that are prepared to support machines. Without these companies the C64 and C128 would be good but limited machines and would not enjoy their current success and appeal. Compiling this article has convinced me that whatever the task you wish to embark on with your C64 or C128 there's likely to be a piece of hardware and software available somewhere that will make it a whole lot easier.

Chips and Boards

Chips and circuit boards are an obvious way of expanding your Commodore as they can add to or replace your computer's hardware. You may need some basic knowledge of electronics and be competent at soldering to get the best out of them, however there are some that simply plug into the cartridge port so even the most inexperienced novice can uncover their secrets.

Turbo ROM II/Datel Electronics/£14.99

This chip replaces the C64s ROM with a turbo version capable of loading and saving programs five or six times faster than normal, and adds a ten second disk format routine and programmed function keys that provides functions such as load and directory and the touch of a key.

4 Way Kernel Board/Datel Electronics/£12.99

This board slots in and replaces the kernal and provides an adaptor that can take 16K or 32K replacement ROMs and a switch so you can swap between the systems.

256K Superom Expander/Datel Electronics/£29.99.

dig your
or Commodore Comm

Possibly the ultimate in ROM expansion as this expander board has eight slots each capable of carrying a 32K EPROM. The board also is supplied with its own menu driven operating system so you can access any of the eight EPROMS without loading in a program.

An EPROM generator utility will convert your own BASIC or machine code programs and turn them into autostart EPROMs.

In effect the Superom expander provides a neat alternative to hordes of cartridges protruding from your C64 as 2764, 27128 and 27256 EPROMs can be switched in and out as required giving you a suite of instant menu accessed programs.

Eprommer 64/Datel Electronics/ 39.99.

The Eprommer 64 is the ideal companion board for the Superom Expander as it can be used to program 2716, 2764, 27128 and 27256 chips.

Menu driven programs allow you to program, read, verify and copy EPROMs simply so that they're ready for use in the Superom Expander.

The Drive Box/F.S.S.L./£19.95.

The Drive Box once soldered in will allow you to alter the drive number (8, 9, 10, 11) of your 1541, 1571, 1570 or 128D disk drive and also write to the backside of a disk without cutting a notch in the disk as it bypasses the write protect sensor.

1764/F.S.S.L./£99.95.

A plug in memory expansion board for the C64 that will add 256K to your computer in four 64K banks. Supplied with its own power supply the 1764 won't drain your C64 and will give you the extra memory needed in so many development projects.

1750/F.S.S.L./£149.95.

512K is available in this the C128 version of the F.S.S.L. memory upgrade board.

Graphics

The Commodore's graphics facilities are the envy of other 8 bit owners who cannot hope to match the quality and colour of C64 graphics. The following packages help you to make the most of these facilities through a combination of hardware and software.

Blazing Paddles/Datel Electronics/ £24.99.

A combined lightpen and graphics package system that promises to help you get the most out of your Commodore's graphics potential.

The fibre optical lightpen plugs into the joystick port and is ideal for creating computer art as you can simply point to the part of the screen you want to work on. Add to that a software package that includes windows and icons for ease of use and features such as rubber banding, zoom modes, a range of brushes, the ability to cut and paste windows, load and save shapes, windows and screens and a colour mix over 200 hues and the result is a must for computer artists.

Stop Press/AMS/£79.95.

Stop Press is one of the better C64 Desktop Publishing packages mainly due to the inclusion of the excellent AMX mouse.

By moving the mouse and pressing one of its three buttons you can select from the programs pull down menus and create graphics and page styles in which you can paint on text created by a separate word processor. In a recent survey of Commodore Desk Top publishers in the last *Your Commodore* Stop Press scored well. It's success partly due to the easy to use software and partly to the AMX mouse that would top any mouse comparison table. Together they made headline news.

BASIC 8/F.S.S.L./£34.95.

This is an incredible package for the C128 which together with F.S.S.L.'s 64K Video RAM upgrade kit (£19.95) unleashes unimagined graphics power that can even rival the 16 bit machines.

BASIC 8 adds over 50 commands to C128 Basic that allows you to draw a circle, box or 3D solid shape with a single command and includes commands to control windows, create fonts, and select patterns and brushes.

The result of your programming can be displayed in 80 column mode and in mono a resolution of 640 x 200 and 640 x 192 in 16 colour mode.

Sound

Computer sound can be one of its most impressive features but few C64 users are able to make the most of their computer's features. Although there are a number of excellent music packages on the market somebody serious about computer music should check out the sounds of science created by these samplers, midi interfaces and electronic drum systems.

Digital Sound Sampler/Datel Electronics/£49.95.

Sound samplers can be great fun to use as you can record or sample any sound or noise and record it in memory. Once it's there you can speed it up or slow it down, play it back forwards or backwards and add echo, reverb or ring modulation to create an amazing range of results that can be saved for later use.

The Datel Digital Sound Sampler comes complete with a microphone and allows you to store and edit up to eight samples at any one time making it a powerful sound editing

tool whether it is just amusement (making your Granny sound like anything from John Wayne to a Dalek), to mimic the sampled sounds of today's records or to create sound effects for stage and radio.

Com-drum/ Datel Electronics/£29.99.

The Com-drum plugs into the cartridge port of your C64 and turns it into a digital drum machine.

Through a menu driven editor you can create drum rhythms in real or step time and store up to eight drum sounds in memory and save them to tape or disk and then play them back through your hi-fi.

A separate Com-drum editor (£4.99) provides the Com-drummer with a disk full of 24 drum sounds that you can combine and edit to provide your own customised drum kit.

MIDI 64/ Datel Electronics/£29.99.

MIDI is one of the buzzwords of the 80s and in this case stands for Musical Instrument Digital Interface that can transmit notes and how they are played (duration, pitch etc) to a storage device or an instrument.

For a basic MIDI system you need a keyboard, synthesiser, MIDI interface and computer. Casio is probably your best source of keyboards and synthesisers, your C64 will prove to be an adequate computer and this a suitable interface between the two.

Cartridges

The Commodore family of computers is one of the few that uses cartridges to expand and improve the original system. The cartridge has an obvious advantage over disk or solder in ROM alternatives as they simply plug into the cartridge port and are instantly ready for use.

Unfortunately, the good name of cartridges has been slurred by people who still insist on driving up the price of software by copying programs for friends. The cartridge companies have also fallen into this trap and base their advertising on how quick they can backup the latest releases.

However, now the companies are fighting back by maintaining that their cartridges are programming tools and I would add that every user has the right to backup his software or create a disk version of a tape game as long as it is for his own use. Piracy simply pushes up the cost of programs.

Action Replay IV Professional/ Datel Electronics/£34.99.

This is the updated version of possibly the best known cartridge and adds to the features of the original compactor, backup, turbo loading, sprite killing, printer dumping original by adding an onboard custom chip that includes an extended monitor that can freeze any program allowing the serious programmer to disassemble, compare, fill, transfer, hunt, relocate and jump to any part of the code and the restart the program from the place you froze it.

This can provide an educational tool for programmers who want to find out how their mentors created a certain effect.

Final Cartridge III/ Datel Electronics/ £39.99.

The latest version of the Final cartridge gives your C64 or C128 user a friendly front end as you control everything through windows and pull down menus.

You can turn your joystick into an auto fire stick, kill and disable sprite collisions, freezes games to create screen dumps, includes a sprite and character editor and a programmer's toolkit incorporating commands such as Auto, Renumber, Delete, Trace, Append and Dump. Add to that a calculator, real time clock, notepad and turbo loader and you have a force to be reckoned with.

Expert Cartridge/ Trilogic/£29.99

The Expert differs from the other commercial cartridges since it contains RAM and not ROM chips. Although this means you must load in the operating system from disk every time you use it, you can easily and cheaply upgrade the system by changing the disk which costs about £3 and not £30 which would be the cost of a new cartridge.

Smart Cart/ Datel Electronics/£29.99.

The Smart Cart is a battery packed 32K RAM cartridge that acts like a ROM cartridge. Although more technical programmers can take advantage of its I/O slots, most users will be more than happy with the way they can load their programs into memory, flick a switch and then for the next five years (until the battery runs out) reload their program in a few seconds.

An 8K version is also available at half the price which makes the 32K version a better buy as well as being more useful.

RAM Disk/ Datel Electronics/£9.99.

RAM disk turns your Smart Cart into a 32K RAM disk capable of instantly storing and retrieving files and programs. Through simple commands such as load, save, directory and scratch you can access this storage area as if it was a disk drive with the only difference being that the programs load and save instantly.

3 Slot Motherboard/ Datel Electronics/£16.99.

This simple device will save the wear and tear on your cartridge port as it contains slots for up to three cartridges that can be switched in and out as required. So if you've finished using the Final Cartridge you could switch to the Smart Cart Action Replay IV.

64 Doctor/ Trilogic/£18.99

Here's a cartridge with a difference as the 64 Doctor is a diagnosis cartridge which examines your C64 and reports back with any problems it finds. In all it performs tests on the keyboard, serial port, cartridge port, kernal ROM, video chip and video banks, NMI and IRO interrupts, cassette data, joystick ports, user port, BASIC ROM, CIA chips, sound chip, cassette key press and even tests out your joystick.

This cartridge was developed by Trilogic as a result of its own work in repairing micros and is designed to produce an accurate diagnosis which will cut down the time and cost of repairs.

Trilogic also produces the Drive Doctor (£14.99) and Datasette Doctor (£8.99) to help you resolve tape and disk loading problems.

Robotics

Robotics is a growing area of interest enjoyed by more enthusiasts every year. Driven on by images of robots in science fiction films they strive to control the outside world from their keyboards. The C64 can be used to experiment in this area with these three Datel packages. They're still light years away from C3PO or R2D2 but it's a step in the right direction.

Robotarm/Datel Electronics/£49.95.

This robotarm has five axis of movement which can be controlled by two joysticks or via the Robotarm interface (Datel £24.99) to your C64 through which you can train or program it to create movement sequences.

Four different attachments can expand its use as you can give your Robotarm fingers, a shovel scoop, jaws or a magnetic attachment.

Robotek 64/Datel Electronics/£39.99.

Robotek 64 is a combined hardware and software package that allows your C64 to talk to the outside world. Four output channels, four input channels, analogue input with full 8 bit conversion and voice input will allow you to experiment with controlling robots and models.

Extras

In any article of this type you quickly run into gizmos that refuse to fall into any predefined categories and they usually end up getting lumped together at the end. This article is no exception so here is a collection of gizmos including a natty little joystick, a teletext adaptor and two add-ons for those Commodore users that are upgrading to the Amiga.

Icontroller/Suncom (Microprose)/£11.95.

The Icontroller is a tiny joystick (little more than an inch high) that sticks on top of the C64 or C128 and plugs into one of the joystick ports but through a second 9 pin adaptor leaves the port free.

This mini stick is ideal for application programs such as GEOS or graphics packages but not for what the instructions describe as "the emotional movement involved in playing certain games".

Commodore 1581 Disk Drive/F.S.S.L./£184.95.

A new disk drive for the C64 and C128 that offers 1 megabyte of memory (800K formatted capacity), 3160 blocks and an impressive 8000 characters per second loading rate.

1571 FIX ROM/F.S.S.L./£24.95.

Developed by Commodore Inc USA this plug in ROM solves most of the many problems faced by 1571 owners whether it be Device not Present errors or problems when using Superbase.

Teletext Adaptor/Microtext/£79.95.

Teletext pages such as those found on BBCs Ceefax and ITV's Oracle service provide a wealth of information ranging from football results to recipes, to weather reports to latest currency and stock prices. Now, with the Microtext Teletext adaptor you can call up the pages on your C64 screen and save the pages to tape or disk.

You can also print them out for future reference and write your own programs that can read the information from the screen buffer and use it in calculation. Applications for these vary considerably from easily inputting a week's football results into a pools predicter to plotting the fall in the pound or predicting the right time to buy shares in a depressed market.

There have been teletext adaptors for computers before but few have been as cheap as this one as it not only connects to your C64 but also to your video recorder and uses its tuner to receive the teletext data. If you haven't a video, and according to Microtext most computers owners have one, you can buy a tuner as well which will increase the combined price to £124.95.

Printlink/Trilogic/£34.95.

Many C64 and C128 owners are now or have already upgraded to an Amiga (the recent price cut will make this move even more attractive) and those who do will be wondering what to do with their old C64 printer. Instead of throwing it away, propping up a wobbly table or giving it away to a friend why not invest in a printlink and use it with your Amiga.

This handy device also adds a 64K print buffer which speeds up the Amiga's notorious sluggish printing speed.

Access 64/Precision/£52.10 (excluding VAT).

This similar device justifies its higher price by allowing upgrading Amiga/C64 owners to also use their 1541 and 1571 disk drives with their new machine and also includes a utility to upload precious sequential files into Amiga format and so ease the strain of upgrading.

Touchline:

***Datel Electronics**, Fenton Industrial Estate, Govan Road, Fenton, Stoke-on-Trent. **Tel:** 0782 744707.*

***Microtext**, 7 Birdlip Close, Horndean, Hants PO8 9PW. **Tel:** 0705 595694.*

***Trilogic**, Unit 1, 253B New Works Road, Low Moor, Bradford BD12 0QP. **Tel:** 0274 691115.*

***F.S.S.L. (Financial Systems Software Ltd)**, 18 High Street, Pershore, Worcs., WR10 1BG. **Tel:** 0386 553153.*

***A.M.S.**, 166-170 Wilderspool, Causeway, Warrington WA4 6QA. **Tel:** 0925 413501.*

***Precision Software**, 6, Park Terrace, Worcester Park, Surrey KT4 7JZ. **Tel:** 01-330 2089.*

Suncom (Microprose)**, 2 Market Place, Tetbury, Glouc GL8 8DA. **Tel: 0666 54326.

Hi-Res Fill

A better way to fill those awkward spaces

By Colin George Wilson

Over the past few months, I have seen various programs appear in magazines which give alot of help to programmers where graphics are concerned. I have seen programs which plot, unplot and flip points, some which draw lines and circles and others that can even move areas of the screen around. But I haven't seen one capable of filling areas of the screen – intelligently.

There have been spray brush routines, but these take no heed of anything already drawn. What would be useful is a routine which would stop painting when it reaches a point already plotted on the screen.

Certain professional packages such as the designer's pencil already have this facility.

Most of these packages still leave unfilled areas which are in the shadow of some object already present. See figure 1 as an example.

In most fill routines, the computer searches left to right on each line until it meets either the screen edge or a point already present and then draws a line between them. However these routines often fail to recognise corners of odd shapes.

The simple solution would be to re-fill these areas after the main fill has been executed, but another way is to have the computer check for such areas and then, once it has filled the area as it sees it, go back and fill the remainder.

I have written a program to solve this problem. Originally the program was developed using Basic Lightning. (I understand that Laser Basic has a very efficient fill routine built in, but as I bought Basic Lightning before it was replaced by Laser Basic, I stuck with what I had.) The listing is fairly straightforward and could easily be converted to other graphic languages, but as it is in Basic, it runs very slowly.

The second program, a stand alone version of the first, is written in machine code and resides in the 4K above the Basic ROM, and the table below supplies entry positions for both Basic and machine code programmers. The source listing has been included for those of you who wish to modify the program for your own uses.

Next, let me explain how the fill routine works. Most people (judging by the amount of hi-res graphic aid listings there are) roughly know the principles of plotting points so I will deal specifically with the fill routine.

First, a buffer area is reserved for the computer to store the co-ordinates of any areas it will need to return to. In Basic, this is matrix ED (number of areas, 1). In machine code, it is a 1K buffer capable of storing 255 sets of co-ordinates.

The key lines in the Basic Lightning listing are explained here.

10010 A buffer pointer is set to zero. This counts the number of co-ordinates found and acts as an index into the buffer.

10015 Two flags, H1 and H2 are set to TRUE (-1). The purpose of these

Figure 1.

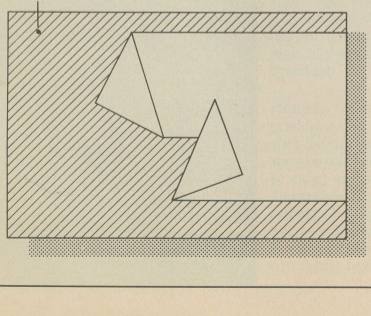
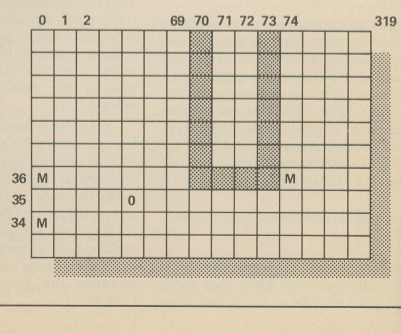


Figure 2.



flags is explained in detail later on.

10050 The computer now searches to the left of the start co-ordinates until it finds the screen edge or a previously set point.

10090 It now performs an identical search to the right of its new found co-ordinates for similar conditions. This time, for every point found blank, it is filled. A subroutine is also called to check for blank areas both above and below the plotted point.

10130 If the buffer pointer indicates that there are no further areas to be filled, the routine finishes.

10140 If not, the last set of co-ordinates stored are retrieved, and the buffer pointer is reduced accordingly.

10150 This continues until either the buffer pointer registers an empty buffer, or the co-ordinates retrieved indicate that the area is still blank.

10160 If the area has been found blank then the fill routine is re-initiated with the new co-ordinates in mind.

10170 Now that everything has been filled, the routine is TERMINATED.

The heart of the program lies in the search routine. This is called every time that a point is plotted on the screen by the fill routine. It works in the following way:

Two flags, H1 and H2 have two states; TRUE (-1) or FALSE (0), and are used to note exactly what is being searched for above (H1) or below (H2) the plotted point.

If the flag is TRUE, then the computer is looking for an empty point. When it finds one, its co-ordinates are placed in the buffer, and the buffer pointer is incremented. The state of the flag is now flipped, and it becomes FALSE. This state now informs the routine that an area has been found, and that a possible dividing line between another such area is being sought i.e. a 'set' point. This prevents the routine from memorising 319 dots where one or two would be sufficient. It is probably BETTER understood with the aid of figure 2.

The points set in column 70 and 73 and row 36 indicate where the bottom line of a rectangle lies. The circle indicates the start position of the fill routine, and the 'm' signals the points that will be memorised by the computer.

First, a search is made to the left for either a point or the edge of the screen. The latter is found first, so the computer starts drawing a line from 0,35. Both flags H1 and H2 have been set to TRUE to look for and 'unset' points.

They both find one immediately, so the co-ordinates 0,36 and 0,34 are noted. H1 and H2 now become FALSE as an area has been found.

Because these flags are now FALSE, the computer continues its search, this time for a 'set' point.

The first to find one is H1 at 70,36. This simply causes the computer to turn H1 back to TRUE to look for a nutter blank point. The co-ordinates 70,36 are then forgotten as they are of no further use.

The plotting and searching continues until 74,35 is reached. Because H1 is now TRUE, The computer notes co-ordinates 74,36 and turns H1 back to false again.

This time, the computer finishes the line without finding any further 'set' points above or below the line. Now it returns to check its buffer, and three co-ordinates are found:

0,34 – below the start of the plotted line
0,36 – above the start of the plotted line
74,36 – to the right of the rectangle

The last set of co-ordinates are taken and tested to see if the area has been filled from another direction. They are found to be blank, and so the computer recalls the fill routine with these co-ordinates and this line is scanned in an identical way:

10190 If we are hunting for an 'unset' point.

10200 Check the point, if it is 'unset', move the buffer pointer on by 1, memorise the co-ordinates and flip the flag.

10210 Otherwise.

10220 Check if the point is set so that we can flip the flag the other way.

10240 – 10280 Repeat the above procedure with the H2 flag, scanning below the plotted point.

NOTE: Basic Lightning uses the TOP LEFT as its origin (0,0) but the machine code version uses the BOTTOM LEFT.

The memory for the machine code version is allocated as follows:

$C000 – $C358 M/C routines
$C359 – $C7FF Free
$C800 – $CBFF Buffer area
$CC00 – $CFFF Hi-res colour screen
$E000 – $FFFF Hi-res bit mapped screen

The routines HIRES and LORES move the screen and switch video banks so that Basic loses no memory at all. Locations $C359-$C7FF are available for other machine code routines. The ones I have supplied are as follows:

HIRES	SYS 49152	Switch hires screen on
LORES	SYS 49184	Switch hires screen off
CLG	SYS 49216	Clear the hires screen
PLOT	SYS 49470,X,Y	Plot point X,Y
UNPLOT	SYS 49480,X,Y	unplot point X,Y
INVERT	SYS 49490,X,Y	eor point X,Y
FILL	SYS 49865,X,Y	fill hires screen from X,Y
COLOUR	SYS 49991,A	set hires colour to a (0-255)
POINT	SYS 50002,X,Y	read point X,Y - peek (780) returns 0 if no point set, 0 if there is.

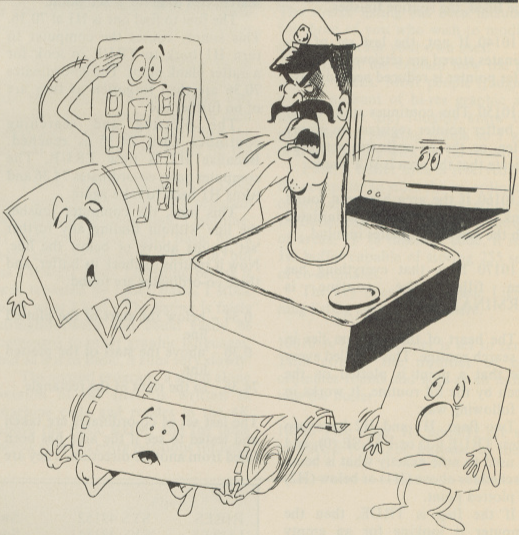
Getting it all in

The Basic program 'Lightning Fill' is provided for those of you with Oasis Software's Basic Lightning program.

'Hi-res Fill' is the basic loader for the stand-alone machine code version.

See listings on page 61

Joystick Cursor



A chance to control the cursor and other keys with the joystick with some handy results

By James Kew

This utility program allows the joystick to be used to control the cursor. It can also be modified so that the joystick emulates any other keys, which can be very useful for adding joystick control to BASIC programs. The four files associated with this program are:

JOYCURS	A BASIC loader
JOYCURS.OBJ	The machine code object file loaded by the above
JOYCURS.SRC	A source code file (loads as a BASIC program) for ASSEMBLER/MONITOR 64
JOYMOD	A BASIC program which modifies the routine

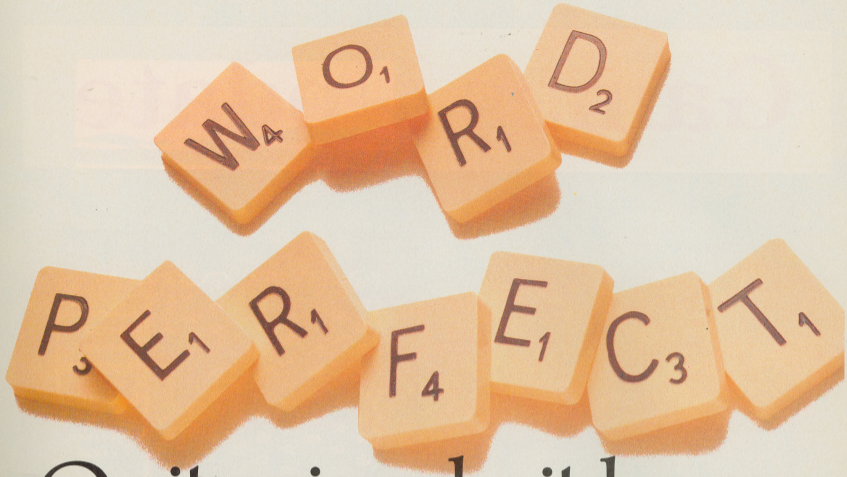
The routine is interrupt controlled. It is loaded into the tape buffer where it occupies 128 bytes, $033C-$03BB (828-955). To load the utility, load and run JOYCURS. The cursor can now be moved around the screen using a joystick in port 2. Pressing FIRE and a direction emulates the following keys: FIRE/UP = Return, FIRE/DOWN = Space, FIRE/LEFT = Delete, FIRE/Right = Insert

The auto-repeat can be turned on and off by poking location 922. Poking with 0 turns repeat off, with 1 turns it on.

The default settings are very useful for editing programs, but can be changed by loading and running JOYMOD. The program here will load the machine code file and will run through the joystick directions, with and without fire, asking for each one which key that particular action is to modify. If no key is to be emulated, press ←. The program also modifies the default value of the repeat flag. It is then possible to save the modified routine from inside the program so that it can be booted from the users own programs.

(For the technically minded, the program modifies a reference table starting at 923 which contains all 32 possible combinations of the five joystick bits in sequence – many of which are impossible to achieve with a joystick. The table contains the CBM-ASCII values of the keys to be emulated, with 0 representing no key.)

See listings on page 61



Quite simply, it leaves other word processors lost for words.

WordPerfect 4.1 for the Amiga includes many features not found in other word processors.

Newspaper style columns can be displayed on screen, 110,000 word UK phonetic dictionary, word-count, background printing and automatic reformatting increase efficiency.

Line drawing and rulers, search/replace and 5-function maths are invaluable assets.

By using the Amiga's pulldown menus nearly all WordPerfect's features are available at the click of a mouse. This makes learning easier than ever before and using it a real pleasure. But if you prefer the traditional function keys there is a colour coded template to make life easy.

What you see on the screen is what will actually print. This makes good, professional layouts simple.

Documents are treated as a whole and not a series of pages. Reformatting and repagination after editing are automatic and very rapid.

However fast you type, you will never be too fast for WordPerfect.

To find out more, write to the address opposite.

And see how WordPerfect delivers today what others are still searching for.

SENTINEL
SOFTWARE

Wellington House, New Zealand Avenue,
Walton on Thames, Surrey KT12 1PY.
Telephone: (0932) 231164
Telex: 916005. FERGUS G.

WordPerfect DataPerfect PlanPerfect Library Executive

Games Update

Alot of budget releases available this month – handy if you're short of the old pennies this month

Yet another quiet month with only a few full price releases as the software companies hold back their major titles for the main autumn offensive. There is however, a plethora of budget games available for anybody looking for the odd pocket money game although it must be said, that a lot of these titles are previously released full price games.

Full Price Titles

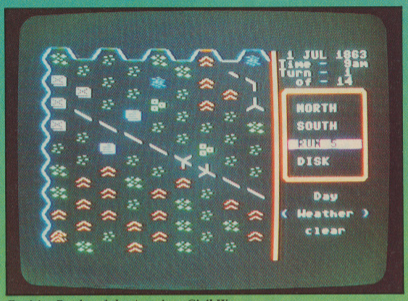
Anybody looking for a bargain could do a lot worse than investigate *Chart Busters* from Beau-Jolly. It seems that even compilations are getting bigger and better as this one offers no less than twenty titles. Most of the games were originally released at a budget price and those that weren't are now showing their age somewhat but nevertheless, there are some nuggets of gold among the also rans.

The titles include *Dan Dare, Tau Ceti, Rasputin, Park Patrol, Thrust, Eyeball, Way of the Exploding Fist, Ghostbusters, Olli* and *Lissa and Brian Jacks Superstar Challenge*. My personal favourite though is Zolyx, a fast thinking strategy game that shows that great graphics aren't necessary for a game to be addictive. On a score of 1 to 100 for presentation, Zolyx comes in at minus five!

If you are looking for something a bit more challenging on the strategy front, then there is the latest release from the Australian wargame company SSG, marketed by Electronic Arts. *Decisive Battles of the American Civil War Volume II* (disk only) lets you recreate five battles including the decisive Gettysburg and Chickamauga. These two, if handled differently could have turned the whole outcome of the War so here is your chance to prove that you are a better general than Robert E. Lee. As is usual with SSG games, the presentation is superb and a complete construction set allows you to design whatever variants you choose.

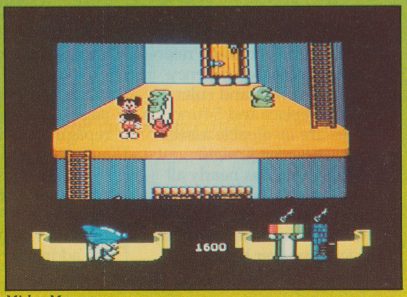
Apart from *Netherworld* (see elsewhere in this issue) Hewson has also released *Marauder*. As with all their releases, presentation is first class but the game itself, a vertically scrolling shoot 'em-up has been seen a thousand times before and offers little that is new.

From Gremlin comes *Mickey Mouse* in a game that I didn't really enjoy but which might appeal more to younger players. Mickey has to climb four towers with the ultimate aim of defeating the ogre king. *En route* he must nail shut all the side doors which involves playing four sub-games. There are ghosts and skeletons to be battled using either

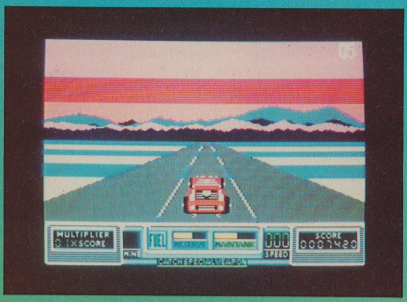


Decisive Battles of the American Civil War

Marauder



Mickey Mouse



Road Blasters

the magic water pistol or rubber mallet but I reckon that anyone playing the game will get more nightmares from listening to an appalling rendition of Paul Dukas' Sorcerer's Apprentice – the bit of the film Fantasia starring Mickey.

Also from Gremlin comes *Blood Brothers,* an arcade adventure for one or two players involving a chase through some mines in search of the Scorpions, a group of space convicts. Although it looks attractive, the gameplay itself left me cold and I just did not enjoy this one at all.

A racing game where you have to blast everything in sight sounds like a good idea but *Road Blasters* from US Gold is yet another game that doesn't quite work. You have to get from A to B within the time limit while at the same time wiping out anything that gets in your way – cars, bikes, mines and gun turrets to name but a few. You can get extra weapons delivered to you from an overhead spaceship if your shooting skills warrant them. Graphics are poor and the scrolling is non too hot either, making control of your car somewhat difficult.

Budget Games

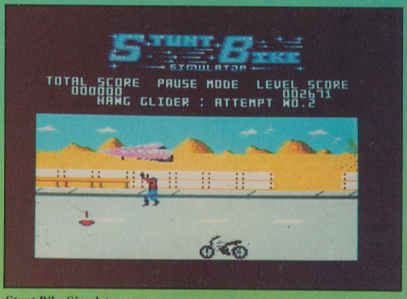
Firebird are the major contributers to this month's budget choice. European five-a-side is actually one of the more playable football games around. In other words, it is possible to take the ball from an opposing player. Nor are you faced with a superhuman computer controlled goalie who manages to stop everything that you kick at him.

There are problems though. Your men have a habit of all rushing up field and staying there so when the time comes to defend, there is no-one there to do it. There is also the habitual problem of control being given to the player that you don't want. The most serious fault though is that it is possible to reach a stalemate position. I became trapped between a defender and the goalie with the ball bouncing out to the corner flag and the goalie diving to save the rebound. The choices were to wait for eight minutes until the game finished, or pull the plug...

Beach Buggy Simulator sees you competing in the dune trials and what trials they are. Apart from having to jump over rocks and other hazards, there is also the slightly more serious problem of passing helicopters trying to blow you to bits. The organisers do however do you the courtesy of fitting your buggy with a gun offering some small crumb of comfort. All this is against a strict time limit with the added problem of dimishing fuel supplies.

I thought that every possible variation of title containing the word *'Ninja'* had been used up, but no, for there on the desk in front of me is *Ninja Scooter Simulator.* Apart from appearing in the title, the word *'Ninja'* has no connection with the game whatsoever but there again, I don't suppose that an ordinary scooter simulator has vast amounts of appeal. In practice, the game is a variant of a well worn theme. Race along a track within a time limit, leaping over ramps, avoiding obstacles and doing mid air tricks if you feel so inclined.

Racing seems to be this month's main theme. *American Road Race* is an old (1985) Activision game. Choose your opponents and course and head off as quickly as you can avoiding anything that gets in your way. Frequent gear changes are required and you will need to watch your fuel gauge if you are to cross the line first. There are no cars coming towards you to worry about, the only real hazard being when the screen turns black at night time!

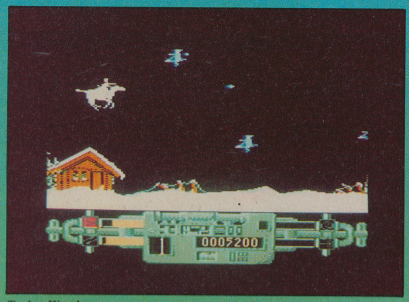


Stunt Bike Simulator

My opinion of stuntmen is that they must have an IQ almost as low as Leeds United supporters or magazine editors. Anyone who wants to do that for a living has got to be crazy. Nevertheless, is seems that there are plenty of crazy people about, and at the moment there is no law against stupidity. *Stunt Bike Simulator* (that seems to be Firebird's favourite word this month) lets you dodge obstacles as you attempt to catch men leaping off hang gliders, jump through rings of fire and try to catch hold of passing helicopters.

The theme of shoot 'em-ups whereby as you improve, so you collect bigger and better weapons has been done to death over the past year. So what have Firebird done to add a spark of originality in *Trojan Warrior?* They have got rid of the ubiquitous spaceship and in its place, substituted a man on a winged horse! And what is the object of your quest? Yes, its yet another princess that has managed to get herself captured! Don't call us, we'll call you.

The final release on the Silverbird label is *Slimeys's Mine* retailing at £2.99 (all the others are £1.99). Hopping from asteroid to asteroid, you must find the entrances to the mines which in turn need to be explored in order to find and assemble bits of a spaceship. Once inside the mine, a screen can only be left when you have shot sufficient aliens to find a red diamond. There are assorted bubbles and boulders to be avoided and maps and banana bombs to be acquired. A decided novelty this month, an original idea!

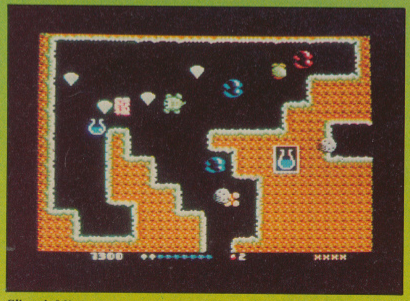


Trojan Warrior

From Codemasters comes *Poltergeist,* a thirty-two level shoot 'em-up on the lines of *Trojan Warrior* above but without the originality. It is however a lot faster, more complex and better designed than its rival and represents much better value for money.

One of the most interesting budget games is *Rogue* from Mastertronic. It is a sort of one player role playing game-dungeons to be explored, treasure to be found and monsters to be bashed. The map of your surroundings is quickly drawn, all you do is use the pointer to indicate where you want to go. The pointer is also used to manipulate any objects that you find so that you can wear armour, weild (sic) a weapon, eat food etc. You have a number of hit points determining how much damage you can sustain, but you must also watch your ever decreasing strength which needs food or magic to replenish it.

The game doesn't quite work in so much as it is too easy to get killed early on. One of the problems is that combat depletes your strength rapidly as well as your hits and the game tends to be over before you know it. Should you manage to survive the early stages – the use of magic items is necessary, you can save your current character to live and fight another day.



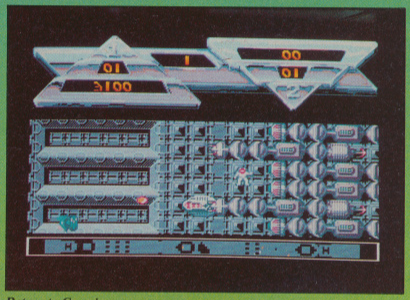
Slimey's Mine

Amiga Games

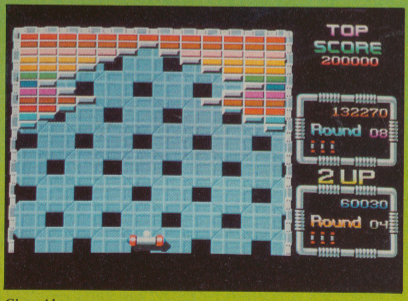
Things are also quiet on the Amiga front this month with no games that really make you sit up and take notice. Pick of the crop is undoubtedly *Bards Tale II* from Electronic Arts, an excellent although difficult role playing game. There are spells and monsters galore as you battle your way through dungeons and wilderness searching for the seven parts of the destiny wand.

Peter Beardsley's International Soccer is released at an unfortunate time, coming shortly after England's dire performance in the European Championships. The game is almost as lack-lustre. The animation of the players is jerky, the computer opponent too difficult and all too frequently, the wrong player put under your control. The added features of throw ins and corners add little to the game. Best stick to playing against a friend.

Still on the sporting theme, *World Tour Golf* from Electronic Arts. Not quite as playable as *Leaderboard,* it nevertheless offers a real challenge. Don't do as I did and choose the Nasty Nine for your first course when you don't really know what you are doing. Eighty-two over par for nine holes is not a score to brag about!



Return to Genesis



Giganoid

Return to Genesis from Firebird is a shoot 'em-up involving the rescue of a load of scientists. Guess what? Some of the scientists can give your ship extra weapon systems. Now where have I heard that before?

Finally this month comes *Giganoid* from Swiss Computer Arts, an almost exact copy of Arkanoid. Sure, the shapes of the screens have been changed but the falling capsules are identical, even down to the letters on them. Why does 'P' represent a bonus life? Take my advice and stick to the original.

YC

F.S.S.L

FINANCIAL · SYSTEMS · SOFTWARE · LIMITED

BASIC 8

Unleash the hidden graphics power of your 128. At last, your Commodore 128 can rival the 16 bit micros! Imagine your 128 in 80 columns producing a resolution of 640 x 200 in mono and 640 x 192 in 16 colours without any additional hardware! (640 x 400 version available soon.) Sounds impossible? Not with Basic 8, the new graphics language extension.

Basic 8 adds over 50 Hi-Res graphic commands to C128 Basic. Just select one of the many graphics modes and draw 3-D lines, boxes, circles and a multitude of solid shapes with a single command. We've even added commands for windows, fonts, patterns and brushes.

To demonstrate the power and versatility of this graphics language, we have created Basic Paint, a flexible icon-based drawing application program. Basic Calc, a full featured spreadsheet and Basic Write a simple to use word processor with a multitude of fonts. Also included is an icon based desk-top utility which provides quick and convenient access to each of your own Basic 8 creations.

All this graphics potential is yours for **£34.95**, 64k Video RAM upgrade kit **£19.95** and The Beginners Guide to Basic 8 with disk **£19.95**.

1541/71 Disk Drive Alignment Package

Problems with your disk drive? The alignment package reports the alignment condition of the disk drive as you perform adjustments. On screen help is available while the program is running. Includes features for seed and head stop adjustment. Allows you to test each full and half track as you realign the drive. Complete instruction manual on aligning both 1571 and 1541 drives. Even includes instructions on how to load the alignment program when nothing else will load. Works on the C64, SX64 and 128 in 64 or 128 mode. **Only £24.95.**

1571 FIX ROM

Are you experiencing any of these problems with your 1571 disk drive, Errors when using Superbase? Device Not Present Errors? Major problems when 2 or more open files? Takes forever to recognize a flippy disk? If you have one or more of these problems then you need 1571 FIX ROM, developed by Commodore Inc USA, just plugs in, solves over 19 main problems. **Only £24.95.**

Commodore 1581 Disk Drive

The New Commodore 1581 drive is now available for the C128 or C64. This drive offers one megabyte of memory, THREE THOUSAND ONE HUNDRED AND SIXTY blocks free, (800K formatted capacity), and a very fast EIGHT

continued

The Big Blue Reader

New from SOGWAP Software Inc., The Big Blue Reader is ideal for those who use IBM PC compatible computers at work and have the Commodore 128 or 64 at home. The Big Blue Reader is not an MS-DOS emulator, but rather a unique and easy way to transfer word processing, text and ASCII files between two totally different formats, Commodore and MS-DOS. The Big Blue Reader requires a 1571 on both the Commodore 128 and 64 and will not work with a 1541 or similar drive. **Only £34.95.**

The Drive Box

The drive box allows you to easily change the device number (8, 9, 10, or 11) of your 1541, 1571, 1570 or 1280 computer. It will, as a bonus, allow you to bypass the write protect sensor, allowing you to write to the back side of the disk without cutting a notch. Installation requires a little soldering. **Only £19.95.**

You don't need a new computer to join in the desktop publishing revolution! With Page Builder and Page Illustrator from PATECH Software, your Commodore 128 can compose professional-looking pages.

Page Builder and Page Illustrator are stand alone programs; each with a specific function to perform. Whether used singly or as an unbeatable team, the Two Constructive Ideas are designed to make maximum use of the C128's native power. They were created by publishing professionals who put that power where you need it most – into real performance and utility, not bells and whistles.

Page Builder

Bring the power of personal publishing to your C128. Integrate text and graphics to construct everything from high quality newsletters to professional business forms and presentations. Layout and design is quick and straight forward import text created with your word processor. Wrap it around graphics created with Page Illustrator, then change the look by using a different font or repositioning graphics. **Only £49.95**

Page Illustrator

At last, an 80-column high-resolution drawing package that's powerful and easy to use. Create colourful graphics or have Page Illustrator assist you in drawing simple geometric figures. Create clip-art from any portion of the screen, then mirror, reverse, or flip it. Import graphics from popular drawing packages for your own creations. Page Illustrator is a window and Icon system presented in the Amiga Desktop style. **Only £29.95.**

THOUSAND Characters per second loading rate. Software for this new drive includes, VizaWrite Classic, HackPack, Petspeed, Oxford Pascal, CAD PAK, Chart Pack, Fontmaster, Spellmaster and much more. Using a package called Super 81 Utilities most software can simply be copied across to the new format. The drive is available for **£184.95.**

The CP/M Kit & Users Guide

The CP/M Kit introduces and explains the unknown, third mode of the C128. The CP/M Users Guide is a 300 page book by Abacus Software covering all aspects of CP/M. Subjects which include the system disk, resident commands and disk copying are described in detail. The CP/M kit contains over 20 CP/M programs including a word processor, chess game and a disk cataloguing program accompanied by a detailed guide to running programs in CP/M. The CP/M kit and Users Guide. **Only £34.95.**

Super Disk Utilities

The ultimate utilities disk for the 1571 disk drive and C128 computer. Copy whole disks with 1 or 2 drives, change disk format, perform CBM DOS, CP/M and MS-DOS utility functions, scratch, unscratch, lock and unlock files, write protect disk, contains disk editor, drive monitor, unique RAM writer and more. **Only £24.95.**

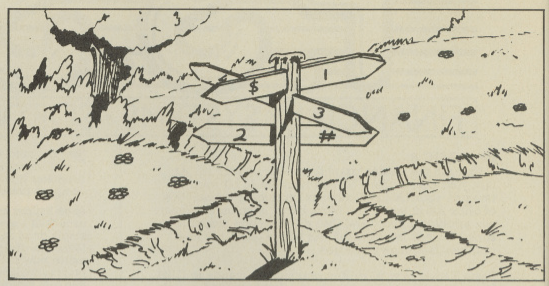
● Merlin 128 Assembler	£49.95
Chartpack 128	£29.95
CADPAK 128	£29.95
Super C	£39.95
Cobol 128	£29.95
Super Pascal	£29.95
HackPack 128	£14.95
RAMDOS	£29.95
Petspeed 128	£14.95
Word Writer 128	£39.95
Swiftcalc 128	£39.95
Data Manager 123	£39.95
Fontmaster 128	£49.95
Commodore 128D	£374.95
1571 Disk Drive	£184.95
1901 Monitor	£210.95
Anatomy of 128	£9.95
Anatomy of 1571	£9.95
Peeks and Pokes	£9.95
CAD on 128	£9.95
Tricks and Tips	£9.95

Access VISA

● Order with Access, VISA, cheque or Postal Order, COD and Express delivery available, foreign orders add £2.50 per package. Prices include VAT and postage. Please allow 14 days for delivery.

18 High Street · Pershore · Worcs · WR10 1BG · Tel: (0386) 553153

Code Relocation



Post process a program and turn it into code that, with a bit of run time processing, can be relocated in any part of memory

By Dave Garside

The area of RAM between $C000 and $D000 has always been a popular area for machine code programmers. The lack of interference from BASIC and the operating system makes this area ideal for small utility programs. Consequently almost all utility programs published are written to run in this area.

Now while this is no problem when each utility is used in isolation, it would often be nice to combine some utilities into a tool set. The problem then becomes one of space and memory conflict. Because the chances are that the particular routines you would like to combine occupy the same area of store.

Of course there would be no problem at all if the offending code could be relocated to a different part of memory: after all there is plenty of space available. However 6502 code is hardly ever relocatable. The reason being that because of the nature of the instruction set, it is extremely difficult to write relocatable code for anything but the simplest of programs. However it is possible to post process a program and turn it into a code that, with a bit of run time processing, can be relocated to run in any part of memory. The utility presented here provides the tools to perform that processing.

How It Works

The easiest way to explain how the relocator works is through a simple example. Consider the following piece of source code:

```
        ldx # 0
b1      lda store,x
        beq f1
        jsr charout
        inx
        bne b1
f1      rts

store txt "this is a very trivial example"
        byt 0
charout=$ffd2
```

Assembled to memory locations $c000 and $4c00 the above routine would appear as follows in a disassembly:

```
c000 a2  00    ldx  # 0
c002 bd  0e c0 lda  $c00e,x
c005 f0  06    beq  $c00d
c007 20  d2 ff jsr  $ffd2
c00a e8        inx
c00b d0  f5    bne  $c002
c00d 60        rts
c00e 54        byt  $54
c00f 48      etc for rest of string
4c00 a2  00    ldx  # 0
4c02 bd  0e 4c lda  $4c0e,x
4c05 f0  06    beq  $4c0d
4c07 20  d2 ff jsr  $ffd2
4c0a e8        inx
4cob d0  f5    bne  $4c02
4c0d 60        rts
4c0e 54        byt  $54
4c0f 48        etc
```

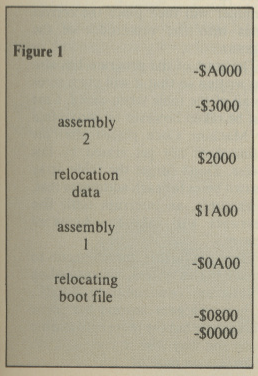
If we consider the binary representation of the two pieces of code it can be seen that the only bytes that are different are those containing the high byte of the start address for the text string 'store'; the relative branches will have the same offset values, the address for charout is the same in both cases and the low byte of the start address for store is the same because both routines are assembled to start at a page boundary.

This establishes the first principle on which the relocator is built – when a program is assembled to two different parts of store, each starting at a page boundary, the only bytes that will differ are the high bytes of addresses that vary with the program start address. And these bytes can be identified by comparing two such assemblies.

The relocator does just that, but on finding a difference it replaces the byte with a marker value and stores the offset value (actual value-start address) in a table appended to the end of the program. Before it can do the comparison the relocator has to decide the marker value, which must be a value that does not appear in the program being processed. It does so by doing an iteritive search on the first assembly until it finds an unused byte. This might seem to constrain the use of the utility, but in practice programs that use all 256 possible values are rare unless they contain lots of graphics.

Once the program has been processed the utility appends a file containing the user end of the relocator to the beginning of the market program, and then saves out the whole package as one complete file. The overall memory requirement for producing a relocatable version of a 4K utility is shown in Figure 1.

Figure 1



From Figure 1 the following constraints can be deduced:

(1) The lowest point in memory for the first (processed) assembly is $0800 plus the length of the boot file which is fixed at $0200 bytes.
(2) The second assembly must start above the first, although it is not necessary to allow space for the relocation data as the second assembly is only processed once and it does not matter if it is overwritten by the data table.
(3) The end of assembly 2 must fall below $A000.

This gives a limit to the size of a relocatable program of $9400/2 bytes i.e. approx 18K, which is more than enough for most utility programs.

The relocating boot file simply does the reverse of the relocating processing: it prompts for the new start address and scans the program from start to finish for the marker bytes. If it finds a marker, it looks up the relevant offset in the relocation data, adds the high byte of the new address and pokes the result back into the program.

When all the markers have been processed the program is booted to the start address and the user is prompted as to whether the program is to be executed. If the answer to the prompt is positive, control is passed to the first instruction of the program. Note that this is the final constraint on using this utility; the first instruction of the program must either be the run address or a jump to the real run address. If the user does not want to run the program immediately, control is returned to the interpreter and the start address is displayed in decimal.

Using the Utility

There are really two sets of user instructions, one set for the programmers producing relocatable programs with this tool, the other set for the end users.

The user – using a relocatable program is simplicity itself. The program formed by the relocator is a machine code program with a BASIC front end, so the program is loaded and run as you would a BASIC program. From then on all the required information is given on the screen.

The user is supplied with the length of the program and asked to provide the new start address, which is done by over-typing the default address of $C000 and pressing return (note that the start address given must be such that the boot program is not overwritten, i.e. the area $0800-$0A00 must not be used). The program is relocated to that address and the user is then asked to indicate whether the program is to be started straight away. A negative response results in the start address being supplied as a decimal figure, an affirmative reply activates the program.

The Programmer – to produce a relocatable version of a program follow these steps:

•Load and relocate the utility as described above, but do not run the program.
•Assemble two versions of the program to be processed according to the constaints identified above.
•Now run the relocator by SYSing the start address.
•From this point follow the instuctions given by the program.

NB There is only limited error checking provided by the program, so ensure that disk drives, etc are connected and switched on, and there is sufficient room on the disk/tape to receive the finished program.

Finally by way of an example of the increased flexibility given by relocatable programs, I've included (listing 2) a version of the public domain program 'Supermon 64'. This version will relocate to anywhere in normal RAM so is really useful when developing machine code programs because you can squeeze it into any available 2K slot.

Both the Relocator and Supermon are supplied as BASIC loaders and the following procedure should be observed:

•Type in the listing.
•Save before running.
•Run the program which will convert the BASIC data back to machine code.
•At the prompt, give a filename, and at the following prompt specify tape of disk.
•The program will be automatically saved and can then be tested.

See listings on page 61

A Short Interlude

We follow on from last month's explanation of how to use interrupts to carry out several tasks at once

By Michael Tinker

The routine presented this month is much more sophisticated and a lot easier to use particularly with utility interrupt programs.

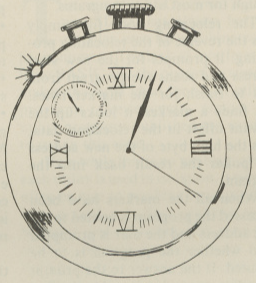
To refresh your memories (no pun intended), last month's program executed up to five interrupt routines stored in a short table. This enabled varying numbers of routines to be used at once.

The main shortcoming with the last program was that it was virtually essential to use a Machine Code monitor to add or remove routines from the table of interrupt routines. Therefore this month I have added a "wedge" into the CHARGET routine to enable the extra facilities to be added.

These facilities are a list command which will list all the interrupt addresses being called, an add command to enable addresses to be added to the table and a remove command to enable easy removal of interrupt routine addresses in the table.

How does it work? First allow me to give a quick explanation of what a wedge is. A wedge is a small routine placed into the operating system of the computer so that when a predetermined action takes place the wedge will pass control to your own routine.

In this routine I have placed the wedge into the CHARGET routine which is used to get a character from the input buffer when in direct mode or from a BASIC program when one



is running. The wedge routine first checks that the computer is in direct mode then looks to see if the first character is the left arrow symbol. If it is, further checks are made to find out what the command is.

For the commands I have chosen "A" for add, "R" for remove and "$" for table directory. The full commands are as follows:

- left arrowAinterrupt #, address (in decimal)
- left arrowR interrupt #
- left arrow

For example: left arrowA2,12288 will add the routine address 12288 into interrupt number two position in the interrupt table and the routine will then be called on every interrupt along with any further routines in the table.

Notice that the system also stops the interrupts while it inserts the address into the table and restarts them afterwards. This will prevent a complete "lock up" while the address is only partly changed.

One of the features of this improved system is that when using the Mikro Assembler program listing the size of the table can be easily changed. At the top of the listing is the constant called Maxint; this gives the maximum size of the interrupt table.

To change the size all that you need to do is to change this one number before assembling the program. The assembler will then place the correct values into the remainder of the program.

The start of the program has also been written so that it will place zeros into all of the table when called. Care must be taken however to ensure that any Machine Code placed after the routine does not get erased by this process. Don't forget the table array uses two bytes for each address so that, for example, an interrupt table five interrupts will take ten bytes of memory.

There are further improvements to be made to this system, such as adding the interrupt commands to BASIC, this however goes beyond the scope of this article but the more enthusiastic among you may wish to try. YC

See listings on page 61

The day Roger Jackson sent his first mailshot.

I was impressed by the fact that Star have now produced a great looking little budget printer with a 24 pin head.

I was impressed by its excellent quality – the 8 resident fonts available and its high density letter quality helped me produce a really professional mailshot.

I was impressed by the extremely swift draft elite speed of 170cps and LQ elite at 57cps and the standard 7k buffer.

I was impressed by the special push-tractor feature that allows the LC24-10 the lowest possible tear off and its ability to 'park' continuous paper and load single sheets automatically – so there's no need to remove the continuous.

I was impressed by the touch-button front control panel that makes using the printer an absolute dream.

But most of all, I was particulary impressed with myself.

Because my Star LC24-10 was so inexpensive and no other printer comes close for sheer quality and value-for-money.

THE Star COMPUTER PRINTERS

Star Micronics U.K. Ltd.
Craven House, 40 Uxbridge Road,
Ealing, London W5 2BS.
Telephone: 01-840 1800.

A division of
Star Micronics Co., Ltd., Japan.

Please tell me how the Star LC24-10 can handle my printing needs.

Name _____

Company _____

Address _____

_____

Postcode _____ Telephone _____

Or just call Belinda on 01-840 1829.

24 YC 10

May I Interrupt

Fine tuning is the key to setting up a continuous music routine

By Eric Doyle

No game is complete without sound effects and music. The art of programming sound involves the impressive array of registers which forms the SID chip and, though I did not intend to go into depth on this subject, a little understanding of the nature of the chip is essential.

Sound effects are 'spot effects' which means that something occurring on the screen is accompanied by a synchronised sound. This is often better handled outside the interrupt system and music is the usual area of interest for interrupt handling.

A sound has several elements; pitch, loudness and shape. In reality, this is a complex relationship but on the SID chip complexity has to be created. The majority of programmers can never hope to reach the symphonic complexity of Rob Hubbard's work, but impressive sound can be produced with a modicum of knowledge and skillful editing.

Each of the three voices of the SID can span seven octaves and the range is more akin to a violin than a piano. This is because a piano has fixed notes which cannot easily be altered (tuned). Play each successive note on a keyboard and the best result is still a series of steps. A violin can produce the same accepted range of notes which form the western concept of music but, by sliding a finger up and down the strings, a continuous rising or falling sound can be produced which includes frequencies that are not catered for in the accepted concept of scales of equal temperament.

The SID is stepped but only in small increments which can fool the ear into believing that a continuous, rising note is being produced. For sound effects this is wonderful, but for music a certain degree of editing is necessary.

In machine code programming, a look-up table based on Table 1 is faster than calculating the value of each note's frequency. All frequencies in the range have values greater than 255, or one byte. For this reason each voice has two locations for the pitch frequency – a low byte and high byte store.

Beyond pure pitch a sound has a shape. Sharply press a key on the piano and a sudden noise is produced. It rises to full volume instantly and then dies away gradually, bang a table and the sound appears and disappears almost instantaneously, or draw a bow across a violin string and the note will gradually build up and fade. There are four elements which describe a sound shape to the SID: attack, decay sustain and release. Together these elements are known as the sound or ADSR envelope.

Attack is the time taken for the sound to reach full volume. Decay, sustain and release are related and describe the way in which the sound dies away. Decay describes how quickly the sounded note falls away immediately after maximum volume is reached, sustain determines the time at which the release phase takes over from the decay and release is how quickly the note disappears. Effectively, decay and release are two parts of the same downward slope separated by the sustain plateau.

For the piano, a short attack phase would be followed by a slow decay and a fast release, the banged table would have a fast attack followed by a fast decay and release, and the violin would have a slower attack followed by a slow decay and moderately slow release. Most diagrams of the ADSR show sustain as a plateau but this is not always the case. Sustain determines how long the decay lasts before release takes over (Diag 1).

Another aspect of sound shape is the waveform. This can be sawtooth, triangle or pulse, each name describing the oscilloscope trace which the wave produces. Sawtooth and triangle are also very descriptive of the sounds that they produce – sawtooth is a rasping sound and triangle gives a gentler, ringing tone.

Pulse is more variable than the other two and is as near to a pure sine wave that the digital nature of the computer can produce. When using pulse a width has to be specified for the wave which determines the harmonic qualities of the sound.

Getting Down To It

Machine code is far more suited to music programming than Basic. On a keyboard notes are played simultaneously but the computer initiates one note at a time. A chord in Basic takes time to create and often sounds as though the notes were pressed in quick succession. This is similar to what occurs with code but the time delay is so short that the notes sound simultaneous.

The first task in programming is to decide how to store the notes. In the program example, the method used is not the most efficient but it does show the principles to best advantage and gives a basis from which to work.

A note consists of a pitch and a duration. To specify duration on the Commodore, the note length is based on the demi-semiquaver which has a duration of one cycle. This means that

the crotchet has a value of eight cycles. In the code this is directly expressed by the number of repeats of the note in the data. Examine the low byte data for Voice 1 and these repetitions can be seen within the numerical values.

Each note has a high and a low byte so there are two tables relating to each voice.

Voice 1

$C000 – $C148 High frequency
$C150 – $C298 Low frequency

Voice 2

$C400 – $C548 High frequency
$C550 – $C698 Low frequency

Voice 3

$C800 – $C948 High frequency
$C950 – $CA98 Low frequency

The spaces between the tables pairs are occupied by waveform values.

$C2AO – $C3E8 Voice 1
$C6A0 – $C7E8 Voice 2
$CAA0 – $CBE8 Voice 3

The ADSR values and volume are constant throughout so the core routine starts with these at line 310 of the assembly code. Most of the waveforms used by these ADSR values are triangular but Voice 2 uses a pulse occasionally and must have a pulse width set. This is also created at the beginning of the core at lines 450 to 480.

These values are constant and may be set outside the routine as long as any program running with the music does not access the relevant locations. Ideally the routine should store all of the SID values at the commencement of the interrupt, set the music parameters and replace them original values on leaving.

Setting the sound frequencies and waveforms is done by a self-modifying program which increments the load location where the notes are found. Lines 490 to 660 relate to the fetch and poke locations for the pitch parameters and lines 790 to 960 increment the relevant locations within this routine ready for the next interrupt.

The interrupt must be able to repeat at the end of the tune. This means resetting all of the parameters for fetch commands. To do this, lines 670 to 720 test the high byte values for Voice 1 to see if location $C298 has been reached. If the test proves true then control is handed to the reset routine at 730 to 780 before returning from the interrupt.

If the routine was now used as an interrupt, the music would rattle through at a high rate of knots. Some form of tempo control is needed.

Lines 250 to 300 cope with timing by aborting four out of five interrupt calls. A flag is set up at location $CCFF with a value of four. As each interrupt call is made, this flag is reduced by one. When the flag reaches zero it allows a full music interrupt to occur and resets the flag to its original value ready for another countdown.

Lines 1110 onwards sets up the interrupt in the normal way, remembering to include the interrupt enabling structure at 970 – 980.

Musical Chores

The problem with music is that it is rhythmical. This means that timing is crucial and disk or tape access will totally halt the tune but the main enemy is accompanying interrupts.

Chained interrupts can be used alongside the music routine but the effect on the music can be drastic. Interrupts for screen scrolling use long and short routines and care must be taken to allow for any delaying effects which these may cause. Raster linking can assist by further tying the routines down to reasonable lengths.

The inhibitive length of the music data as presented in the example program would obviously use too much memory for most practical purposes. The contents can be greatly reduced if an indexing system is used.

Set up a table of all the necessary frequency values and use a numbering system such as $01, $08, $11 to indicate the lowest note on the table held for eight sixteenth notes (a crotchet) with a triangular waveform. The frequency values could then be found and poked to the relevant registers at the same time as the waveform. The duration can be stored in a location and decreased each time an interrupt is called until it reaches zero. Then the next value can be called up.

Such a system requires quite a lot of work from the interrupt routine but does increase the flexibility of the program.

The data can be pushed under a ROM, to free even more easily available RAM, if the relevant changes are made to location 1 on entering the interrupt and reset on leaving.

Using the Example

The example program can be tested by poking $CCC2 (52418) with $CC (204) and the next location with $10 (16). Location $CC8C should then be poked with $60 (96) and then SYS 52237 will run the tune once.

When all is correct the changed values can be reset and SYS 52480 will run the interrupt. YC

Table 1

	Octave							
Note	0	1	2	3	4	5	6	7
C	010C	0218	0430	0861	10C3	2187	430F	861E
C#	011C	0238	0470	08E1	11C3	2386	470C	8E18
D	012D	025A	04B4	0968	12D1	25A2	4B45	968B
D#	013E	027D	04FB	09F7	13EF	27DF	4FBF	9F7E
E	0151	02A3	0547	0A8F	151F	2A3E	547D	A8FA
F	0166	02CC	0598	0B30	1660	2CC1	5983	B306
F#	017B	02F6	05ED	0BDA	17B5	2F6B	5ED7	BDAC
G	0191	0323	0647	0C8F	191E	323C	6479	C8F3
G#	01A9	0353	06A7	0D4E	1A9C	3539	6A73	D4E6
A	01C3	0386	070C	0E18	1C31	3863	70C7	E18F
A#	01DD	03BB	0777	0EEF	1DDF	3BBE	777C	EEF8
B	01FA	03F4	07E9	0FD2	1FA5	3F4B	7E97	FD2E

Football Manager II

The world's most famous football game has a sequel. Football Manager caused me more bleary eyes and sleepless nights than any other game. Now it's all going to start again.

Much of the original game is still there, after all, why change a winning formula. You still manage your favourite team and you begin your reign at the foot of the fourth division. Nine skill levels decide the difficulty of the task that lies ahead and you must use your skill to pick the teams that will win you league and cup glory and buy and sell players to fill your squad and you still have to stand helpless on the sidelines while the matches are played.

The first thing you'll notice when you take over the manager's chair is that the players have changed. They are still rated for skill and fitness but the Peter Withes, Gary Shaws and Tony Morleys of the original have been replaced by Gary Lineker, Ian Rush, Mark Hughes and Brian Robson.

The fitness factor is now rated out of 100 and if a player's fitness drops below 50 he's injured and out for at least the next game. The team selection has now become more meaningful as you must select players to fill forward, midfield and defensive positions. Since there are four positions in each (and of course, a goalkeeper) you can't fill them all which gives you scope to change the formation and man to man markings.

You can also assign two substitutes to bring on at half time to fill any gaps exploited in the first half or open up play by bringing on a winger for a defender.

In the original game the outcome of a match was decided in the difference in skill totals for various areas of the field but now the more realistic player vs player match results in more action and more control over the final result. For example even if the total of your three defenders is greater than the opposing attack; if you leave a skill 3 forward unmarked you're asking for trouble.

The games themselves consist of untimed highlights but instead of just a selection of set moves the players dribble, pass and cross the ball and shoot at a diving keeper. The action is still played at a snailspace, after all this is no International Soccer but even slow action can get the adrenalin going in a crucial promotion or relegation battle.

In between games you can alter the style of play by having extra passing practice and increase or decrease the height and length of the passes and determine whether your side is going to be short passing team like Liverpool or adopt the hit and hope style of Wimbledon and Watford. There's more to this than the style of play as long high balls from defence can bypass a weak defence and get the ball straight to your forward line.

Football Manager II is a tidier game as the program now tells you which of your players scored the goal including midfielders, money that you receive at the end of the season to bolster your failing bank account that you squandered on a third goalkeeper comes now in the form of shirt advertising deals. The deals that you're offered vary considerably and the number of deals depend on your management rating so if you're doing badly you should take the first deal offered because if you turn it down there might not be another.

A longer 23 match season and two cups (FA and League) to play for will suit Football Manager fans who will wallow in every game but may put off others who prefer less thought and faster action.

T.H.

Touchline:

Title: *Football Manager II.* ***Supplier:*** *Addictive Games (Prism Leisure), Unit 1, Baird Road, Enfield, Middlesex, EN1 1SJ.* ***Tel:*** *01-804 8100.* ***Machine:*** *C64.* ***Price:*** *£9.99 (Ca) £14.99 (Disk).*

File Extension

Now you can load and run files from a directory in a single key press with this basic utility

By James Kliemt

Normally after listing a directory, loading a file involved moving the cursor to the file name, typing LOAD, cursoring through the file name, typing either ",8,1" or "8", spacing over the three-letter file description and finally pressing RETURN. File Extension permanently writes the load description to the end of any file you nominate. To load a file thereafter, you simply list the directory, cursor up to the file name and push SHIFT & RUN/STOP.

File Extension will work on a Commodore 64 or 128 in 40 or 80 column modes. The program is in Basic, therefore there are no special instructions – just type it in and save it as you would a normal program.

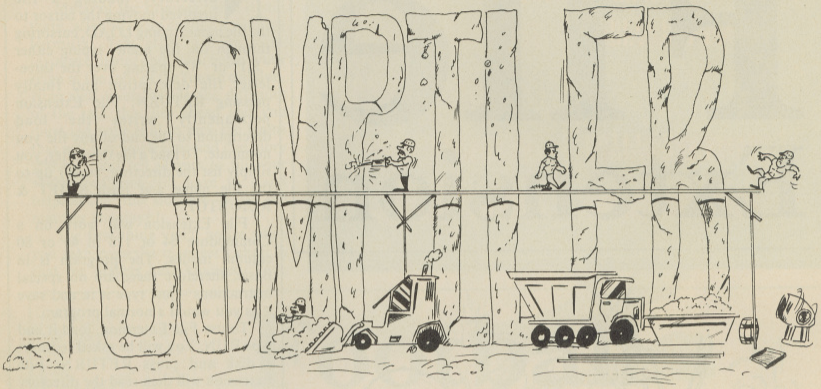
To use File Extension, load it and type RUN. You will be asked to insert a disk and press RETURN. File Extension will then read the directory and print it to the screen. You can stop the directory at any time by pressing SPACE. If it is finished reading the directory or you have pressed SPACE, you will be taken to the main menu. Here you are presented with the current file name displayed in the top left hand corner of the screen and a list of options. Use cursor up and down to view other file names in the directory. Pressing HOME will take you to the first file name in the directory and SHIFT HOME will take you to the last.

Once you have selected the file you wish, press the appropriate key. If you press 1, the computer will add ,8: to the end of the file name – the load description for any basic file. Pressing 2 adds ,8,1 to the file name – for binary or machine language files. Pressing 3 will result in a : being added to the file name. This is for 128 files.

A number of other options exist. Pressing the minus key will erase the current file. The @ key allows you to access disk commands such as validate, new, etc. R lets you rename the current file and P will list the directory to the printer. Any time you wish to view the disk status, simply press S. Once you have completed operations on a disk, press SPACE to return you to the insert disk option.

See listings on page 61

Constructing a



We hope your typing fingers are in good shape as we launch into the next two programs in the FCL compiler series – the code generator and the assembler

By Steve Carrie

Although codegen may look rather complicated, its operation is very simple. It reads the .SFC file created by compile and generates an assembly-language source file .ASM. Codegen is able to recognise the operation codes in the pseudo code file and how many opcode bytes each should have. (These codes were listed last time.) It then uses a library of preset assembly-language lines to make up the output file. Some of these library routines simply make a call to the SYSLIB library, others are several lines long and perform data transfers between the system variables and other memory locations.

Codegen is also responsible for making the program header to allow the final runtime file to be loaded and run as if it were a BASIC file. If you already have a disk-based assembler, you may not need to use the assemble program at all since it is easy enough to change the preset routines in codegen to suit your particular program.

Most of the work done by codegen is performed in subroutines, the first section of the program simply diverting control as necessary. The first task is to read in the two data files containing symbol and string information (the .SYM and .LTR files). These are entered into tables in a similar format to those in compile. The next task is to open the work files and generate the program header. This header contains the org directive for the assembler and this should be changed if the program is to be loaded at an address other than the default start of BASIC at 2049 ($0801). Next, the symbol and literal tables are processed. The tables are updated with information regarding the position of variables within the program. Codegen knows how much memory should be allocated to each type of variable and it also generates the literal strings in the correct format. Once this is done, work can then begin on the program itself.

The code is read one line at a time and control is passed to the pseudocode processing subroutine which in turn passes control to the appropriate routine to generate the assembly source text. As you may recall, some codes require operands and each routine knows how many operands it needs and reads them as required. There are two distinct blocks of routines; those handling pseudocodes 0-33 and those handling codes 128 to 191. The latter set of codes are the keywords.

During code generation, the program keeps track of how many lines are being generated into the .ASM file. The only problem that may arise here is if the disk space becomes scarce, the process will abort.

If, during code generation, a "Not Implemented" message appears, some illegal opcode has been found. This may indicate an error in compile. While on the subject of the opcodes, you will need to add extra lines to codegen if you decide to extend the compiler system with new commands.

The compile program should automatically load and run codegen for you (assuming the compilation was

error-free). When asked for the filename, you should enter exactly the same as you did for compile.

Codegen will report the number of lines being generated as it processes the pseudocode file. Upon completion, codegen will load and run the FCL ASSEMBLE program.

The only possible error is the "not implemented" message which indicates that an opcode was not recognised. This may mean one of two things:

- there is an error in compile, or...
- You have added new commands to compile without adding the necessary handlers to codegen.

The Assembly Stage: ASSEMBLER

Assemble is a very basic two-pass assembler written entirely in machine code and is presented here as a BASIC loader. It must be loaded and run as if it were a BASIC program only at the default BASIC start address of 2049 ($0801). The reason for writing this program in machine code will be obvious when you run compile, BASIC would be very very slow... In order that the program loads at the correct address, you must ensure that it is constructed at 2049. *Before you start typing in the BASIC loader, execute the following command in direct mode.*

```
POKE 8192,0:POKE 44,32:NEW
```

This moves the start of BASIC upwards in memory to 8192 decimal ($2000 hex). If you are entering the program in stages, make sure that you type this command every time BEFORE you start and make sure you haven't got EDIT installed!

Since I have had considerable assembler-writing experience, I didn't really need to spend time working out the routines required and coded directly into machine code. Actually, the original version of this assembler was written on a PLUS/4, as was the original version of compile, and converted across to the 64.

The next bit is a short user manual for the assembler which is entirly disk-based in its operation; i.e. there is no assemble-to-memory option available.

FCL Assembler User Manual

In the following document, **boldface** characters are used to represent valid assembler directives only. This program will switch the character set to lowercase mode and it should be noted that uppercase characters are only allowed in literal strings or comment lines.

Getting Started

The program should be loaded as would a normal BASIC program using the LOAD command. If you are using assemble as part of the FCL Compiler System, the codegen program will automatically load and run the program for you.

The program file to be assembled should have extension .ASM by default. The program will request input of the filename; you should only enter the first part of the name e.g. to assemble PROG1.ASM you need only enter PROG1 when asked for the filename. The assembler will produce a file with extension .EXE; e.g. for the above example, PROG1.EXE.

During assembly, information will be printed on the screen relating to the current program state. During PASS 1, no messages other than the pass message will be output unless an error occurs whereupon an error message is printed and assembly aborted. During PASS 2, the program will be listed as it it processed. Again, any errors will cause an error message to be output and the assembler will stop.

On completion of a successful assembly, information relating to the start and end addresses of the program will be printed. The start address of the program is deemed to be the load address. Runtime .EXE files should be loaded using a specially written loader or use secondary address 1 in a BASIC LOAD command; e.g. LOAD "PROG1.EXE",8,1

Directives

There are seven directives valid with this assembler:

- byt – assemble a byte value. May also be used to assemble a line of text delimited by single quotes (').
- wor – assemble a word value (2 bytes) in 6502 lo-byte, hi-byte order.
- eqz – Equate zeropage. Explicitly define a symbol as type 'byte'.
- eqa – Equate absolute. Explicitly define a symbol as type 'word'.
- org – Set code origin. Sets the assembly address and therefore the load address of the a assembled program.
- res – Reserve a block of memory. Memory bytes are initialised to zero.
- (full stop) Define a symbol. May be followed by an equate or either byte or word type. If no equatea follows then the current assembly address is used; i.e. defines a line label rather than a symbol.

Operators

The assembler accepts normal 6502 assembly language notation and addressing modes. The hash (#) denotes an immediate operand and the symbols < and > may be used to define lo-byte or hi-byte operations. A full list of operators is given below.

Operator	Action	Example of Use
<	lobyte	lda #< symbol
>	hibyte	ldx #> symbol
+	add	lda symbol+1
-	subtract	ldx symbol-1

Numeric Types

Only decimal and hexadecimal types are catered for. A hexadecimal number must be prefixed with a dollar or ampersand while a decimal number need no prefix at all. For example:

$8000 as in lda $8000 means address 8000 hex (32768)
8000 as in lda 8000 means address 8000 decimal

Error Messages

Error messages may be printed out by the assembler during either pass 1 or pass 2. Errors during pass 1 are normally syntax-type errors where the programmer has misspelt a word or used an illegal character sequence. Errors during pass 2 include those of pass 1 and also symbol-type errors such as relative branch range errors.

These error messages are listed in Fig 1. and are printed in either of two formats. During pass 1, the line in which the error occurred is printed and the error message is displayed below

it. During pass 2, the program is being listed anyway so only the error message is displayed.

Assemble Error Messages

Undefined symbol error – indicates that a symbol has been referenced but has not been defined using the directive (full stop).
Redefined symbol error – indicates that a symbol has been declared twice or more times.
Mnemonic not recognised – the mnemonic found was not a standard 6502 type or assembler directive.
Bad symbol error – means that a symbol was syntactically incorrect.
Illegal Operand field – occurs when an operand is syntactically incorrect.
Illegal Mnemonic field – indicates that a mnemonic was expected but something else was found instead.
Missing operand error – an operand was expected but was not found.
Disk file error – file is missing or possibly the disk is faulty or full.
Syntax error – this is a general message, possibly indicates a bad operator.
Illegal quantity error – indicates that a numeric literal was out of range, i.e. too big.
Illegal addressing mode – indicates that you have tried to use an instruction in an incorrect addressing mode.
Not X or Y index – only X and Y index registers exist on the 6502. You have specified an incorrect index.
Symbol table full – assembly cannot continue due to lack of symbol workspace.
Branch range error – relative branch instructions have a range of -128 or +127 bytes. You have exceeded these limits.

Example of an assembly language source program.

```
10   ; Example program
20   ;
30   org $c000
40   .border eqa $d020
50   .screen eqa border+1
60   ;
70   .start ldx # 0
80   stx border
90   stx screen
100  inc border
110  .loop1 inc screen
120  lda screen
130  cmp # $0f
140  bne loop1
150  inc border
160  stx screen
170  lda border
180  cmp #15
190  bne loop1
200  .exit
210  rts
```

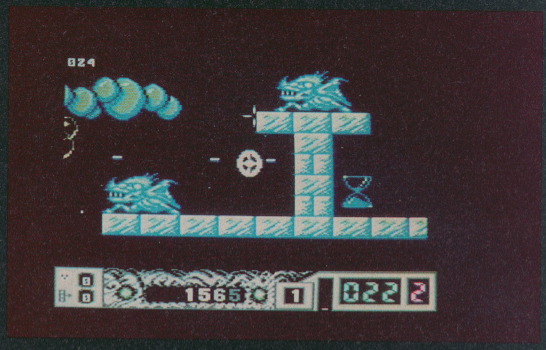
Note the use of the symbol declaration directive (full stop) and the combination of symbol label and instruction in line 110. Lines 200-210 show how you may place these on separate lines. Remember that the org directive not only sets the code origin, it also sets the file load address on the disk. This is important because the address defaults to $0000. Loading a file at this address will almost certainly crash the machine!

So now you have EDIT, COMPILE, CODEGEN and ASSEMBLE. Next time I will present the final part of the system, the SYSLIB runtime library and some example programs will also be included.

See listings on page 61

VG

Netherworld



Touchline:
Product: *Netherworld.* ***Supplier:*** *Hewson, 56B Milton Trading Estate Milton, Abingden, Oxon OX14 4RX.* ***Machine:*** *C64/128.* ***Price:*** *£7.99 (£14.99 disk).*

I used to think chocolate milk was addictive! Netherworld is definitely a game to test your willpower as much as your joystick skills. I haven't been so hopelessly addicted to a game since Boulderdash (to which this game owes more than a passing resemblance). Jukka Tapanimaki may be testament to the programmer's art in Finland, but this man is obviously in need of psychiatric help!

Trapped in a fantasy world with nothing more than your multi-firing gyrosphere to protect you, the only way back to normality (?) is by battle and bribery. Acid, bubble-belching dragons are your worst enemy, but never forget that time is no friend either. Steer your ship around the maze, collecting diamonds and egg timers (the latter extends your time limit in your favour) until you have enough diamonds to bribe the guardians of the teleports into letting you proceed. Until then, you can only use the teleports for 'local' trips, these being quite useful once you've worked out where each one deposits you. Shooting acid bubbles can produce items that when collected, help you on your way, increase your score, or merely serve to hinder you.

After succesfully completing level one, a devilishly tricky bonus round is your next task, although completion is not obligatory. By pushing moveable rocks into positions, the flying blob is directed into the converter grid a valuable extra life can be collected.

Levels two and beyond are infinitely more difficult with the inclusion of 'nasties' generators, alien eggs, moveable rocks and various other hinderances.

Although the game play is reminescent (to me, anyway) of Boulderdash (collect-all-the-diamonds-and-the-exit-before-the-clock-runs-out), the graphics belong to the age of Uridium (ultra-smooth, ultra-fast scrolling) and 10 (imagine-your-worst-enemy's-worst-nightmare). Your gyrosphere responds well under joystick control, its 'natural' inertia took quite a bit of getting used to – a lot like Paradroid (I don't like drawing comparisons like this but sometimes it's the only way!). Chancing the mystery bonus (after shooting acid bubbles) can provoke some weird results – your gyrosphere can suddenly respond back to front and upside down (inverting your joystick gets you out of this quite nicely) or you could lose control completely for a while. On the plus side, you could gain extra speed, a demon killer, or be able to knock out bricks. The latter two features are cumulative not to mention essential to solving the higher levels.

Soundwise, the inter-game music narrowly escapes 'disgustingly bad' but knocks spots off one or two Amiga soundtracks I could call to mind! Sound effects (muzee-speek ekwivelent = SOWNDEFX) are useful rather than tuneful – and so they should be.

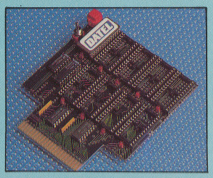
Well done Hewson (nice press do), more of the same please! This Finnish geezer is pretty hot stuff – the bonus round is probably worthy of a game on its own! It's pretty rare for one of my reviews to have nothing but praise, so take a pat on the back all round. I only hope I can squeeze my meals in between attacks of Netherworld.....

F.R.

DATEL ELECTRONICS

256K SUPEROM EXPANDER

- Now you can select from any of 8 32K EPROMs instantly.
- 8 sockets to accept upto 32K EPROM in each.
- On board operating system – no programs to load.
- Program your own EPROMs using our EPROM programmer.
- No need to have loads of cartridges – just make a selection from the Superom menu.
- Directory of utilities on power up.
- Fully menu driven on power up.
- Select any slot under software controls.
- Unique EPROM generator feature will take your own programs – basic or m/c and turn them into autostart EPROMs. (EPROM burner required).
- Accepts 2764/27128/27256 EPROMs.
- On board unstoppable reset.

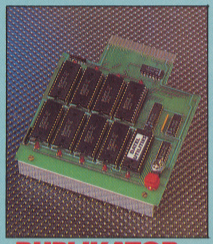


ONLY **£29.99**

RESET CARTRIDGE

- Unstoppable reset button.
- Resets even so called "unstoppable" programs.
- Add pokes from magazines etc.
- Fits in cartridge port.
- Simply plug in.

ONLY **£5.99**



DUPLIKATOR™

- Copies whole disk in one pass – only one drive required!
- Makes backup copies in eight seconds!!
- Duplikator is the fastest, most efficient and easiest to use disk copying system ever conceived.
- Comes complete with 256K on-board ram and it's own operating system – no software to load.
- Makes multiple copies from one original.
- Full disk verification during back-up process.
- Copies standard software as well as errors 21-29 and upto 40 tracks.
- Full disk error check in eight seconds.
- Full disk verify against ram in fifteen seconds.
- A must for clubs, user groups etc. How else can you copy over 250 disks and hour for less than £100.
- Comes complete with on/off switch and reset button.
- Fitted in minutes – no soldering usually required.

ONLY **£89.99**

16K EPROM BOARD

- Accepts 2 x 8K EPROMs.
- Switchable to configure as 2 x 8K or 16K or off.
- On board unstoppable reset.
- Full instructions.

ONLY **£8.99**

4 WAY KERNAL BOARD

- This board fits in place of the kernal in your 64 and accepts a 16K or 32K replacement kernal giving 2 or 4 different operating systems.
- Just flick the switch supplied to select between systems.
- This is a carrier only – ready to accept your own chip.
- Now you can have all your different systems available at one time.
- Full instructions.
- Fitted in minutes.
- 5-Way Board

ONLY **£12.99**

DISK NOTCHER

- Quickly and easily double your disk capacity.
- Use both sides of your disks.
- Simple to use.
- Takes seconds.

ONLY **£4.99**

DEEP SCAN BURST NIBBLER™

- The most powerful disk nibbler available anywhere, at any price!
- Burst Nibbler is actually a two part system – a software package **and** a parallel cable to connect to 1541/1570/1571 to 64/128 (state type).
- What gives Burst Nibbler its power? Conventional nibblers have to decode the data from the disk before it can transfer it using the serial bus – when non standard data is encountered they are beat. Burst Nibbler transfers data as raw GCR code via the parallel cable without the need to decode it so you get a perfect copy of the original.
- Will nibble upto 41 tracks. ● Copy a whole disk in under 2 minutes. ● Full instructions.
- Regular updates – we always ship the latest. ● Fitted in minutes – no soldering usually required.
- Full or ½ tracks. ● No need to buy parallel cable if you have Disk Demon/Dolphin etc.
- Cable has throughbus extension for other add ons.
- Whether to choose FastHack'em or Burst Nibbler? Fast Hack'Em is unbeatable value as an "all-rounder" – with nibblers, 1 or 2 drive copy, format, file copy, 1571 copy etc. etc., so if you have a more general requirement perhaps FastHack'Em is for you. Burst Nibbler is a pure nibbler second to none, for the reasons stated. So if it's just making backups you are interested in, there is no other product to beat it.

ONLY **£24.99** COMPLETE
SOFTWARE ONLY **£12.99** CABLE ONLY **£14.99**

BURST NIBBLER PARAMETERS DISK

- Burst Nibbler is the most powerful disk copier available – but there are still a few programs with very complicated protected, which makes it impossible to nibble copy. The Burst Nibbler Parameter Disk contains routines to copy individual programs.
- Used in conjunction with Burst Nibbler even the latest highly protected programs can be backed up.
- The disk contains over 100 parameters including many of the latest titles. Many of the titles can already be straight nibbled by burst nibbler – but can be used with the "Super Serial Nibbler" program (supplied) by users with drives that will not support parallel copier cables such as Excelerator, Oceanic etc.
- Simple to use – just nibble the disk run the individual parameter for that program and the special routine will produce a perfect working copy – in some cases will even de-protect it!
- Comes complete with "Super Serial Nibbler" program for users who can't fit parallel copier such as Burst Nibbler to drive (Excelerator, Oceanic etc), not as as Burst Nibbler but when used in conjunction with parameters its formida
- Remember – this disk is by no means a must for Burst Nibbler owners since it already copies over 90% of Software. But for those who want everything this is it. Also for none Burst Nibbler owners you get a "Super Serial Nibbler" which together with the parameters is a powerful utility.

COMPLETE PROGRAM DISK # 1 AVAILABLE NOW ONLY **£12.9**

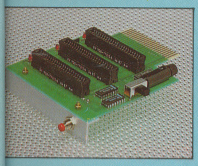
TOOLKIT IV

The ultimate disk toolkit for the 1540/1541

- A disk toolkit is an absolute must for the serious disk hacker. 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 programs by up to 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. Ma at up to 6 times normal speed.
- FORMATTER – 10 second format an ent disk or format any individual track or half 0 to 41. Redefine any of 30 parameters to cr or recreate unique disk formats.
- ERROR EDIT – Quickly find and recreate read errors including extra and renumbered tracks or sectors and half tracks from 0 to 4th. Even recreates data under errors and allows to redefine any necessary parameters.

ONLY **£9.99**

CSDATEL ELECTRONICS



3 SLOT MOTHERBOARD

ave wear and tear on your xpansion Port

Accepts 3 cartridges. ☐ Onboard safety fuse.
Switch in/out any slot. ☐ High grade PCB.
Fully buffered. ☐ Reset button.

ONLY £16.99

DATA RECORDER

Quality Commodore compatible data recorder.

Pause control. ☐ Suitable for 64/128.
Counter. ☐ Send now for quick delivery.

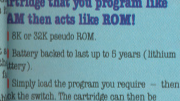
ONLY £24.99

SMART CART™

ow you can have an 8K or 32K rtridge that you program like AM then acts like ROM!

- 8K or 32K pseudo ROM.
- Battery backed to last up to 5 years (lithium battery).
- Simply load the program you require — then ick the switch. The cartridge can then be moved just like a ROM cartridge.
- Make your own cartridges including autostart oss — without an EPROM burner.
- Can be switched on or off board via software.
- I/O 2 slot open for special programming chniques.
- 32K version has 4 x 8K pages.
- Some knowledge of M/C is helpful — but full struction are provided.

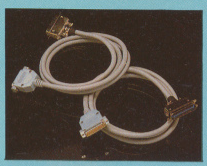
8K VERSION £14.99
32K VERSION £29.99



RAM DISK

- Turn your Smart Cart into a 32K RAM/disk.
- 32K of instant storage area for files/programs.
- Load/save instantly.
- Disk type commands: load, save, directory, atch.
- Program data retained when computer is tched off!

Full command **ONLY £9.99**
with instructions.



CENTRONICS PRINTER LEAD

- Connect your C64/128 to a full size Centronics Parallel Printer.
- Suitable for use with Action Replay IV or Final Cartridge III
- Also works with any Software/Graphics package that has parallel driver software built-in — this includes many popular wordprocessors, databases, etc.
- Top quality connections — ribbon cable 1.5m long.

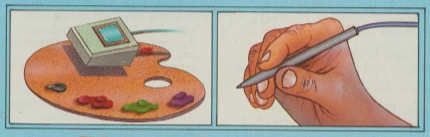
ONLY £12.99

TURBO ROM II

Turbo Rom II is a replacement for the actual kernal inside your 64. It provides superfast load/save routines.

- ☐ Loads most programs at 5-6 times normal speed.
- ☐ Saves at 5-6 times normal.
- ☐ Improved DOS support including 10 sec format.
- ☐ Programmed function keys:- load, directory, old, etc.
- ☐ Return to normal kernal at flick of a switch.
- ☐ FCOPY — 250 block file copier.
- ☐ FLOAD — special I/O loader.
- ☐ Plus lots more.
- ☐ Fitted in minutes — no soldering usually required. (On some 64's the old ROM may have to be desoldered.)

ONLY £14.99



BLAZING PADDLES

A complete lightpen/graphics illustrator package.

- ☐ A fully icon/menu driven graphics package of a calibre which should cost much more.
- ☐ Complete with a fibre optical lightpen system for pin point accuracy.
- ☐ Multi feature software including:
- Range of brushes ● Airbrush ● Rectangle ● Circle ● Rubberbanding ● Lines ● Freehand
- Zoom mode ● Printer dump ● Load/save ● Advanced colour mixing — over 200 hues!!
- Cut and paste allows shapes/window/pictures to be saved to/from tape/disk.
- ☐ Blazing Paddles will also work with many other input devices including; Joysticks, Mice, Graphics Tablets, Trackball etc.
- ☐ Pictures can be saved from Action Replay and edited with Blazing Paddles.

Complete Blazing Paddles & Lightpen **ONLY £24.99**

Blazing Paddles available separately for **£12.99**

GRAPHICS SUPPORT UTILITIES DISKS

● A range of utilities to make the most of your high res pictures created with popular graphics utilities or captured with Action Replays unique picture grabber.

● SLIDE SHOW
- View your favourite screens in a slide show type display.
- Move from screen to screen — keyboard or joystick control. ● Very easy to use.

● BLOW UP™
- A unique utility to allow you to take any part of your picture and 'blow it up' to full screen size.
- Even fills the border with powerful sprite handling techniques. ● Very easy to use — simple commands
- An interesting utility.

● SPRITE EDITOR
- A complete sprite editor helps you create or edit sprites.
- Full colour display ● Animate to view movements.
- Action Replay can capture/insert sprites with any program — this editor is a perfect companion.

● MESSAGE MAKER
- Takes your favourite screen — created with a graphics package or captured with action replay and turns it into a scrolling screen message complete with music.
- Send screens to your friends with music and text scrolling. ● Simple text editor — easy to use.
- Choice of music. ● An exciting utility.
- Finished screens stand alone.

Complete disk with all four utilities

ONLY £12.99

ROBOTEK 64

Model & Robot Control made easy

- ☐ Robotek 64 is a comprehensive hardware/software package which enables you to connect your 64/128 to the outside world.
- ☐ 4 output channels — each with onboard relay
- ☐ 4 input channels — each fully buffered TTL level sensing.
- ☐ Analogue input with full 8 bit conversion.
- ☐ Voice input for voice control.
- ☐ Software features:- test mode/analogue measurement/voice activate/digital readout etc.
- ☐ Excellent value! **ONLY £39.99**

including hardware/software/ mic etc. (State tape or disk)

DIGITAL SOUND SAMPLER

- ☐ The new sampler allows you to record any sound digitally into memory and then replay it with astounding effects.
- ☐ Playback forwards/backwards with echo/ reverb/ring modulation etc.
- ☐ Now with full sound editing module to produce outstanding effects.
- ☐ Full 8 bit D to A and ADC conversion.
- ☐ MIDI compatible with suitable interface. (I.e. Datel unit for $29.99, see ad).
- ☐ Live effects menu includes real time display of waveforms.
- ☐ Line in/mic in/line out/feedback controls.
- ☐ Powerful sequencer with editing features.
- ☐ Load/save sample.
- ☐ Up to 8 samples in memory at one time.
- ☐ Tape or disk (please state).
- ☐ Complete software/hardware package **£49.99**
- ☐ Com-Drum software is available separately at **£9.99** to turn your Sampler II into a Com-Drum system as well as a sampling system.

COM-DRUM

Digital Drum System

- ☐ Now you can turn your computer into a digital drum system. ☐ Hardware/software package.
- ☐ 8 digital drum sounds in memory at one time.
- ☐ Complete with 3 drum kits.
- ☐ Real drum sounds — not synthesised.
- ☐ Create superb drum rhythms with real and step time. ☐ Full editing! ☐ Menu driven.
- ☐ Output to hi-fi or through tv speaker.
- ☐ Load/save facilities.

ONLY £29.99 (state tape or disk)

COM-DRUM EDITOR

- ☐ 24 drum sounds supplied on disk to enable you to construct your own drum kit.
- ☐ Re-arrange sounds supplied with a Com-Drum to make new kits.
- ☐ With sound sampler hardware you can record your own kits. ☐ Load/save facilities.

ONLY £4.99 disk only

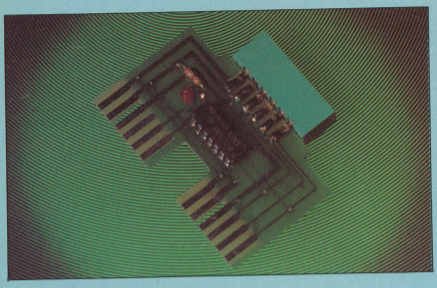
MIDI 64

A Full Midi Interface for the 64/128 at a realistic price

- ☐ MIDI in. ☐ MIDI thru. ☐ 2 x MIDI out.
- ☐ Compatible with most leading software packages including: Seil, JMS, Advanced Music System, Joreth, Steinburg etc.

ONLY £29.99

DATEL ELECTRONICS



NEW CLONEMASTER™

The most effective tape to tape back-up board available.

- Makes perfect backups of your tapes easily and effectively!!
- No user knowledge at all needed.
- On board TTL logic circuitry actually shapes the program and sends a perfect signal to the record cassette – producing a copy better than the original in many cases.
- L.E.D. indicator shows when data is being transferred to avoid excessive tape winding.
- Works with almost any program including multi-loaders, turbos and even very unusual type turbos.
- Requires access to two CBM compatible data recorders
- Simply press 'Play' on one recorder and press 'Record' on the other – that's it!
- You can even make a backup while you are loading the program.
- This is a total hardware solution – no programs to load – the results are stunning!

ONLY £9.99

- **Datasettes are available for £24.99 (see other pages)**

BLUE CHIP DRIVE

- **Fully C64/128 compatible.**

At last a top quality drive at a sensible price.

Super slimline case

External power supply for cool operation.

Direct drive motor.

Supplied complete with all cables – no more to buy.

This drive is now probably the most compatible drive available for the Commodore. More so than even Commodores own 1541C. Much more so than other so called compatibles. In fact we have been unable to find a program including the latest that would not work. (At time of Press).

No need to look elsewhere – this is the best.

ONLY £139.99 POST FREE
(If you require courier delivery add £8.00).

ULTRA CRUNCHER

- **The ultimate cartridge based program compactor.**

Compacts by upto 50%!

More programs for disk.

3 compacting programs on one cartridge.

Fast loading/saving routines – works with Disc Demon.

Can even further compact AR III files!

250 block file copy function.

Full DOS support including fast format.

ONLY £12.99 on cartridge. Available as chip only for 256K Superom Board for only £7.99

FAST HACK'EM™

- **Multi Module Disk Nibbler – all on one disk.**

Single 1541 Nibbler – Copy a disk in 2 minutes.

Auto Nibbler – Copy an entire protected disk in 3 minutes.

Super fast File Copy – Under 9 seconds typically.

Copes with Fat Tracks.

Superfast Copy – Entire disk in 36 seconds with verify.

Twin Drive Copier – Even faster!

Plus unique "Parameters" mode. Takes files "Unlock" the more heavily protected programs with a parameter for a particular brand or even single program.

No other product is such a good "All Rounder" at this price its unbeatable.

ONLY £9.99 POST FREE

ROBOTARM
– 5 Axis Movement
– Full Function

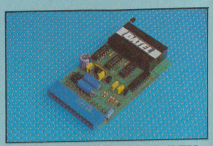
- Explore the fascinating science of Robotics with this full feature Robot Arm.
- Human like dexterity – with 5 Axis of movement it is so versatile. It can manipulate small objects with amazing ability.
- Easily controlled using 2 joysticks (any 9 pin type) or connect to your computer with our Interface + Software to give Computer/Robotic control (see Interface offer).
- Comes with Accessories including 'Finger' Jaws, Magnetic Attachment, Shovel Scoop, 4 Stabilizing Suction Base Legs, etc.
- Uses 4 HP2 batteries (not supplied) to power motor movement so uses no computer power.
- Self contained, ready to use (except batts, joysticks).

ONLY £49.99

INTERFACE OFFER

- Unique Software/Hardware package to allow you to interface your computer with the Robotarm.
- Train mode allows you to store and then repeat movement sequences.
- Very easy to use.
- This Interface is not needed to use the Robotarm but interfacing with your computer has great possibilities

ONLY £24.99
COMPLETE WITH CABLES.



EPROMMER 64™

A top quality, easy-to-use EPROM programmer for the 64/128.

Fully menu driven software/hardware package make programming/reading/verifying/ copying EPROMs simplicity itself.

Will program 2716, 2764, 27128 and 27256 chips. 12.5, 21 or 25 volts

Fits into user port for maximum compatibility with cartridges/Superom Board etc.

Full feature system – all functions covered including device check/verify.

We believe Eprommer 64 is the most comprehensive, most friendly and best value for money programmer available for the 64/128.

Ideal companion for Superom Board, Cartridge Development System, our kernal expanders or indeed any EPROM base project.

Comes complete with instructions – plus the cartridge handbook.

ONLY £39.99 COMPLETE

DISKS/STORAGE BOXES (Lockable)

For 5¼"	**ONLY**
DD 50 holds upto 50	**£6.99**
DD100 holds up to 100	**ONLY £8.99**
For 3½"	
DD 40 holds upto 40	**ONLY £7.99**
DD 80 holds upto 80	**ONLY £9.99**
Diskettes	
5¼" – DS/DD	**ONLY £24.00** for 5
3½" – DS/DD	**ONLY £49.00** for 5

ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS

HOW TO ORDER . . . .

BY PHONE
0782 744707
24 hr Credit Card Line

BY POST
Send cheques/POs made payable to 'Datel Electronics'

FAX
0782 744292

UK ORDERS POST FREE – EUROPE ADD £1
OVERSEAS ADD £3

DATEL ELECTRONICS

DATEL ELECTRONICS LTD., FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND.

SALES ONLY
0782 744707

TECHNICAL ONLY
0782 744324

Set the Alarm!

Has there ever been a time when you've been so absorbed with programming your 64 that you've been totally unaware of the world outside? If so then help is at hand with this routine. Just type in Alarm and you'll never miss the start of your favourite telly program again or even worse last orders at the Dog and Fox

By Nick Gregory

Alarm turns the 64 into a digital alarm clock while still allowing you to use the computer normally. The program works on interrupts, checking every 1/60th of a second to see what time it is and whether or not its time to sound an alarm. There are four ways to use Alarm which I will demonstrate with examples:

```
SYS 49152
```

This turns off the Alarm routine and returns the C64 to normal.

```
SYS 49152,"P0800", "P1045", "LAST ORDERS NOW"
```

This sets the actual time to 8 o'clock pm and the alarm to 10.45pm. When 10.45 is reached then the message "LAST ORDERS NOW" will be flashed in the top left hand of the screen. The message will be flashed on the screen until you use the first command (or RUN/STOP and RESTORE) to turn it off. You can set the time or alarm to am by using an 'A' rather than 'P' in the time string. For example "A1000' is 10 o'clock am.

The time strings must start with either an 'A' or a 'P' otherwise you will get a syntax error and they must contain the time in the format HHMM within the natural ranges otherwise you will get an illegal quantity error. The message can be anything you want up to 26 characters but it shouldn't contain control codes or cursor controls, just ordinary printable characters. Again if you exceed 26 characters you will get an illegal quantity error.

```
SYS 49152, "P0800", "P1045", "LAST ORDERS NOW",1
```

This is exactly the same as the example above except that the time will be continually displayed in the top right hand of the screen. The time is printed in hours, minutes and seconds though you can not set the time to seconds. An 'A' or a 'P' is also displayed to tell you if it's am or pm. If the final value in this example is greater than one you will get an illegal quantity error, if it is zero then the command is the same as in the last example:

```
SYS 49152, "A0000", "A0010", "TEN MINUTES ARE UP"
```

This example shows how you can use Alarm to time specific periods. The alarm will go off in ten minutes time. It doesn't matter in this case if you use am or pm but the routine expects one or the other. Putting a 1 as the final value (as in the last example) will display the clock continually.

Before you set the times you should know how the clock works. The clock will tick away from A1200 to P1200; there are no A0010 except as I've just described above. For example, five minutes past mid-day is written as P1205 and five minutes to mid-day as A1155. Likewise five minutes past midnight will be A1205.

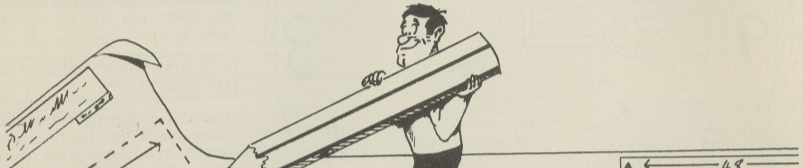
As Alarm is an interrupt routine you should be extra careful when typing it in because the 64 will most certainly hang up on you if you've made a mistake and remember the golden rule: SAVE BEFORE YOU RUN.

See listings on page 61

Hires/ Multicolour Plotter

Sacrifice your horizontal resolution to combine multicolour and high resolution mode

By Daniel Ansari



None of the plot routines that I have so far seen in magazines were intended for use by the machine code programmer, neither were they able to be used in multicolour mode as well as hires mode. Multicolour mode is a nice feature of the Commodore 64, allowing up to four different colours to be used in a single character square, unlike the two colours in high resolution mode. There is, although, a sacrifice in horizontal resolution, which is halved to 160 pixels.

The routines available plot/unplot points, test them, draw/undraw boxes of any size and shape, clear the hires screen, enter hires mode, enter text mode, colour the whole screen, and load and save screens.

When used from Basic, the only POKE command needed is to tell the routine whether you wish to use hires mode, or multicolour mode. All the other instructions from now on are simple SYSs, with the parameters separated by commas. I have eliminated the need for several POKE instructions as well as an SYS, when one SYS and no POKEs greatly

POKE 254,m	Sets the mode, where m is 0 or 1 for hires or multi-colour mode respectively.
SYS 49152,x,y,c,b	Turns a point, of co-ordinates (x,y), on or off. x is a number from 0-319, y a number from 0-199, and c the point colour; in multicolour mode it is a number from 0-15; in hires mode it is a number from 0-255 calculated by 16* point colour (0-15)+ background colour (0-15) b is the brush; in hires mode 1 or 0 for on or off; in multicolour mode 0 for off, or brush number 1-3.
JSR 49193	The machine code version of the above. Before using this instruction, store x in locations 50177-8 in the order LSB, MSB, and store y in 50179. c and b should be put in locations 50183 and 50184.
SYS 49340,x,y	Tests a point of co-ordinates (x,y). The number in location 50192 is 0 if the point is off, and greater than 0 if it is on. In hires mode, the number in 50193 gives the point colour and background colour together. The point colour is calculated by INT(n/16), where n is the number. The background colour is n-INT(n/16)*16 and can be calculated even if the point is off. In multicolour mode location 50193 contains the point colour (0-15).
JSR 49378	Tests a point. Only x and y are needed in locations 50177-9.
SYS 49634,x,y,w,h,c,b	Draws/erases a box of top left co-ordinates (x,y) where w is the width (0- 319-x) and h is the height (0- 199-y).

simplify the task of creating graphics, and also make the process considerably faster.

From machine code, this is a little more complex. It is not possible to enter parameters separated by commas in this language, even though it is much faster. The values for the parameters must be POKEd into certain locations which are described later on. Every effort has been made to keep these locations down to an easily memorable level.

The demonstration program illustrates the capabilities of multicolour graphics reasonably well, but I'll leave it up to you to create your own masterpieces. If you do not have an assembler, then type in the Basic loader program. Don't worry if you make any mistakes – the program will tell you exactly where to find them.

When you have run your Basic loader program successfully, type in the memory save program and the plot routine will be saved to tape or disk.

The instructions to use are as follows, with SYS as the Basic instruction and JSR as the machine code (assembly language) instruction:

JSR 49675	The m/c box instruction, where w is held in 50180-1 and h is held in 50182.
SYS/JSR 49867	Clears the hires/multicolour screen at 8192.
SYS/JSR 49897	Enters hires/multicolour mode, depending on the contents of location 254.
SYS/JSR 49926	Enters text mode.
SYS 49951,s,t	Sets screen and border colours, where s is the screen colour, and t is the border colour. In multicolour mode each parameter ranges from 0-15; in hires mode s is a number from 0-255, calculated by 16* point colour+background colour (the colours of all the points on the hires screen can be changed with this instruction); t is a number from 0-15.
JSR 49974	Before using this instruction, load the x register with t, and location 253 with s.
SYS 50005,d	Saves the hires/multicolour screen with device number d. d can be 1 or 8, for tape or disk. This instruction can only be used in program mode; this is because if a screen is saved in immediate mode it becomes corrupted as you type in the command.
JSR 50019	The m/c save instruction. Load the x register with d.
SYS 50128,d	Loads the screen. Please note that the screen can be loaded while still in text mode.
JSR 50142	Loads the screen from m/c. Load the x register with d before calling this routine. As with the save routine, this has to be used in program mode.

See listings on page 61

Making Music

Commodore tell us that the SID (Sound Interface Device) Chip is a single-chip, 3-voice electronic music synthesiser/second effects generator compatible with the 6510 and similar microprocessor families. It has the following features: three tone oscillators in the range 0-4 kilohertz (one hertz is, you may recall, one cycle per sound); four waveforms per oscillator, and these are of course our familiar triangle, sawtooth, pulse and white noise; three amplitude modulators, with a 48 decibel range; three envelope generators, featuring exponential response, an attack rate varying from two milliseconds to eight seconds, a decay rate varying from six milliseconds to 24 seconds, a sustain level varying from 0 to the peak volume level, and a release rate which also varies from 6 milliseconds to 24 seconds. They all, of course, vary from zero milliseconds to whatever the maximum setting might be. This was all seen to ample effect in the ADSR settings program.

Oscillator synchronisation, which we have simply referred to as synchronisation and which requires the voice being synchronised to be at a lower frequency than the one it is being synchronised with, but preferably at a higher frequency than zero!

Ring modulation, which we have dignified with the full term and which, as we have seen, requires a triangle waveform in order to operate properly.

Filtering techniques, which again have been covered in some detail. Commodore call them oscillators, we call them voices!

However, these are just words, and actions (or at least tables) speak louder than words. The Commodore 64 manual obligingly gives us the high and low value frequency settings for a range of notes, but in order to obtain the frequency value of an unspecified note in a form suitable for turning into a high and low value frequency we must use the formula:

F=Freq/0,06097

where Freq is the value we want, and F is the frequency of the note in question. Having got Freq we can find the high and low value frequencies (FH and FL) from the following equations:

FH=INT(F/256)

and FL=F-(256*FH)

All this assumes that F is an integer value, by the way.

The ADSR settings, with talk of milliseconds and seconds, sounds all very grand, but in terms of actual numbers and values to be POKEd into memory the following table tells us all we need to know:

Decimal	Hexadecimal	Attack	Decay/Release
0	0	2	6
1	1	8	24
2	2	16	48
3	3	24	72
4	4	38	114
5	5	56	168
6	6	68	204
7	7	80	240
8	8	100	300
9	9	250	750
10	A	500	1.5 secs
11	B	800	2.4 secs
12	C	1.0 secs	3.0 secs
13	D	3.0 secs	9.0 secs
14	E	5.0 secs	15.0 secs
15	F	8.0 secs	24.0 secs

The times given are all in milliseconds, unless otherwise specified.

You'll see from this table that not every setting is possible, although the number of different ADSR settings available (256 * 256, or 65536) should be more than enough for most people. It isn't, for example, possible to get an attack rate of 30 milliseconds, or a decay rate of 500 milliseconds, but such minor problems should really be overlooked in the face of what we have got.

Combine the number of possible ADSR settings with the number of different notes we can play, the variations on ring modulation and synchronisation, and in particular the number of different filter types and filter settings (combining resonance and cutoff frequencies of different values) and you'll soon realise that it is a foolish man who can claim to know all about the SID chip and its workings.

Conclusion

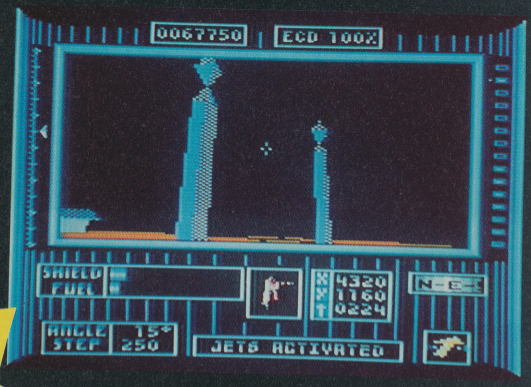
During the course of this foray into the inner workings of the SID chip we have encountered many musical marvels, and have come close to talking about everything that the chip is capable of doing. Envelopes, modulators, synchronisers, filters, have all been discussed, and the sound effects and musical tunes that we can produce have a virtually infinite range.

The major programs presented will help you to understand how the chip functions, and how its various features can be utilised to best effect.

However, in the end it is of course up to you, the user of the chip, to get the best out of it, and the only way to do that is by experimenting. No one can hope to commit to memory all of the wonderful effects that are available to us when using this chip. No, the only route is through continuous experimentation, fiddling about with programs, changing the values stored in registers, altering what goes where and seeing what happens as a consequence.

I encountered my first, very humble, 'synthesiser' program for the Commodore 64 back in the early months of 1983, over four years ago. I still use that program, and I'm still learning how the chip itself operates, and how I can ever possibly hope to understand all its inner workings and create every sound it's capable off. If you've just started, try not to despair!

See listings on page 61



Dark Side

In a month of sequels (Football Manager II, The Games – Winter Edition) non is more impressive than the sequel to Incentive's Driller, Dark Side.

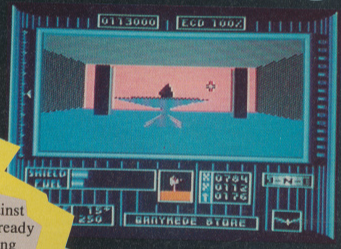
This is the second in the games to feature the Freescape 3D system that creates solid images and gives you millions of possible views of those objects. The views you will see are of the moon Tricuspid which is the second moon of the planet Evath.

On its surface the Ketras are planning the destruction of Evath and are building a massive energy weapon called the zephyr one. This massive machine of destruction is powered by a line of Energy Collection Devices (ECD's). Your mission is to knock out the Zephyr one and your only chance of that is to destroy the ECD's that feed it with power.

As the game begins you are dropped on the light side but your quest lies on the dark side of the moon. There you will find ECD's and the Zephyr one that are guarded by Plexor tanks that automatically open fire when you come into range. Some regions that you will need to go are restricted and can only be reached through telepod towers but you will need to find telepod crystals to operate them.

First on your agenda must be to find shield plates for more protection and fuel rods to power your jetpac that can get you in and out of so much trouble.

The Freescape system almost gives you the feeling that you're there as you can fly over, around and into buildings and objects scattered around the planets surface. Inside the buildings you will find puzzles to solve and hidden trapdoors but the main puzzle will be how to knock out the ECD's. Although all you have to do is blast away its crystal at the top of the tower but unfortunately if the ECD you've knocked out is connected to more than one other, and most are, it simply regenerates. Therefore, you must scout out the moon carefully to find the ends of the line.



However, time is also against you as the Zephyr one is already building up its power bringing the destruction of Evath closer and also making it more difficult for you to destroy.

The view of the planet is seen through the helmet of you the Evath agent which is dominated by the Freescape 3D view of the moon's surface but below that are instruments that show the co-ordinates of your current location, the sector you are in, a compass, and current shield and fuel levels.

Once you've played your first game of Dark Side, Evath will have been destroyed and you in the vain attempt to save it but you will be convinced of two things. Firstly, it often takes a couple of games for a new system such as Freescape to settle down since it is only then that the development team concentrate on the plot and that Dark Side is one of those rare games that is both pretty to look at and a challenge to play.

T.H.

Touchline:
Title: *Dark Side.*
Supplier: *Incentive, Zephyr One, Calleva Park, Aldermaston, Berks., RG7 4QW.*
Tel: *07356 77288.* ***Price:*** *£9.95 (Ca) £12.95 (Disk).*

TOTAL BACKUP POWER!

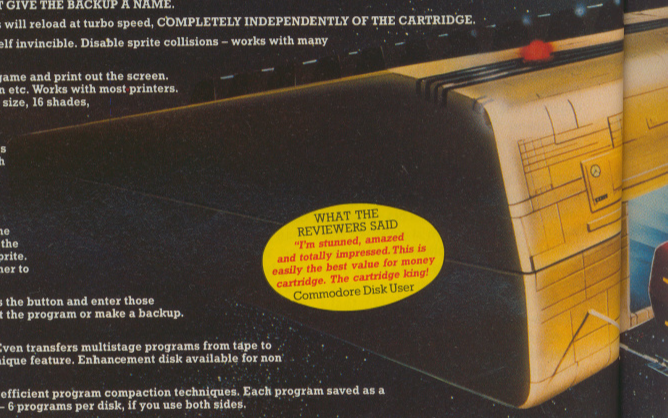
Now ACTION REPLAY M

NOW EVEN MORE POWERFUL, MORE FRIENDLY AND WIL BA

ONLY **£29·99** POST FREE

Action Replay 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.

- **WARP 25. THE WORLD'S FASTEST SERIAL DISK TURBO – NOW EVEN FASTER! LOADS 200 BLOCKS IN 6 SECONDS! 240 BLOCKS IN 7 SECONDS!** – that's even faster than some parallel systems. Built into the cartridge – no extra hardware or software required. Includes supercast, warpsave, scratch, filecopy/convert. Integrated with normal disk turbo for supercompatibility – auto detects warp or normal format so no special load commands are required. Turbo and Warp 25 speed are entirely independent of the cartridge with SUPERBOOT.
- **SIMPLE TO USE:** Just press the button and make a complete backup – tape to disk, tape to tape, disc to tape, disk to disk. THE PROCESS IS AUTOMATIC – JUST GIVE THE BACKUP A NAME.
- **TURBO RELOAD.** All backups will reload at turbo speed, COMPLETELY INDEPENDENTLY OF THE CARTRIDGE.
- **SPRITE KILLER.** Make yourself invincible. Disable sprite collisions – works with many programs.
- **PRINTER DUMP.** Freeze any game and print out the screen. Eg. loading picture, high score screen etc. Works with most printers. MPS 801, 803, Star, Epson etc. Double size, 16 shades, reverse print option. Very versatile – no user knowledge required.
- **PICTURE SAVE.** Save any Hires multicolour screen to disk at the push of a button. Compatible with Blazing Paddles, Koala, Artist 64, Image System etc.
- **SPRITE MONITOR.** Unique Sprite monitors allows you to freeze the action and view all the sprites, watch the sprite animation, save or delete any sprite. Load sprites from one game into another to make customised programs.
- **POKES/CHEAT MODE.** Press the button and enter those pokes for extra lives etc., then restart the program or make a backup. Ideal for custom games.
- **MULTISTAGE TRANSFER.** Even transfers multistage programs from tape to disk. The extra parts fast load – a unique feature. Enhancement disk available for non standard multi-loaders (see below).
- **SUPER COMPACTOR.** Ultra efficient program compaction techniques. Each program saved as a single file. 3 programs per disk side – 6 programs per disk, if you use both sides.
- **TEXT MODIFY.** Change title screens, high score screens etc. Put your own name into a game then restart it or make a backup to tape or disk. Very simple to use.
- **MONITOR.** Full feature 'Floating' type MACHINE CODE MONITOR. All standard features plus many more:- assemble, disassemble, hex dump, interpret, transfer, compare, fill, hunt, number conversion, bank switching, relocate, load/save etc. Uses no memory. Full printer support.
- **DISK MONITOR.** A special monitor for use on the RAM inside your disk drive. All the usual commands – a useful hacking tool.
- **WHOLE DISK COPY.** Copy a full unprotected disk in under two minutes with only one drive.
- **FAST FILE COPY.** Works with standard and Warp 25 files of up to 249 blocks. Converts formats to and from Warp 25.
- **FAST FORMAT.** Under 20 seconds.
- **TOOLKIT COMMANDS.** A whole range of useful new commands including: AUTO LINE NUMBERING, DELETE, MERGE, APPEND, OLD, LINESAVE, etc., PRINTERLISTER – list any program (including directory) directly from disk to printer or screen without corrupting memory.
- **REDEFINED FUNCTION KEYS.** Single stroke commands for operation of many common commands including: LOAD, SAVE, DIR. Load from directory – no need to type in filename.
- **TAPE TURBO.** Designed to make turbo load/save for your own programs. No screen blanking during loading.



WHAT THE REVIEWERS SAID
"I'm stunned, amazed and totally impressed. This is easily the best value for money cartridge. The cartridge king!
Commodore Disk User

REMEMBER all features are built in and available at the touch of a key. All features work with both **TAPE** and **DISK**. (Except multipart transfer & disk file utility).

ACTION REPLAY ENHANCEMENT DISK

The biggest and best collection of special parameters and file copy programs for transferring non-standard multi-load tapes to disk – games like **LAST NINJA, CALIFORNIA GAMES, LEADERBOARD, DRAGON'S LAIR** – SEVENTY titles in all. Almost all major titles covered. Latest edition includes **COMBAT SCHOOL, PLATOON, PREDATOR, GAUNTLET II, TESTDRIVE, SKATE OR DIE, APOLLO 18, THE TRAIN** and many more. Cheats for infinite time, lives etc. The **GRAPHIC SLIDESHOW** – latest edition displays multicolour pictures or loading screens saved by Action Replay or any major Art Package – Blazing Paddles, Koala, Advanced Art Studio, Artist 64 etc. Lots of fun.
Only **£7.99**. Upgrades – send £3.00 plus old disk.

RTAKES A QUANTUM LEAP
YMK IV HAS ARRIVED!

FOR CBM64/128

ILL BACKUP MORE PROGRAMS THAN ANY RIVAL UTILITY.

BUT THATS NOT ALL ... NOW AVAILABLE FOR THE SERIOUS PROGRAM HACKER

ACTION REPLAY IV 'PROFESSIONAL'™

● **All the features of the normal Action Replay IV but with an amazing on board LSI LOGIC PROCESSING CHIP. Plus 32K operating system ROM and 8K RAM CHIP. The first RAM/ROM based cartridge of its type!**

ALL THE MK IV FEATURES PLUS ...

● **FULLY INTEGRATED OPERATION.**
The MK IV 'Professional' has all the features of the MK IV plus an onboard custom LSI LOGIC PROCESSING CHIP that integrates the whole range of utilities and makes them available at the press of a button at any time.

● **EXTENDED MONITOR.**
The 'Professional' has an extra powerful machine code monitor. Because it has both ROM and Ram at its disposal the Professional can freeze any program and then examine the WHOLE OF COMPUTER MEMORY in the frozen state including screen RAM, ZERO PAGE and STACK.
Full feature disassembly, compare, fill, transfer, hunt, relocate, jump etc, etc. In fact all the features of the best fully blown monitor available. Return to the frozen program at the press of a key at the point you left it! An absolute must for the program hacker – or even the programmer who needs to de-bug his program.

● **INTELLIGENT HARDWARE**
The Professional hardware is unmatched anywhere in the world today. The special logic processing chip can cope with protection methods as they appear by reacting to its environment.

● **RAM LOADER**
In addition to Warp 25, the AR4 Professional now has RAM LOADER. Making use of its onboard 8K Ram the Professional can also load commercial disks directly at up to 25 times normal speed. Remember this feature is in addition to AR4's unique Warp 25 feature that reloads all backups at 25 times speed.

MK IV PROFESSIONAL ONLY £34.99 POST FREE

WARP 25 Reloads an average BACK-UP in 6 Seconds!!

UPGRADE INFORMATION

MK III TO MK IV. Just send £9.99 and we will send you the new MK IV Chip to plug into your cartridge. Fitting is very easy.
MK III TO MK IV 'PROFESSIONAL'. Send your old cartridge plus £19.99 and we will send you a new Professional MK IV.
MK 2 Action Replay owners can get £10 as part exchange against either the MK IV or Professional. Send old cartridge plus balance.

PERFORMANCE PROMISE

Action Replay will backup any program that any other cartridge can backup - and more! It also has an unmatched range of onboard features. Before you buy check our competitors ads to see what they offer and see how many of the Action Replay MK IV features are either not there or have to be loaded from Supergate disks etc. When you buy Action Replay if you don't find our claims to be true then return it within 14 days for a full refund.

ALL ORDERS NORMALLY DESPATCHED WITHIN 48 HRS

HOW TO ORDER ...

BY PHONE	BY POST	UK ORDERS POST FREE
0782 744707 24 hr Credit Card Line	Send cheques/PO's made payable to 'Datel Electronics'	EUROPE ADD £1.00 OVERSEAS ADD £3 FAX 0782 744292

DATEL ELECTRONICS

DATEL ELECTRONICS LTD, FENTON INDUSTRIAL ESTATE, GOVAN ROAD, FENTON, STOKE-ON-TRENT, ENGLAND

SALES ONLY	TECHNICAL ONLY
0782 744707	0782 744324

The President is Missing

The President is Missing not only launches an intriguing detective style investigation but also a new style in games from US software house Cosmi. Cosmi made the news a few weeks ago with its move from the US Gold stable when it signed a UK joint venture with Microprose which was also once imported by US Gold.

With the move it has left behind its old, less than subtle style of game, that included the blood and guts of Forbidden Forest and Aztec Challenge and the taste shown in games like Chenobyl. The President is Missing is a high quality investigation backed up with two double sided disks, an audio tape and booklets and documents to set the scene.

The President, and incidently nine other western leaders, were supposed to be at a summit in Switzerland but the venue was switched at the last moment to somewhere in Lichtenstein. Last night two army helicopters carrying armed terrorists stormed the meeting place and abducted the leaders. Because of the grave crisis the Vice President has appointed you as Special Investigator making it your job to find out who perpetrated the abduction, bring them to justice and bring about the safe return of the leaders.

To help you in this onerous task you have access to the federal databases, agency reports, government documents, public and private records, intelligence files and a team of eight field agents. These files are stored on the four disk sides, but there is just so much information available that you must approach the case logically or get drowned in a sea of data.

A reasonable place to start is the official report of the kidnapping but more tempting is the audio tape included in the game box. This is packed with potential clues as well as a fair helping of red herrings, and includes recordings of phone taps, a speech made at Oxford University several years earlier, ransom demands from the kidnappers and statements from the President and the French Premier. This piles on the atmosphere and sets you scribbling frantic notes about names and places that crop up and some intriguing morse code that appears at the end of the tape that was intercepted by your intelligence services that is guaranteed to send you racing for the encyclopedia to find out its meaning.

On side three of the disk there are ten photo files to send the investigating buds as you scour the images with the zoom option to look for the vital clue. Almost at once you're beginning to get suspicious.

The kidnappers claim to be Islamic fundamentalists and demand among other things the destruction of the state of Israel, the withdrawal of western influences and puppet governments and the return of all Islamic assets. The voice of one of the kidnappers sounds similar to the speaker at Oxford who describes terrorists as heroes and freedom fighters. However, the meeting place was only disclosed to security agents and the leaders themselves hours before (they had only be warned of it being within 50 miles of Zurich) which suggests at least some inside knowledge and perhaps a traitor. Add to that the use of the abductors of Russian made gas bombs and a Russian trawler within range of where the abductors drop out of radar surveillance and you have the scope for some interesting theories.

However, theories on their own won't win the game and so you need to delve deeper into personal and private files and put your field agents to work. These can take any orders, go anywhere in the world and report back to you but the skill is deciding where to send them and ensuring their orders are clear enough to avoid time wasting and wild goose chasers.

The President is Missing is a fascinating game of international intrigue and although reminds you of the first part of the Fourth Protocol game the depth and attention to detail put it in a class of its own.

If solving the game isn't enough to satisfy your curiosity, and this should take several weeks of sleepless nights, then you can take up Cosmi's offer to send in your conclusions and evidence to help prosecute the offenders in return for the juries decisions. **T.H.**

Touchline

Title: *The President is Missing.* ***Supplier:*** *Cosmi (Microprose), 2 Market Place, Tetbury, Gloucs., GL8 8DA.* ***Tel:*** *0666 54326.* ***Machine:*** *C64 disk.* ***Price:*** *£12.95.*

Sprite Library

It's back to the ABC in this month's delve into the Library

By Mike Benn

The alphabet takes on a shady appearance this month. The individual characters are based on a single sprite definition. Use the table to decide which characters you need; they are in alphabetical order so it should be easy to calculate which letter you will need. The C64 allows up to eight sprites on the screen at any one time which should meet most needs. If you require more sprites on the screen, I recommend *Split Sprite* by S.J. Chance (YC April 1987) which allows up to 32 sprites on the screen at one time.

Multialph — Multicolour

HEX	DECIMAL	DESCRIPTION
A0 — B9	160 — 185	CAPITALS
BA — C3	186 — 195	NUMBERS
C4 — DD	196 — 221	SMALL LETTERS
DE	222	CIRCLE
DF	223	SQUARE

Getting it all in

Type the basic loader as published and SAVE IT-DON'T RUN IT or it will self-destruct and, possibly, burst into flames. Before running the loader program you will need to reset the computer and type directly the following:

```
POKE43,0: POKE44,64: POKE16384,0:

NEW
```

and press return. This will trick the computer into believing that the basic now starts at $4000 instead of $0801. Load in the basic loader and run it;if error free, the program will automatically save as a block of data.

If you reload that data in the future remember to add a 1 after the device number. The data is saved in the following location $2800-$37FF.

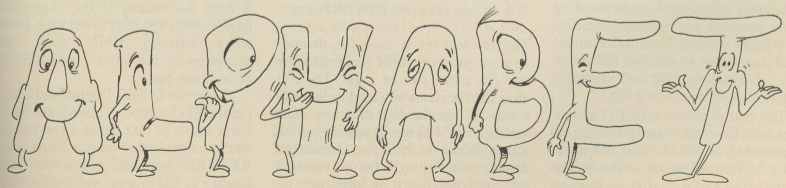
The sprites run from 160 to 223 in a compromise to avoid the area $2000 traditionally set aside for redefined character graphics and to avoid the need of typing in line after line of data.

If only one or two sprites are required then use this formula: (Sprite block No. — 160) *40 + 190 = the data line number at which that sprite blocks data starts. Remember to type in the following three lines of data and alter the variable BL to the number of data lines you have in your finished program, less 1.

The small basic program M. ALPH DISPLAY will variously animate the sprites in both non-expanded and expanded forms on the screen simultaneously. To hold on any sprite enter the same number for Start and End.

Any sprite Editor program will enable you to change and adapt the individual sprites to your own requirements. YC

See listings on page 61



The mysteries of the CP/M+ context editor explained

By Alan J. Wills

CP/M+

A few years ago I upgraded my trusty Commodore 64 for a new Commodore 128D. I was persuaded by slick advertising that I would be receiving three computers in one package. What really clinched the deal was the prospect of using CP/M+. I had worked with Wordstar, which runs under CP/M, and was excited by the prospect of using CP/M+ to run business programs from public domain software suppliers.

When my 128D arrived I immediately tried the CP/M+ system disk supplied with the computer. I was not impressed with the screen display and wondered how I could make use of my new operating system.

I soon found out that CP/M had many different formats and I would not be able to readily obtain programs from software suppliers. Indeed it became very obvious that I could do very little with CP/M+ unless I was prepared to study and work on practical exercises. The section on CP/M+ in the Commodore 128 handbook gave an inkling of what to expect, but no real guidance.

Recently I saw a series of articles on CP/M+ and the 128 in *Your Commodore*. I obtained a handbook on CP/M+ and over a few months I managed to glean enough information to use several of the transient programs supplied on the CP/M+ system disk.

Commands for operating the transient program, ED, will be demonstrated and it must be emphasised that only the basic commands will be shown. It will be up to the individual to progress onto more advanced techniques after some understanding of the program has been reached. ED is not "user friendly" and at first might seem impossible to use, but ED is one way of entering text or assembly language programs into a file.

The real problem with ED comes when text from an existing file has to be amended or edited. Text is loaded into a buffer and edited in the buffer before being saved to disk in its new form. Unfortunately the cursor does not perform its usual role; instead a character pointer called CP, which is invisible, is used for positioning in the buffer. Think of the buffer as a graph with CP positioning across the top and line positioning down the left hand side. The text being the actual area where plotting takes place. However the CP must know where it is at all times, so it is important to set CP at the start of the buffer.

After using ED for some time its editing system will become familiar and although rather slow to use, with a great deal of counting necessary, it at least gives the user a method of entering text into a file without the added expense of a more advanced editor.

I have compiled a summary of ED commands used in this article and it would be useful to have them at hand for reference as the exercises are worked. To make sure that ED is on the CP/M+ disk enter DIR at the system prompt and check the directory for ED. If it is on the disk then remove the disk and switch off the computer.

Loading ED

The following instructions load ED into the computer memory from the system disk. Place the CP/M+ disk containing ED in the default drive then switch on the drive and the computer (only if 128D). The system disk will auto boot and stop with the CP/M+ system prompt A>. At the prompt enter the following:

>A ed text.txt press RETURN key

The file text.txt is used for demonstration purposes only and in reality any file name can be used. The .txt after the file name is useful to identify a text file on the disk directory. The words NEW FILE will appear on the screen. When the drive stops the screen display will display:* Before entering text into the file it is important to understand the operating modes of the Ed program.

Operational Modes

ED has two modes – COMMAND and INSERT. In COMMAND mode the prompt displayed on the screen display is :*. In this mode commands can be entered one at a time or if more than one command is required in a continuous line with one command following the other, spaces are not required. Commands can be edited before the RETURN key is pressed. Use the CRSR right and left key to position the cursor then the DEL key to go to erase the character.

If the letter i is entered at the prompt and RETURN key pressed ED enters the INSERT mode. In this mode ED inserts text directly into the memory buffer.

ED will generate a line number for reference followed by the prompt :.. Editing in this mode is carried out by moving the CP, which will be explained later. A complete line of text can be deleted by using the CURSOR DOWN key immediately above the £ key. Spaces can be inserted into the text, by using the SPACE BAR.

Entering Text on a File

The next step is to enter text into a disk file. WARNING – it is not an easy matter to correct mistakes after text has been entered into a file so it is worth checking the text before the RETURN key is pressed. At this stage it does not matter if the command letters are in upper or lower case, both work equally well, with the exception of the letter i which must be in lower case.

Enter the INSERT command letter i at the ED prompt. A lower case letter i will result in text being displayed in upper and lower case. Press the RETURN key and the screen will display I:; ED is now waiting for text

Context Editor

to be entered into the buffer. Enter the following lines of text and press RETURN at the end of each line.

My dear son James, the head of the family,
died on 2 September 1834.
Thus death, or rather the conqueror of the last enemy,
has said, hitherto shall the immediate Branches of the
Family Tree go, and no further.

When line 6 prompt is displayed enter CONTROL Z (CONTROL key & Z together) and press the RETURN key. The CONTROL Z sequence will not be displayed on the screen. The screen display should now look like this:

```
A>ed text.txt

NEW FILE

          :*i

1: My dear son James, the head of the family,
2: died on 2 September 1834.
3: Thus death, or rather the conqueror of the last enemy,
4: Hath said, hitherto shall the immediate Branches of the
5: Family Tree go, and no further.
6: CONTROL Z (not displayed)
```

The CONTROL Z sequence switches off line numbering and forces ED to enter the COMMAND mode. To save the file for future use, enter the EXIT command letter E at the prompt and press the RETURN key. ED will save the file text.txt and make a backup copy. This file will be used in exercises to demonstrate various ED commands.

The Buffer

At this stage a brief description of the text buffer might help you to understand its complexity. Text is entered directly into the memory buffer from the keyboard. The size of the buffer can be determined by the 0V command entered at the prompt followed by the RETURN key; the display on the screen will give free space/buffer size. When the command is executed the screen will display 38271/38491. The LINE NUMBER command letter N allows movement through the lines of text in the buffer and is executed by entering a line number at the prompt.

The line selected is displayed on the screen; unlike the LINE command L which only goes to the line number and requires a further command to display text. The B command sets the CP at the start of the buffer and -B puts the CP at the end of the buffer. ED then enters the COMMAND mode and displays the command prompt :*. Enter B0P at the prompt to display text from the start of the buffer. The letter B moves the CP to the start of the buffer and 0 (figure 0) followed by the letter P displays half the buffer to the screen. The B0P command will be used extensively in the coming exercises to set the CP at the start of the memory buffer and print the file.

Viewing an Existing File

Now let's view the file text.txt created earlier and saved to the disk using the EXIT command. Before any viewing takes place the file MUST be loaded into the buffer. To do this use the APPEND command letter A is be used. Decide on how much text you want to view at one time and enter one of the A commands at the ED prompt, then press the RETURN key.

Saving Text File

You have already saved the file text.txt using the EXIT command letter E. Here are two other ways of saving files. The HEAD OF FILE command letter H, saves the contents of the memory buffer without leaving ED and sets the CP at the start of the buffer. This allows re-editing without having to load ED again.

If you make a mess of the text file and want to return to the original file then use the ORIGINAL command letter O. This command will abandon all changes made to the text file and returns to the original file ready for re-editing, again without the ED session. The O command differs from the E and H commands as you are asked to confirm the validity of the command by the prompts O (Y/N). Enter Y or N and press the RETURN key and leave the computer and disk drive to do the rest.

Loading from an Existing File

Now to get down to the serious work of editing a text file. To re-call text previously entered into a file enter the following line at the system prompt:

```
>A ed text.txt          press RETURN key
```

ED will load the file text.txt ready for editing. Use the combined APPEND #A and PAGE 0P commands to display text on the screen from the buffer. The screen will display the following:

```
A >ed text.txt
      :* #A0P
1: My dear son James, the head of the family,
2: died on 2 September 1834.
3: Thus death, or rather the conqueror of the last enemy,
4: hath said, hitherto shall the immediate Branches of the
5: Family Tree go, and no further.
1: *
```

I'm afraid space doesn't allow us to print the whole article. Watch this space for the concluding part.

See listings on page 61

TRYBRIDGE

TITLE	CBM 64 CASS	CBM 64 DISC
ACE 2	6.50	9.95
AIRWOLF	1.75	
AMERICAN CIVIL WAR		14.25
ALLSTARS (EDGE)	6.00	
ALIEN SYNDROME	6.50	9.95
ADV TACT FIGHTER	6.50	9.95
ADV ART STUDIO	15.00	19.00
ARCADE ALLEY	6.59	9.95
ARCTIC FOX	6.95	10.45
APOLLO 18	6.95	10.45
AIRBORNE RANGER	10.45	13.95
ARMY MOVES	3.50	
ARCADE FORCE FOUR	6.95	9.95
ATHELA	3.50	
ARKAROID 2 REVENGE	6.00	9.95
BARBARIAN	6.95	
PSYGNOSIS		
BEACH BUGGY SIM	1.75	
BATTLEFRONT		14.25
BATTLE IN NORMANDY		14.25
BATTLSHIPS	1.75	
BLACK TIGER	6.95	8.95
BOMB JACK	1.75	
BRAINSTORM	1.75	
BATTLE VALLEY	2.75	
BEYOND ICE PALACE	6.50	9.95
BLOOD BROTHERS	6.50	10.45
BIONIC COMMANDO	6.95	9.95
BAD CAT	6.95	9.95
BEST OF ELITE VOL 1	4.50	
BOBSLEIGH	6.50	
BARBARIAN 1 or 2	6.50	9.95
BLACKLAMP	6.00	9.95
BEDLAM	6.50	9.95
BUGGY BOY	6.50	9.95
BARDS TALE 1 or 2	6.95	10.45
BARDS TALE 3		10.45
BANGKOK KNIGHTS	6.50	9.95
BUBBLE BOBBLE	6.00	8.95
BLOOD VALLEY	6.95	9.95
BOUNCES	2.00	
B'DASH CON KIT	5.00	
CARRIER COMMAND	9.95	13.95
CARRIERS AT WAR		14.25
CHUBBY GRISTLE	6.59	
CROSSWIZE	6.00	9.95
DEMON STALKER	6.95	10.45
DARK SCEPTRE	6.00	8.95
DRAGONSLAIR 1 or 2	3.00	
DRUID	2.00	3.00
EDDIE EDWARDS SKI	6.50	9.95
EMPIRE STRIKES BACK	6.50	9.95
EUROPE ABLAZE		14.25
EURO 5 A SIDE	1.75	
ECHELON	6.95	9.95
ENDURO RACER	6.50	9.95
ELITE	9.95	11.95
EYE	2.95	4.95
EARTH ORBIT STATION		12.95
4x4 OFF ROAD RACING	6.95	9.95
4TH AND INCHES	6.95	9.95
FLYING SHARK	5.00	9.95
FRANK BRUNO	1.75	
FLASHPOINT	6.00	9.95
FRIGHTMARE	6.50	9.95
FIREFLY	6.00	9.95
FOOTBALL DIRECTOR	6.00	
F15 STRIKE EAGLE	6.50	9.95
FOOTBALL MANAGER	2.95	6.95
FOOTBALL MANAGER 2	6.95	9.95
FIVE COMPUTER HITS	3.50	
FUTURE KNIGHT	2.00	
FREDDY HARDEST	3.00	
FLINTSTONES	6.50	9.95
FROSTBYTE	2.00	
FIVESTAR 1,2 or 3	6.95	
GT GIANA SISTERS	6.59	8.25
G LINEKER SKILLS	6.95	9.95
GUTZ	6.00	
GOTHIK	6.00	9.95
GAUNTLET 2	6.95	9.95
GEE BEE RALLY		
GUNSMOKE	6.95	8.95
GRYZOR	6.00	8.95
GAME OVER		
GAME SET & MATCH	8.95	11.95
GARFIELD	6.50	
GREAT ESCAPE		
GUILD OF THIEVES		13.95
GUNSHIP	9.50	13.95
GO TO HELL		
GUNRUNNER		
GOBOTS		
HALLS OF		14.25
MONTEZUMA		
HOPPIN MAD	6.95	9.95
HERCULES	6.95	9.95
HEADCOACH	2.95	
HEAD OVER HEALS	3.50	
HEARTLAND		
HOTSHOT		
HYPERBALL	1.50	
INFILTRATOR 2	6.59	9.95
I D	6.25	9.95
INT SOCCER	6.50	9.95
IMPACT	6.50	
INT KARATE	2.95	6.95
INT KARATE +	6.50	9.95
IMP MISSION 2	6.95	9.95
IKARI WARRIORS	6.50	8.95
INDY JONES TEMPLE	6.95	9.95
ICOUPS	1.50	
JINKS	6.95	8.95
JEWELS OF DARKNESS	9.00	11.95
KONAMI COLLECTION	6.50	
KNIGHTMARE	6.50	9.95
KARNOV	6.50	9.95
KNIGHTMARES 2.	6.50	
KNIGHTORC	9.95	9.95
LIVE AMO	6.50	9.95

TITLE	CBM 64 CASS	CBM 64 DISC
LAST NINJA	6.50	9.95
LAST NINJA 2	8.50	9.95
LAZER SQUAD	6.95	9.95
MARAUDER	6.95	9.95
MICKEY MOUSE	6.95	9.95
MADBALLS	6.00	
MAGNIFICENT 7	6.50	12.95
MINDFIGHTER	9.95	13.95
MORPHEUS	9.95	11.95
MATCH DAY 2	6.00	9.95
MEGA APOCALYPSE	6.50	9.95
ROBIN OF WOOD	1.50	
SUMMER OLYMPIAD	6.50	9.95
SOLDIER OF LIGHT	6.50	9.95
SKATECRAZY	6.95	9.95
SALAMANDER	6.25	
SAMURAI WARRIOR	6.00	9.95
STAR WARS	6.50	9.95
SIDEARMS	6.59	9.95
STREETFIGHTER	6.95	9.95
SINBAD & THRONE		9.95
STUNTBIKE SIM	1.75	
SUPERSTAR ICE	5.00	
HOCKEY		
STRIP POKER 2	6.95	9.95
STREET BASKETBALL	6.95	9.95
SOLID GOLD	6.95	9.95
STARGLIDER	9.95	11.95
SENTINEL	2.95	3.95
SIDEWIZE	3.00	
SILENT SERVICE	6.50	9.95
SUPERSPRINT	6.50	9.95
SILICON DREAMS	9.50	9.95
720	6.95	8.95
SHOOT EM UP CON KIT	9.95	13.95
STEALTH FIGHTER	9.95	13.95
SKATE OR DIE	6.95	10.45
SPY V SPY ARTIC	2.00	
SPY V SPY TRILOGY	6.95	9.95
3 STOOGES		10.95
10 GREAT GAMES 1 or 2	6.95	
20 CHARTBUSTERS	6.95	
TERRAPODS	6.95	
TEST DRIVE	6.95	10.45
TIMESCANNER	6.95	9.95
TIME STOOD STILL	6.00	9.95
MUSIC SYSTEM	10.00	30.00
MINI OFFICE 2	10.00	15.00
MINI PUTT	6.95	10.45
MAGNETRON	5.95	9.95
19 BOOTCAMP	6.95	9.95
NIGEL MANSELL GP	6.95	10.45
NEBULUS	6.50	9.95
NOW 5	6.50	
NORTH STAR	6.95	9.95
NIGHTRAIDER	6.95	9.95
NODES OF YESOD	2.00	
OPERATION WOLF	6.00	9.95
OVERLANDER	6.95	9.95
OUTRUN	6.50	9.95
OH NO	2.75	
PETER BEARDSLEY	6.95	9.95
POWER PYRAMIDS	6.95	
PATTON VS ROMMEL		10.45
PANDORA	6.50	9.95
PACLAND	6.00	9.95
PLATOON	6.50	9.95
PREDATOR	6.50	9.95
PSYCHO PIG UXB	6.95	9.95
PINK PANTHER	6.50	9.95
PHM PEGASUS	6.95	10.45
PAWN		13.95
PIRATES	9.95	13.95
POWER AT SEA		10.45
PAPERBOY	3.00	
RACE AGAINST TIME	4.95	
ROAD BLASTERS	6.95	9.95
RIMRUNNER	6.00	8.95
REACH FOR THE STARS		14.25
ROMMEL		14.25
RAMPAGE	6.50	9.95
RASTAN SAGA	6.50	9.95
ROADWARS	6.50	8.95
RYGAR	6.00	9.95
ROLLING THUNDER	6.95	9.95
RENEGADE	6.00	9.95
RING WARS	6.50	9.95
RED OCTOBER	6.95	13.95
REVS +	6.50	9.95
TRAIN ESCAPE	6.95	10.45
TO HELL & BACK	6.95	9.95
TANGENT	2.75	
THE GAMES WINTER	6.95	9.95
TRIGGER HAPPY	6.95	8.95
TROLL	6.50	8.95
TIME & MAGICK	6.95	9.95
TRACKSUIT MAN	6.95	9.95
TRAITOR	6.95	9.95
TARGET RENEGADE	6.00	
THUNDERCATS	6.50	9.95
TEMPEST	6.50	9.95
TERRAMEX	6.50	9.95
TETRIS	6.50	9.95
TAIPAN	3.50	
UNITRAX	6.95	9.95
VAMPIRES EMPIRE	6.95	8.95
VINDICATOR	6.95	9.95
VIRUS	6.95	9.95
VIXEN	6.95	10.45
VENOM	6.95	9.95
WIVARD WARZ	6.95	9.95
WORLD CLASS L'BOARD	6.95	9.95
WONDERBOY	6.50	9.95
WORLD TOUR GOLF	8.00	9.95
WIZBALL	3.50	
WE ARE THE CHAMPIONS	6.50	12.95
WHIRLIGIG	6.95	8.95

Trybridge Software Distribution
72 North Street,
Romford,
Essex RM1 1DA 0708-765271

Win a Bionic Arm!

Your chance to win a fantastic Robotarm from Datel!

We've teamed up with Datel for this month's competition spot the difference and the lucky winner could walk away with a Robotarm and software – worth £50. The next four entries out of the hat will each receive Blazing Paddles – a combined light pen and graphics package system. So what are you waiting for?

How to Enter

Study the two cartoons on this page; there are a number of differences between them. Once you have decided how many differences there are, complete the entry coupon and send it to the editorial address (see coupon). Write the number of differences that you have found on the back of the envelope. If you don't your entry will not be accepted.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications and Datel. This restriction also applies to employees' families and agents of the companies.

The How to Enter section forms part of the rules. The Editor's decision is final and no correspondence will be entered into.

Detal Entry Coupon

Name .....

Address .....

.....Postcode .....

Number of differences found .....

Closing date: 31st Oct 1988

Post to: Your Commodore
Datel Competition
ASP Ltd
1 Golden Square,
London W1R 3AB

Interceptor

All forms of combat have become much more remote as technology has improved. The Roman soldier certainly knew when he had killed someone as his victim was impaled only eighteen inches in front of his face. By the time a squaddie had a rifle in his hand, he was taking pot shots at people over half a mile away. If that person disappeared, the squaddie never knew whether he had hit his target or the man had just ducked down.

It is the same with air warfare. Gone are the days of the silk scarf, goggles and shouts of 'Tally-Ho Chaps' as you waved to your opponent before blasting him out of the skies. Now, all you get to see is a small blip on your radar screen at which let loose the odd missile or two. It is a bad show if you actually get to see your opponent.

Two of the latest killing machines are the F-16 Fighting Falcon and F/A-18 Hornet, pride of the American ground and naval forces respectively. Interceptor from Electronic Arts puts you in charge of either in their latest Amiga game.

As combat simulators go, Interceptor falls somewhere in the middle ground. You do not have to wade through

hundred page manuals before you discover how to take off. Nor is the documentation so sparse that you are literally flying on a wing and a prayer. Instead, there is a twenty four page manual, most of which is taken up with diagrams.

What the program does instead is to take you through a series of training flights. At the simplest of levels is free flight. There are no enemies or targets, just you alone in a big empty sky getting used to the controls of your aircraft.

The next stage is the easiest of all. You don't do anything as you sit beside your training officer as he demonstrates the seven basic combat manoeuvres – the aileron and barrel rolls, inside and vertical half loops, break turns, inverted flight and the split-S. You had better be paying attention though for your next task is to demonstrate that you can perform the moves yourself.

A qualification mission follows. Take off from the deck of the carrier, fly around dealing with any enemy aircraft that happen to be in the vicinity before finding and landing on the carrier once more. Only a successful mission here results in you being passed fit for active duty.

The controls of your plane are reasonably straightforward with most of the keys used being sensibly arranged and easy to remember. e.g. R for range, T for target, M for map and so on. For once in games of this type, I found that the combination of joystick and keyboard easy to manage so that I could stay airborne long enough to be shot down rather than going into a power dive from thirty thousand feet as I struggled to find the right button to press! The head up display, which throws an image of all the vital information onto the canopy proved more than useful and saved forever having to look down at the instrument panel. Ironically, the control that gave me the most trouble was the security wheel, included in the package to stop piracy.

You have a variety of weapons available at your disposal – AMRAAM medium range missiles, Sidewinder short range missile and a close range cannon. Naturally, it would be unfair to expect your opponent to fight back armed only with a pea shooter so it is necessary to make use of chaff, flares and electronic counter measures in an attempt to divert the bad guy's missiles. The only problem with these is that they do tend to advertise your presence somewhat.

One of the most unusual features of Interceptor is the number of different views that you, the pilot can obtain. You can look out of your cockpit left or right, up or down and forwards or backwards. As if that wasn't enough, you can also get third person views of your aircraft, i.e. someone standing right next to you but outside the aircraft, again from the same bewildering set of angles. Why you should want to do this in actual combat, I haven't yet discovered, but you must admit, it does look impressive in the photographs!

Interceptor has got the balance just about right between complexity and gameplay and the game should provide many hours of entertainment to any would-be, latter-day Biggles. An excellent game. **G.R.H.**

Touchline:
Title: *Interceptor.* ***Machine:*** *Amiga.* ***Supplier:*** *Electronic Arts, 11-49 Station Road, Langley, Berks SL3 8YN.* ***Tel:*** *0753 49442.* ***Price:*** *£24.95.*

To find out all you need to

Know

about the Amiga computer

it

pays to subscribe to 'Your Amiga'

all

you need to do is fill in the coupon

U.K. £9.00, Europe £11.80, Middle East £11.90,
Far East £13.00, Rest of the World £12.10
Airmail rates on request.

Please commmence my subscription to YOUR AMIGA with the ..... issue. I enclose my cheque/money order for £..... made payable to ARGUS SPECIALIST PUBLICATIONS LTD.
or debit £..... from my Access/Barclaycard
No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐
Valid from ..... to .....
Signature .....
Name .....
Address .....
..... Postcode .....

Send this form with your remittance to:
INFONET LTD. 5 River Park Estate,
Billet Lane, Berkhamsted, Herts HP4 1HL

Jack in the Box!

A handy utility which can be used by Basic or machine code programmers

By S. Scott

The Box utility program provides four main functions to allow powerful handling of screens.

Firstly, a PRINT routine is provided. This is not necessary for machine code programmers as the kernal plot routine at $FFF0 can be used. To position the cursor from Basic enter:

SYS 52797,X,Y

X must be in the range 0-39 and Y in the range 0-24.

The second routine is called CONFIG. This is a special routine that will allow the user to set up the utilities as required. To call the CONFIG routine from Basic enter:

SYS 52480,A,B,C,D,E,F

A – Border colour
B – Screen colour
C – Ink colour
D – Input ink colour
E – Cursor colour
F – ASCii code of cursor e.g. ASC(".") or 39

Calling the Config routine in machine code is slightly more complex. The parameters A to F must be set up by placing the required values in the locations below. This is done using LDA and STA in machine code.

A –$D020 – this is the standard border colour
B –$D021 – screen colour
C –$0286 –cursor colour
D –$CF68 – input colour
E –$CF69 – cursor colour
F –$CF6A– the cursor type

To call the Config routine enter JSR $CD00.

Routine three is an input routine. The main advantage that this has over the standard Commodore input statement is that numeric input is masked. Only numbers are allowed in numeric input, letters and symbols are ignored.

The cursor type and colour are pre-set by the config routine (section 2). For basic users, the input routine is called by the following statement:

SYS 52814,TYPE,DIGITS

Type is a parameter. This shows the type of input. 1 is used for numeric and any other value for alpha.

Digits simply indicate the number of characters in the string. This must be in a range of 1 to 25.

NB: the input data is stored at location $CF40 or 53056 decimal. To read back the data the following code may be used:

For numeric values:

```
10 SYS 52814,1,10
20 A$=""
30 FOR L=0 TO 9
40 A$=A$+CHR$(PEEK(L+53056))
50 NEXT L
60 A=VAL(A$)
70 PRINT"NUMBER INPUT";A
```

For strings:

```
10 SYS 52814,0,10
20 A$=""
30 FOR L=0 TO 9
40 A$=A$+CHR$(PEEK(L+53056))
50 NEXT L
60 PRINT"STRING INPUT ";A$
```

For machine code programmers, ensure that config has been set up. Set the X register to the number of digits and set location $CF5E to the required value(0 or 1). Now call the routine at $CE57 with a JSR statement. The input data is returned in location $CF40 as above.

The final routine is called Box. It was created to allow multi-size rectangles to be drawn with ease and speed. The routine works by clearing the required area with spaces and drawing a box. The boxes give much enhancement to menus and the general display.

To draw a box in Basic, ensure the config routine has been called and then enter:

SYS 52517,A,B,C,D,E,F,G,H,

The parameters are:

A – the start X co-ordinate
B – finish X
C – start Y
D – finish Y
E and F – these values are used to specify additional lines. The lines are displayed horizontally, inline with the top and bottom lines. The values for E and F should fall between C and D.
G – this is the colour of the box in the range 0 – 15.
H – the parameter allows the boxes to be drawn in reverse(1) or not(any other value).

An example box might be:

SYS52517,10,30,5,14,7,12,1,1

Machine code programmers may use boxes by ensuring that config has been called and then setting the following locations to the required values:

A	$CF5F	–	Start X
B	$CF60	–	Finish X
C	$CF61	–	Start Y
D	$CF62	–	Finish Y
E	$CF63	–	Line 1
F	$CF64	–	Line 2
G	$CF65	–	Colour of box
H	X-register	–	Reverse flag

When the parameters have been set, execute the routine at $C057 with JSR $C057.

Program Notes

The box routine has been kept compact to allow maximum memory usage by the programmer. Therefore, parameters are not fully checked for valid entries and invalid or high values may cause corruption of your data!

To make the box program even easier to use, the following basic lines can be adopted:

```
100 F=F+1
110 IFF=1THENLOAD"BOX UTILS",
      8,1
120 PRINT"8"
130 CO=52480 : REM CONFIG
140 BO=52517 : REM BOX
150 AT=52797 : REM PRINT AT
160 IN=52814 : REM INPUT
              ROUTINE
```

See listings on page 61

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 having 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 long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

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

INFONET LTD, 5 River Park Estate, Berkhamsted, Herts HP4 1HL.
Tel: (04427) 76661

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.

MAY 1988

DESIGNER — A powerful drawing package for C64 owners.
80 COLUMN VIDEO — A simple 80 column character designer for the C128 plus disk.
CHARACTER GRABBER — Grab your favourite C64 character sets and use them in your own programs.
ADVENTURE KIT V — The fifth part of our continuing library of C64 adventure writing routines.
C128 FKEYS SWAPPER — Store four sets of function key definitions with this handy utility.
SCREENDRAW 64 — A powerful C64 character and background editor for producing your own scrolling backdrops (disk only).

ORDER CODE
DISK YDMAY88 £6.00
TAPE YCMAY88 £4.00

JUNE '88

DIRECTORY EDITOR — A superb utility that allows you to alter your disk directories as well as add comments (C64 disk only).
30K RAM DISK — Turn unused memory on your C64 into a pseudo disk.
BASIC LISTER — List a Basic program stored on disk without having to load it into memory (disk only).
EASY BASIC TOOLKIT — Give your C64 over 30 new basics – including the ability to store libraries of subroutines.
DISK SECTOR EDITOR — Examine the contents of your Commodore 1541 disks (disk only).

ORDER CODE
DISK YDJUN88 £6.00
TAPE YCJUN88 £4.00

JULY '88

EASIPRINT — Now C16 and Plus/4 owners can access their printer functions with a set of 60 easy to use Basic commands (available on disk only).

HANDY INPUT ROUTINES — Make your Basic programs idiot-proof and more attractive with these two Basic input routines (C64).
MAKING MUSIC — A simple C64 synthesiser to accompany our popular series.
DIY PARALLEL INTERFACE — Use this software and a lead of your own manufacture to drive a Centronics printer (C64).
CP/M CENTRONICS INTERFACE — Give your 128 in CP/M mode access to a Centronics printer..
CASSETTE INLAY PRINTER — Use your printer to produce neat inlays for your cassette collection (C64).
DISKASSEMBLER — Dissassemble your programs direct from disk with this program for the C64 (Disk Only).

ORDER CODE
DISK YDJUL88 £6.00
TAPE YCJUL88 £4.00

AUGUST '88

MAKING MUSIC — Programs to accompany August's installment of our super music series (C64).
SHORT INTERLUDE — Overcome the problems of handling more than one interrupt with this handy routine for machine code programmers (64).
TAPE ORGANISER — A high speed program filing system for cassette users. (C64).
SPILT BAUD RATE TERMINAL — Drive an RS232 modem with this TTY software for C64 or C128.
SPRITE LIBRARY — Aeroplanes are the subject of this installment (C64).
EDUCATING SYDNEY — Create an image of the SID chip in memory so that you can see what it's up to whenever you require (C64).
SIMPLE — Give your Plus/4 the facility to use Icons and pull down menus. Available on disk only.

ORDER CODE
DISK YDAUG88 £6.00
TAPE YCAUG88 £4.00

SEPTEMBER 1988

MUSIC COMPOSER – Compose your own three part harmonies on your C64 with this superb package – disk only.
MUSICAL FX – An excellent effects generator that allows you to produce sound effects in your own C64 programs.
SAMPLER 64 – The quality may not be suitable for studio use but you can have great fun using this C64 sound sampler.
C16 Disk Monitor – A superb disk utility for C16 and Plus/4 owners (available on disk only)

ORDER CODE

DISK	YDSEP88	£6.00
TAPE	YCSEP88	£4.00

Cassettes or disks are available from 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
OCTOBER 88		**TAPE (£4.00)**	**YCOCT88**	
OCTOBER 88		**DISK (£6.00)**	**YDOCT88**	
OVERSEAS POST £1				
			TOTAL	

NAME.....

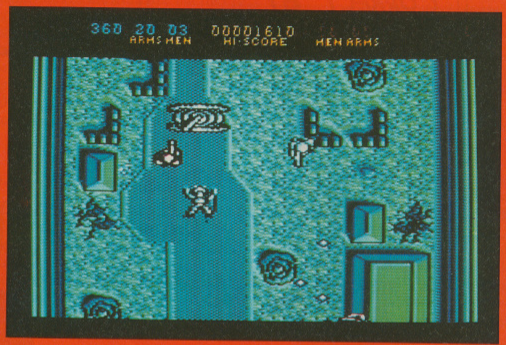
ADDRESS.....

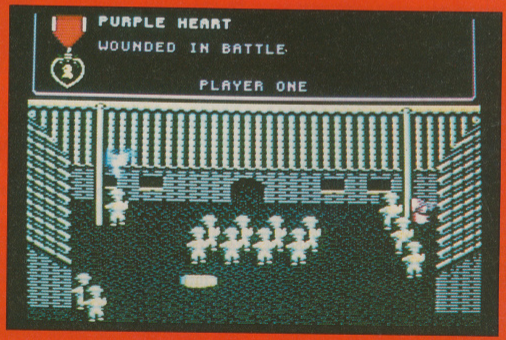
POSTCODE.....

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.

FERNANDEZ MUST DIE





I honestly thought we'd left this kind of gratuitous violence safely behind us – obviously I was wrong (a hard thing for a journalist to admit)! Alright, Commando was good fun for a while, but it's been well and truly done to death (no pun intended). The scenario is totally predictable – fight your way up the screen shooting everything and everybody in your way to assasinate mad despotic General Fernandez and free the state of El Diablo from his tyrannical rein.

Fernandez Must Die was written by none other than the legendary Tony 'Ratt' Crowther and David 'Bish' Bishop – obviously on the train on their way to the publishers! If you read this Tony, I hope you're ashamed of yourself!

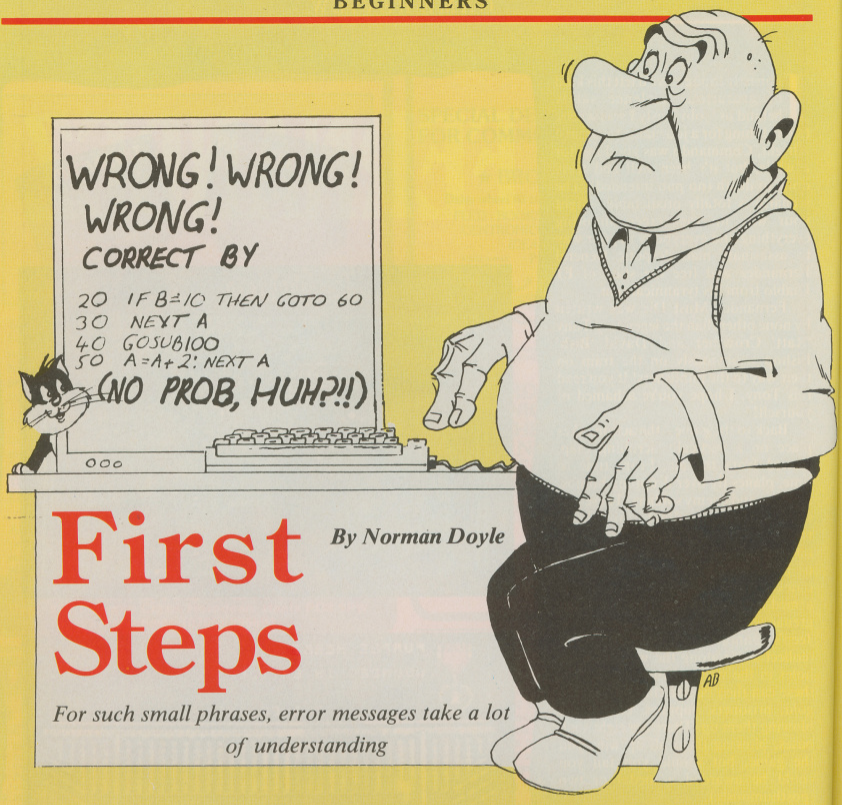
Back to the game – the action takes place on a vertically scrolling map, viewed from the air. From time to time, planes fly over dropping bombs, supplies and enemy soldiers. These you should avoid, collect and shoot respectively. Abandoned jeeps are abound, affording you a small measure of protection as well as getting you quickly from A to B. Your soldier is armed with a machine gun and hand grenades, and can make use of the Jeep's cannon if you have any shells (collect some along the way) to blow holes in the walls of the compounds, these can then be searched for hidden gold, prisoners, supplies, etc; before blowing them up. There are eight such bases, blowing them all up wins you the game, but should you fail you could be awarded a medal or two (posthumously).

The music is not brilliant, not even tolerable – 'sufferable' might come closer. Sound effects during the game are the predictable bangs and crashes, nothing particularly noteworthy.

This has been a dificult review to write, having absolutley nothing good to say about it. At the same time, some of you are going to buy this game no matter what I think. So if you like mindless violence, Fernandez Must Die is the game for you.

F.R.

Touchline:
Product: *Fernandez Must Die* ***Suplier:*** *Image Works, Headway House, 66-73 Shoe Lane, London EC4P 4AP.* ***Price:*** *£9.99 (tape), £12.99 (disk)* ***Machine:*** *C64/128.*



First Steps

By Norman Doyle

For such small phrases, error messages take a lot of understanding

Error messages are actually devised to help rather than hinder progress. This article completes our look at file problems and tackles the errors that can arise with calculations.

NOT INPUT FILE

Occurrence: program error

Generated after an INPUT # or GET # command, this means that the file number refers to an output file. In other words the file was opened as a write only file.

NOT OUTPUT FILE

Occurrence: program error

Similar to the previous error, this appears when the wrong type of file is accessed by the PRINT command. The only solution for both of these problems is to first of all check that the command does describe the required action and that the file number is correct. If everything checks out, then the file must be closed and re-opened as the correct type.

FILE DATA

Occurrence: program/file error

When numeric data is expected from a file read command but string data is returned instead, this is the error message that appears. First of all check that the file is the right one and then alter the INPUT # or GET # command structure to handle the data correctly.

For some obscure reason, the C64 manual refers to this as the BAD DATA error message.

MISSING FILE NAME

Occurrence: user error

This only occurs when operating with a device number greater than three and is generated when a null string is given as the filename. This can only be done by using the syntax: LOAD " ",8. On cassette this would be a valid filename and would load the first program file encountered. The equivalent disk command is an asterisk or a colon followed by an asterisk.

ILLEGAL DEVICE NUMBER

Occurrence: user error

There are only two device numbers which cause this error: zero and three. These correspond to the screen and the

keyboard which cannot be saved to or loaded from. With sequential files the operating system is blind to device numbers and will apparently accept any syntaxially correct statement regardless.

Printers are not input devices but the operating system will still allow an attempt to load. Trying to save to a printer produces interesting results!

Legal device numbers range from zero to 255 but values less than 63, or between 128 and 191 generate a DEVICE NOT PRESENT error if the device is not connected. An attempt to access devices with any of the remaining values will be executed whether the device exists or not.

If a device number of 256 is used the error generated is ILLEGAL QUANTITY.

LOAD

Occurrence: operating system or user intervention

This indicates that a load has failed. The causes can be a faulty disk or tape, a permanent or temporary electrical fault or the pressing of the RUN/STOP key to abort a load.

The electrical fault may be as simple as a bad connection at the cassette port or a transient power spike. Spikes are caused by heavy load equipment such as central heating systems, cookers or fridges causing a feedback into the main. This usually causes the visual display to jump and a loud click is heard through the speaker.

Another cause can be misaligned tape heads. As time goes by, the playback/record head can move slightly and the tape signal misses the read head slightly. This results in a loss of 'volume' which the computer can only tolerate to a certain degree. Once the signal becomes so quiet that this threshold is reached, the tape may start reading until natural tape movement pulls the signal down below the cassette recorders threshold of 'hearing'.

Alternatively, the drive band in the cassette may be worn out. This causes the tape to vary in speed ruining the precise signal timing that the computer relies on to make sense of the data. Similarly, a motor fault would produce the same effect.

The solution to spikey mains signals is to unplug the offending equipment or to fit a smoothing mains filter socket for the computer equipment.

Alignment problems can be cured by a datasette doctor system which will help to diagnose and possibly correct the fault.

Disk faults result from similar causes to cassette faults but correction of alignment or speed problems is more difficult to solve. Disk drive alignment kits are available but they're more difficult to use. Given that the disk is faulty anyway, one may be worth a try. Care must be taken however because the drive plugs directly into the mains and a 240V shock could be at the least painful, at worst fatal.

VERIFY

Occurrence: operating system or user intervention

A verify error usually occurs because the disk or tape program is not the same as the one in the computer's memory. If this is definitely not the case, the device has one of the faults outlined under LOAD errors.

This completes the catalogue of cassette based errors but there are plenty of problems which can be experienced with disk drives. The C128, C16 and Plus/4 computers all have special handling systems to report these faults but C64 users will have to rely on the flashing red LED warning light on the drive. A cartridge or a disk operating system, such as the one supplied on the TEST/DEMO disk, can correct this problem.

All of the remaining errors in the C64's repertoire are programming errors. The specialised C128, C16 and Plus 4 errors will be covered in a later article.

Mathematical Errors

Mathematical operations follow very strict rules; all of which cannot be detected by the operating system. Use of statements such as 4*5+1 are valid when the required answer is 21 but invalid when the programmer means that four is to be multiplied by the result of five plus one. This should be correctly written as 4*(5+1). Such undetectable programmer errors are not the concern of the computer's operating system and care in the use of brackets is an essential skill to master.

ILLEGAL QUANTITY

This occurs when a number is used which goes beyond the allowable range for an integer variable or exceeds the 255 range of file numbers, device numbers and other such values.

The allowable range for integers is —32768 to +32767 inclusive. If a calculation is expected to exceed these limits it is best to use the more usual floating point method (A rather than A%).

OVERFLOW

An overflow error only occurs when the result of a floating point calculation exceeds plus or minus 1.7014118345E+38.

No errors are generated with negative exponential (E) values which exceed 2.93873588E-39. This is because lower decimal values represented in this way are very small indeed, having 38 zeros between the decimal point and the string of numbers preceeding the E value. Unfortunately, exceeding this value results in the variable becoming zero, so calculations should be kept well within the limit to ensure maximum accuracy.

DIVISION BY ZERO

Although dividing by zero is not permitted, dividing zero by another number is allowed but gives a value of zero.

FORMULA TOO COMPLEX

This can occur under numerous circumstances but basically means that the computer cannot cope with the mathematical formula as it is presented.

Correction involves breaking the calculation down into easily assimilated sub—calculations or to use fewer brackets if at all possible.

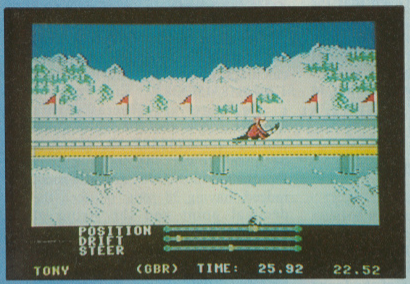
UNDEF'D FUNCTION

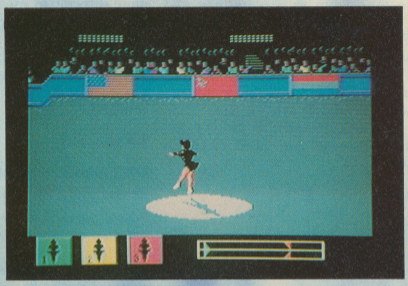
All FN functions must be defined before they are used. This may sound like commonsense but it can be easily done when a program is created in modular form using subroutines.

The way to avoid the error is to define all functions within the first few lines of every program. If a function is necessary at line 1000 of a program, go back and add a line as near to the beginning as possible to set up the FN formula.

Next month we'll be covering errors associated with GET and INPUT, including problems posed by mixing strings and numerical data. YC

The Games – Winter Edition





First there was Summer Games, then its sequel Summer Games II which were quickly followed by Winter, World and California Games. Now just when you thought it was safe to pick up your joystick out comes The Games – Winter Edition.

Seven more events await joystick athletes in the first of the many games set to jump on the Olympic bandwagon but why is the Winter Edition released now in the Summer when you just know there's a Summer Edition coming in the winter?

These new "games" games are as a result of Epyx's success in capturing the Olympic licence and the Winter Edition includes a combination of snow, skis, skates and ice which will prove irresitable to those aspiring to the greatness of top athletes such as Eddie "the Eagle" Edwards.

Many of the seven events in the Winter Edition appeared in Winter Games but are now more involved games demanding more than a sequence of joystick moves.

As with the previous games, up to eight players can compete for gold, silver and bronze medals and to set new world records. You can also practise any event or compete in one or more.

The luge is the first event and hurling yourself down a track on a small piece of wood seems the ideal way to end the contest, not start it. But you must steer your luge down one of four packed snow tracks faster than anyone else by steering it down the middle of straights and riding corners as much as you can without clipping the edges which will cost you valuable seconds.

Cross Country skiing also gives you a choice of courses that range from one to five kilometres and is basically the Winter Games Biathlon without the shooting and is the most disappointing of all events as a simple left. Right rhythm will ensure a good time.

The ice skating is far more involved than its Winter games equivalents as now you must choose your music and plan your program of moves before performing it in the Olympic arena. A selection of jazz, rock and pop ensure a mixture of beats to plan your double axels, spins and falls to. Then in the performance you have to perform the right move at the right time in the music to score maximum points.

For true Eddie Edwards action you should try the Ski Jump with its new jumper perspective of the slide down the slope before you hopefully soar into the air for a medal leaping jump or plummet and land in a heap in the snow.

The slalom course is just as treacherous as you must ski between the flags. Timing is vital but the inconsistent spacing of the flags means a simple rhythm just won't work.

Speed skating seems like an obvious event to include and many were surprised that it was left out of the original Winter Games but now it's back for those who want head to head racing action. In this event beating a computer pacer isn't quite as satisfying as crossing the finishing line while your human opponent is face down in the ice.

The final event is for the extroverts of the skiing world as TV cameras line the route of the downhill. The course is mapped out with flags that you must steer between to stay on your skis but when you come in range of the cameras you can show off with a few flips and jumps. Naturally, it's the one with the fastest time that will take the gold but it helps to get the crowd on your side.

The medals are presented to the winners in true Olympic fashion with the first three on pedestals, the gold medal winners national anthem playing as the flags are unfurled.

More stirring stuff from Epyx.

Touchline: **T.H.**

Title: *The Games – the Winter Edition.* ***Supplier:*** *Epyx (US Gold), Units 2/3, Holford Way, Holford, Birmingham, B6 7AX.* ***Tel:*** *021-356 3388.* ***Machine:*** *C64.* ***Price:*** *£9.95.*

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
9,2346
 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 Many of the listings are presented in lower case. To turn your computer to lower case mode press the Commodore key and the SHIFT key at the same time. YC

Mnemonic	Symbol	Keypress
[RIGHT]		CRSR left/right
[LEFT]		SHIFT & CRSR left/right
[DOWN]		CRSR up/down
[UP]		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]		SHIFT & f7 key
[HOME]		CLR/HOME
[CLR]		SHIFT & CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	Keypress
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8
[POUND]		£
[LARROW]		←
[UPARROW]		↑
[PI]		SHIFT & ↑
[INST]		SHIFT & INST/DEL
[REV T]		see text
[Cletter]		CBM + letter
[Sletter]		SHIFT + letter

Listings

SPRITE LIBRARY

PROGRAM: MULTIALPH DISPLAY

```
85  10 REM************************
    ****
31  20 REM* SPRITE LIRBARY DISPL
    AY *
81  30 REM*          MULTIALPH
    *
CB  40 REM************************
    ****
FF  50 POKE55,0:POKE56,40:X=X+1:
    IFX=1THENLOAD"MULTIALPH",8,1

E9  60 P0=70:P1=150:P2=118:P3=15
    0:P4=180:P5=150:P6=248:P7=15
    0:S=160:E=199:D=250
76  70 V=53248:PRINT"CCLR,WHITE,
    DOWN26,RIGHT9,RVSONJF7 TO ST
    OP ANIMATION"
84  80 POKEV+21,15:POKEV+23,10:P
    OKEV+28,15:POKEV+29,12:POKEV
    +32,3:POKEV+33,3
63  90 POKEV+37,0:POKEV+38,15:PO
    KEV+39,2:POKEV+40,2:POKEV+41
    ,2:POKEV+42,2:POKEV,P0
B7  100 POKEV+1,P1:POKEV+2,P2:PO
    KEV+3,P3:POKEV+4,P4:POKEV+5,
    P5:POKEV+6,P6:POKEV+7,P7
1A  110 INPUT"CHOME,DOWN3START S
    PRITE";S:INPUT"END SPRITE";E
    :INPUT"DELAY";D
13  120 FORSP=SIOE:FORT=0TOD:NEX
    T:PRINT"CHOME3"TAB(23)"SPRIT
    E NO.=";SP:POKE2040,SP
67  130 POKE2041,SP:POKE2042,SP:
    POKE2043,SP:NEXT:GETK$:IFK$=
    "CF7"THEN110
34  140 GOTO120
```

PROGRAM: MULTIALPH DATA

```
AF  10 REM************************
    *
B1  20 REM*   SPRITE  LIRBARY
    *
30  30 REM*   ----------------
    *
6F  40 REM*  MULTIALPH SPRITES
    *
JE  50 REM*  BASIC DATA LOADER
    *
99  60 REM* SPRITES DESIGNED BY
    *
2E  70 REM*       MIKE BENN
    *
C5  80 REM************************
    *
DD  90 BL=255  :LN=190  :SA=1024
    0
89  100 FOR L=0 TO BL:CX=0:FOR D
    =0 TO 15
4F  110 READ A:IF A>255THENPRINT
    "NUMBER TO LARGE";LN+(L*10):
    STOP
98  120 CX=CX+A:POKE SA+L*16+D,A
    :NEXT D
D9  130 READ A:IF A><CX THENPRIN
    T"ERROR IN LINE";LN+(L*10):S
    TOP
37  140 NEXTL:POKE43,0:POKE44,40
    :POKE45,0:POKE46,56
05  150 SAVE"MULTIALPH",8,1:END
EF  160 REM************************
    **********
3B  170 REM TAPE USERS WILL NEED
     TO CHANGE          DEVICE N
    UMBER FROM 8 TO 1
FB  180 REM************************
    **********
4F  190 DATA 0,0,0,0,0,0,0,42,0,
    0,170,128,2,166,160,6,674
6C  200 DATA 145,160,6,129,160,6
    ,129,160,6,129,160,6,170,160
    ,6,170,1702
AA  210 DATA 160,6,149,160,6,129
    ,160,6,129,160,6,129,160,6,1
    29,160,1655
A9  220 DATA 6,129,160,10,162,16
    8,26,166,168,21,69,80,0,0,0,
    190,1355
52  230 DATA 0,0,0,0,0,0,0,10,170,
    0,26,170,128,22,150,160,6,84
    2
62  240 DATA 129,160,6,129,160,6
    ,129,160,6,129,160,6,170,144
    ,6,170,1670
6B  250 DATA 64,6,149,128,6,129,
    160,6,129,160,6,129,160,6,12
    9,160,1527
BE  260 DATA 6,129,160,10,170,14
    4,26,170,64,21,85,0,0,0,0,25
    5,1240
C3  270 DATA 0,0,0,0,0,0,0,0,42,32
    ,0,170,96,2,166,160,6,674
09  280 DATA 145,160,6,129,160,6
    ,129,160,6,129,64,6,128,0,6,
    128,1362
AE  290 DATA 0,6,128,0,6,129,160
    ,6,129,160,6,129,160,6,129,1
    60,1314
A2  300 DATA 6,161,160,5,170,144
    ,1,106,64,0,85,0,0,0,0,144,1
    046
CF  310 DATA 0,0,0,0,0,0,0,10,170,
    0,26,170,128,22,150,160,6,84
    2
AB  320 DATA 129,160,6,129,160,6
    ,129,160,6,129,160,6,129,160
    ,6,129,1604
AY  330 DATA 160,6,129,160,6,129
    ,160,6,129,160,6,129,160,6,1
    29,160,1635
7D  340 DATA 6,129,160,10,170,14
    4,26,170,64,21,85,0,0,0,0,20
    7,1192
C1  350 DATA 0,0,0,0,0,0,0,10,170,
    160,26,170,160,22,149,160,6,
    1033
CB  360 DATA 129,160,6,129,64,6,
    128,0,6,128,0,6,170,128,6,17
    0,1236
BF  370 DATA 128,6,149,0,6,128,0
    ,6,128,0,6,128,0,6,128,160,9
    79
AD  380 DATA 6,129,160,10,170,16
    0,26,170,160,21,85,64,0,0,0,
    127,1288
D9  390 DATA 0,0,0,0,0,0,0,10,170,
    160,26,170,160,22,149,160,6,
    1033
D0  400 DATA 129,160,6,129,64,6,
    128,0,6,128,0,6,170,128,6,17
    0,1236
8B  410 DATA 128,6,149,0,6,128,0
    ,6,128,0,6,128,0,6,128,0,819

12  420 DATA 6,128,0,10,160,0,26
    ,160,0,21,64,0,0,0,0,127,702

E3  430 DATA 0,0,0,0,0,0,0,0,42,32
    ,0,170,96,2,166,160,6,674
63  440 DATA 145,160,6,129,160,6
    ,129,64,6,128,0,6,128,0,6,12
    8,1201
37  450 DATA 0,6,130,168,6,134,1
    68,6,133,160,6,129,160,6,129
    ,160,1501
4F  460 DATA 6,161,160,5,170,144
    ,1,106,64,0,85,0,0,0,0,2,904

93  470 DATA 0,0,0,0,0,0,0,10,162,
    168,26,166,168,22,133,160,6,
    1021
B0  480 DATA 129,160,6,129,160,6
    ,129,160,6,129,160,6,170,160
    ,6,170,1686
F1  490 DATA 160,6,149,160,6,129
    ,160,6,129,160,6,129,160,6,1
    29,160,1655
E7  500 DATA 6,129,160,10,162,16
    8,26,166,168,21,69,80,0,0,0,
    95,1260
F5  510 DATA 0,0,0,0,0,0,0,0,42,12
    8,0,106,128,0,90,0,0,494
D7  520 DATA 26,0,0,26,0,0,26,0,
    0,26,0,0,26,0,0,26,156
4F  530 DATA 0,0,26,0,0,26,0,0,2
    6,0,0,26,0,0,26,0,130
DF  540 DATA 0,26,0,0,105,128,0,
    106,128,0,85,0,0,0,0,84,663
08  550 DATA 0,0,0,0,0,0,0,0,10,16
    0,0,26,160,0,22,128,0,506
99  560 DATA 6,128,0,6,128,0,6,1
    28,0,6,128,0,6,128,0,6,676
02  570 DATA 128,0,6,128,0,6,128
    ,0,6,128,0,6,128,10,6,128,80
    8
DD  580 DATA 26,6,128,22,170,128
    ,1,170,0,1,84,0,0,0,0,232,96
    8
```

```
99 590 DATA 0,0,0,0,0,0,10,160,
160,26,162,160,22,130,160,6,
996
6B 600 DATA 138,144,6,138,64,6,
170,0,6,169,0,6,168,0,6,154,
1185
9S 610 DATA 0,6,168,0,6,170,0,6
,154,0,6,154,128,6,154,160,1
118
1S 620 DATA 6,150,160,10,166,16
8,26,166,168,21,69,80,0,0,0,
22,1212
F3 630 DATA 0,0,0,0,0,0,10,160,
0,26,160,0,22,128,0,6,512
F1 640 DATA 128,0,6,128,0,6,126
,0,6,128,0,6,128,0,6,128,798

EA 650 DATA 0,6,128,0,6,128,0,6
,128,0,6,128,160,6,129,160,9
91
3S 660 DATA 6,129,160,10,170,16
0,26,170,160,21,85,64,0,0,0,
253,1414
2B 670 DATA 0,0,0,0,0,0,42,0,42
,106,128,170,90,128,168,26,9
00
ED 680 DATA 162,168,26,162,168,
26,106,104,26,106,104,26,88,
104,26,24,1426
S9 690 DATA 104,26,20,104,26,0,
104,26,0,104,26,0,104,25,0,1
04,774
D9 700 DATA 26,0,104,42,128,170
,106,129,170,85,1,85,0,0,0,4
6,1092
83 710 DATA 0,0,0,0,0,0,42,2,16
8,106,6,168,90,133,160,26,90
1
EA 720 DATA 129,160,26,161,160,
26,161,160,26,161,160,26,169
,160,26,105,1816
22 730 DATA 160,26,105,160,26,9
0,160,26,26,160,26,26,160,26
,22,160,1359
66 740 DATA 26,6,160,42,5,160,1
06,1,160,84,1,64,0,0,0,190,1
005
E9 750 DATA 0,0,0,0,0,0,0,42,0,
0,170,128,2,166,160,6,674
82 760 DATA 149,160,6,133,160,6
,129,160,6,129,160,6,129,160
,6,129,1628
CF 770 DATA 160,6,129,160,6,129
,160,6,129,160,6,129,160,6,1
29,160,1635
FD 780 DATA 6,162,160,5,170,144
,1,106,64,0,85,0,0,0,0,72,97
5
05 790 DATA 0,0,0,0,0,0,10,170,
0,26,170,128,22,150,160,6,84
2
F5 800 DATA 129,160,6,129,160,6
,129,160,6,129,160,6,170,144
,6,170,1670
E3 810 DATA 64,6,148,0,6,128,0,
6,128,0,6,128,0,6,128,0,754
24 820 DATA 6,128,0,10,160,0,26
,160,0,21,64,0,0,0,0,122,697

24 830 DATA 0,0,0,0,0,0,0,42,0,
0,170,128,2,166,160,6,674
9A 840 DATA 145,160,6,129,160,6
,129,160,6,129,160,6,129,160
,6,129,1620
5E 850 DATA 160,6,129,160,6,138
,160,6,154,160,6,154,160,6,1
50,160,1715
89 860 DATA 6,166,160,5,170,168
,1,106,104,0,85,104,0,0,80,1
58,1313
3S 870 DATA 0,0,0,0,0,0,10,170,
0,26,170,128,22,150,160,6,84
2
2S 880 DATA 129,160,6,129,160,6
,129,160,6,129,160,6,170,144
,6,170,1670
A8 890 DATA 64,6,168,0,6,170,0,
6,154,128,6,150,128,6,134,12
8,1254
5C 900 DATA 6,134,128,10,165,16
0,26,161,160,21,65,64,0,0,0,
193,1293
B1 910 DATA 0,0,0,0,0,0,0,42,32
,0,170,96,2,166,160,6,674
B5 920 DATA 149,160,6,129,160,6
,129,160,6,129,64,5,160,0,1,
104,1368
CD 930 DATA 0,0,90,0,0,22,128,0
,5,160,6,129,160,6,129,160,9
95
B1 940 DATA 6,162,160,6,170,144
,6,106,64,5,85,0,0,0,0,151,1
065
32 950 DATA 0,0,0,0,0,0,10,170,
160,26,170,160,25,105,96,20,
942
AE 960 DATA 104,64,0,104,0,0,10
4,0,0,104,0,0,104,0,0,104,68
8
90 970 DATA 0,0,104,0,0,104,0,0
,104,0,0,104,0,0,104,0,520
39 980 DATA 0,104,0,1,170,0,1,1
70,0,1,84,0,0,0,0,208,739
74 990 DATA 0,0,0,0,0,0,0,0,0,1
0,162,168,26,166,168,22,722
4B 1000 DATA 133,160,6,129,160,
6,129,160,6,129,160,6,129,16
0,6,129,1608
DF 1010 DATA 160,6,129,160,6,12
9,160,6,129,160,6,129,160,6,
129,160,1635
BE 1020 DATA 6,162,160,5,170,14
4,1,106,64,0,85,0,0,0,0,151,
1054
31 1030 DATA 0,0,0,0,0,0,0,0,0,
10,0,40,26,0,104,26,206
3D 1040 DATA 128,168,22,129,160
,6,129,160,5,129,128,1,162,1
28,1,166,1622
A4 1050 DATA 128,1,165,128,1,16
6,128,1,102,0,0,102,0,0,106,
0,1029
E5 1060 DATA 0,106,0,0,106,0,0,
88,0,0,16,0,0,0,0,149,465
01 1070 DATA 0,0,0,0,0,0,42,128
,170,106,129,170,90,1,104,26
,966
DD 1080 DATA 8,104,26,24,104,26
,42,104,26,106,104,26,106,10
4,26,166,1102
EE 1090 DATA 168,26,166,168,26,
133,168,26,129,168,25,129,16
8,26,1,104,1632
E6 1100 DATA 26,0,104,26,0,88,2
4,0,24,16,0,16,0,0,0,7,331
FE 1110 DATA 0,0,0,0,0,0,2,128,
160,6,129,160,6,129,160,6,88
6
B7 1120 DATA 166,128,5,166,128,
1,166,128,1,106,0,0,106,0,0,
106,1207
0B 1130 DATA 0,0,106,0,0,102,0,
0,166,128,0,166,128,2,166,16
0,1124
F3 1140 DATA 6,149,160,6,129,16
0,6,129,160,5,1,64,0,0,0,52,
1027
D9 1150 DATA 0,0,0,0,0,0,10,0,1
60,26,130,160,26,134,160,22,
828
E5 1160 DATA 134,128,6,134,128,
6,134,128,6,134,128,5,134,0,
1,134,1340
E7 1170 DATA 0,1,170,0,1,170,0,
1,106,0,0,104,0,0,104,0,657

49 1180 DATA 0,104,0,0,104,0,0,
104,0,0,80,0,0,0,0,0,192,584
D4 1190 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,149,160,6,99
9
03 1200 DATA 129,160,5,1,160,0,
1,160,0,2,128,0,10,0,0,40,79
6
8B 1210 DATA 0,0,160,0,2,128,0,
6,128,0,6,128,0,6,128,160,85
2
4A 1220 DATA 6,129,160,6,170,16
0,6,170,160,5,85,64,0,0,0,18
6,1307
B3 1230 DATA 0,0,0,0,0,0,0,42,0
,0,170,128,2,166,160,6,674
3C 1240 DATA 149,160,6,133,160,
6,161,160,6,169,160,6,169,16
0,6,154,1765
44 1250 DATA 160,6,154,160,6,15
0,160,5,134,160,6,133,160,5,
129,160,1690
49 1260 DATA 6,162,160,5,170,14
4,1,106,64,0,85,0,0,0,0,9,91
2
ED 1270 DATA 0,0,0,0,0,0,0,10,0
,0,42,0,0,106,0,0,158
0B 1280 DATA 106,0,0,90,0,0,26,
0,0,26,0,0,26,0,0,26,300
B6 1290 DATA 0,0,26,0,0,26,0,0,
26,0,0,26,0,0,26,130
B0 1300 DATA 0,42,128,0,106,128
,0,106,128,0,85,0,0,0,0,89,8
12
37 1310 DATA 0,0,0,0,0,0,0,170,
128,2,170,160,6,170,160,6,97
2
E1 1320 DATA 161,160,6,129,160,
5,1,160,0,2,160,0,10,160,0,4
2,1156
27 1330 DATA 128,0,170,0,0,168,
0,2,160,0,6,128,160,6,129,16
0,1217
27 1340 DATA 6,170,160,6,170,16
0,6,170,160,5,85,64,0,0,0,23
4,1396
3F 1350 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,150,160,6,99
0
9C 1360 DATA 130,128,5,74,128,0
,10,0,0,42,0,0,170,128,1,170
,986
CA 1370 DATA 128,1,86,160,0,1,1
60,0,1,160,2,129,160,6,130,1
60,1284
56 1380 DATA 6,170,128,5,170,12
8,1,106,0,0,85,0,0,0,0,252,1
051
7B 1390 DATA 0,0,0,0,0,0,0,0,10,1
28,0,26,128,0,42,128,0,462
7B 1400 DATA 106,128,0,170,128,
1,166,128,1,166,128,2,166,12
8,6,150,1574
93 1410 DATA 128,6,134,128,10,1
70,168,26,170,168,26,170,168
,21,86,144,1723
C7 1420 DATA 0,10,160,0,26,160,
0,26,160,0,21,64,0,0,0,169,7
96
BD 1430 DATA 0,0,0,0,0,0,2,170,
160,6,170,160,6,170,160,6,10
10
34 1440 DATA 149,160,6,129,160,
6,129,64,6,168,0,5,170,0,1,9
0,1243
7E 1450 DATA 128,0,22,160,0,5,1
60,0,1,160,6,129,160,6,130,1
60,1227
21 1460 DATA 6,170,160,5,170,12
8,1,106,0,0,85,0,0,0,0,19,85
0
AE 1470 DATA 0,0,0,0,0,0,0,0,42,0
,0,170,128,2,166,160,6,674
```

```
75  1480 DATA 145,160,6,129,160,
    6,129,64,6,128,0,6,170,0,6,1
    70,1285
42  1490 DATA 128,6,150,160,6,12
    9,160,6,129,160,6,129,160,6,
    162,160,1657
63  1500 DATA 6,170,160,5,170,12
    8,1,106,0,0,85,0,0,0,0,109,9
    40
8D  1510 DATA 0,0,0,0,0,0,2,170,
    160,6,170,160,6,170,160,6,10
    10
9C  1520 DATA 149,160,6,129,160,
    5,74,160,0,26,0,0,26,0,0,40,
    935
5A  1530 DATA 0,0,104,0,0,104,0,
    0,160,0,1,160,0,1,160,0,690
EB  1540 DATA 2,168,0,6,168,0,6,
    168,0,5,80,0,0,0,0,98,701
6D  1550 DATA 0,0,0,0,0,0,0,42,0
    ,0,170,128,2,166,160,6,674
3D  1560 DATA 149,160,6,133,160,
    6,129,160,6,162,160,5,170,12
    8,1,106,1641
A2  1570 DATA 0,0,166,128,2,149,
    128,2,133,160,6,129,160,6,12
    9,160,1458
42  1580 DATA 6,162,160,5,170,14
    4,1,106,64,0,85,0,0,0,0,36,9
    39
C8  1590 DATA 0,0,0,0,0,0,0,42,0
    ,0,170,128,2,170,160,6,678
B1  1600 DATA 166,160,6,149,160,
    6,133,160,6,129,160,6,161,16
    0,5,170,1737
B4  1610 DATA 160,1,106,160,0,85
    ,160,0,0,160,2,128,160,6,128
    ,160,1416
96  1620 DATA 6,162,160,5,170,12
    8,1,106,0,0,85,0,0,0,0,251,1
    074
5E  1630 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,168,0,2,170
DF  1640 DATA 170,0,10,90,128,26
    ,22,128,20,6,128,0,166,128,2
    ,170,1194
2D  1650 DATA 128,10,170,128,26,
    154,128,26,90,128,26,22,128,
    26,6,128,1324
79  1660 DATA 26,138,128,22,170,
    160,5,170,160,1,85,64,0,0,0,
    144,1273
5F  1670 DATA 0,0,0,0,0,0,10,160
    ,0,26,160,0,22,128,0,6,512
DC  1680 DATA 128,0,6,128,0,6,12
    8,0,6,128,0,6,138,0,6,170,85
    0
BF  1690 DATA 128,6,166,160,6,14
    9,160,6,129,160,6,129,160,6,
    129,160,1660
92  1700 DATA 6,162,160,10,170,1
    28,26,154,0,21,69,0,0,0,0,20
    ,926
73  1710 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,32,0,32
DD  1720 DATA 42,96,0,170,160,2,
    166,160,6,149,160,6,133,160,
    6,129,1545
A2  1730 DATA 64,6,128,0,6,128,0
    ,6,128,0,6,128,160,6,129,160
    ,1055
1A  1740 DATA 6,162,160,5,170,14
    4,1,106,64,0,85,0,0,0,0,139,
    1042
FC  1750 DATA 0,0,0,0,0,0,0,10,1
    60,0,26,160,0,22,128,0,506
3C  1760 DATA 6,128,0,6,128,0,6,
    128,0,6,128,0,166,128,2,170,
    1002
5C  1770 DATA 128,10,154,128,26,
    86,128,26,86,128,26,6,128,26
    ,10,128,1224
D7  1780 DATA 26,138,128,22,170,
    160,5,166,160,1,81,64,0,0,0,
    20,1141
9B  1790 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,42,0,0,42
24  1800 DATA 170,128,2,166,160,
    6,149,160,6,133,160,6,161,16
    0,6,162,1735
C9  1810 DATA 160,6,170,160,6,17
    0,128,6,154,0,6,148,0,6,128,
    160,1408
BE  1820 DATA 6,160,160,5,170,12
    8,1,106,0,0,84,0,0,0,0,0,820

4D  1830 DATA 0,0,0,0,0,0,0,0,10,1
    28,0,42,160,0,165,160,1,666
40  1840 DATA 161,64,1,160,0,1,1
    60,0,1,160,0,1,160,0,2,170,1
    041
0E  1850 DATA 0,6,170,0,5,164,0,
    1,160,0,1,160,0,1,160,0,828
DA  1860 DATA 1,160,0,2,168,0,6,
    168,0,5,80,0,0,0,0,0,195,785
B4  1870 DATA 0,0,0,0,0,0,0,0,0,
    0,42,0,0,170,128,2,342
35  1880 DATA 166,160,2,149,160,
    6,133,160,6,129,160,6,130,16
    0,6,162,1695
EB  1890 DATA 160,6,170,160,5,17
    0,160,1,105,160,0,85,160,2,1
    33,160,1637
BA  1900 DATA 6,150,160,5,170,12
    8,1,106,0,0,84,0,0,0,0,0,810

14  1910 DATA 0,0,0,0,0,0,10,160
    ,0,26,160,0,22,128,0,6,512
4B  1920 DATA 128,0,6,128,0,6,12
    8,0,6,128,0,6,138,0,6,170,85
    0
5B  1930 DATA 128,6,166,160,6,14
    9,160,6,133,160,6,129,160,6,
    129,160,1664
9A  1940 DATA 6,129,160,10,162,1
    68,26,166,168,21,85,80,0,0,0
    ,245,1426
24  1950 DATA 0,0,0,0,0,0,0,10,0
    ,0,26,0,0,20,0,0,56
35  1960 DATA 0,0,0,42,0,0,106,0
    ,0,90,0,0,26,0,0,26,290
7C  1970 DATA 0,0,26,0,0,26,0,0,
    26,0,0,26,0,0,26,0,130
2B  1980 DATA 0,26,0,0,42,128,0,
    106,128,0,85,64,0,0,0,168,74
    7
D6  1990 DATA 0,0,160,0,1,160,0,
    1,64,0,0,0,0,2,160,0,548
90  2000 DATA 6,160,0,5,160,0,1,
    160,0,1,160,0,1,160,0,1,815
90  2010 DATA 160,0,1,160,0,1,16
    0,2,129,160,6,129,160,6,130,
    160,1364
66  2020 DATA 6,170,128,5,170,0,
    1,104,0,0,84,0,0,0,0,93,761
BC  2030 DATA 0,0,0,0,0,0,0,10,160
    ,0,26,160,0,22,128,0,6,512
58  2040 DATA 128,160,6,130,160,
    6,130,128,6,138,0,6,138,0,6,
    168,1310
83  2050 DATA 0,6,168,0,5,170,0,
    6,154,0,6,154,128,6,150,160,
    1114
58  2060 DATA 6,133,160,10,162,1
    68,26,166,168,21,69,80,0,0,0
    ,26,1195
E4  2070 DATA 0,0,0,0,0,0,0,42,0
    ,0,106,0,0,90,0,0,238
3D  2080 DATA 26,0,0,26,0,0,26,0
    ,0,26,0,0,26,0,0,26,156
F3  2090 DATA 0,0,26,0,0,26,0,0,
    26,0,0,26,0,0,26,0,130
AD  2100 DATA 0,26,0,0,106,128,0
    ,106,128,0,85,0,0,0,0,131,71.
    0
95  2110 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0,0
05  2120 DATA 0,0,0,0,0,0,10,128,0
    ,26,128,0,22,138,32,6,170,66
    0
49  2130 DATA 168,6,170,168,6,15
    4,104,6,154,104,6,154,104,6,
    154,104,1568
D9  2140 DATA 6,154,104,10,154,1
    06,26,154,106,21,21,84,0,0,0
    ,251,1197
FD  2150 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
69  2160 DATA 0,0,0,0,0,0,0,0,2,
    160,0,6,162,128,5,170,633
28  2170 DATA 160,1,169,160,1,16
    5,160,1,161,160,1,161,160,1,
    161,160,1782
5E  2180 DATA 1,161,160,2,161,16
    8,6,161,168,5,65,80,0,0,0,19
    2,1330
C5  2190 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
03  2200 DATA 0,0,0,0,0,0,42,0,0
    ,170,128,2,166,160,6,149,823

19  2210 DATA 160,6,133,160,6,12
    9,160,6,129,160,6,129,160,6,
    129,160,1639
91  2220 DATA 6,161,160,5,170,12
    8,1,106,0,0,84,0,0,0,0,62,88
    3
EB  2230 DATA 0,0,0,0,0,0,10,138
    ,0,26,170,128,22,166,160,6,8
    26
0A  2240 DATA 149,160,6,133,160,
    6,129,160,6,129,160,6,162,16
    0,6,170,1702
5C  2250 DATA 128,6,154,0,6,149,
    0,6,128,0,6,128,0,6,128,0,84
    5
3F  2260 DATA 6,128,0,10,160,0,2
    6,160,0,21,64,0,0,0,0,2,577
44  2270 DATA 0,0,0,0,0,0,0,162,
    160,2,170,160,10,154,128,26,
    972
25  2280 DATA 86,128,26,22,128,2
    6,6,128,26,6,128,26,138,128,
    22,170,1194
99  2290 DATA 128,5,166,128,1,86
    ,128,0,6,128,0,6,128,0,6,128
    ,1044
39  2300 DATA 0,6,128,0,10,160,0
    ,26,160,0,21,64,0,0,0,195,77
    0
5C  2310 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
84  2320 DATA 0,0,0,0,0,0,0,0,2,
    160,0,6,162,128,5,170,633
42  2330 DATA 160,1,169,160,1,16
    5,160,1,161,64,1,160,0,1,160
    ,0,1364
C7  2340 DATA 1,160,0,2,168,0,6,
    168,0,5,80,0,0,0,0,7,597
A4  2350 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
BE  2360 DATA 0,0,0,42,0,0,170,1
    28,2,166,160,6,150,160,6,133
    ,1123
10  2370 DATA 160,6,161,64,6,170
    ,0,5,170,128,1,90,160,2,150,
    160,1433
99  2380 DATA 6,165,160,5,170,16
    0,1,106,128,0,85,0,0,0,0,28,
    1014
C4  2390 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,40,0,0,40
4C  2400 DATA 104,0,0,104,0,0,17
    0,0,1,170,0,1,104,0,0,104,75
    8
72  2410 DATA 0,0,104,0,0,104,0,
    0,104,0,0,104,0,0,104,0,520
B8  2420 DATA 0,104,0,0,106,0,0,
    90,0,0,20,0,0,0,0,26,346
D4  2430 DATA 0,0,0,0,0,0,0,0,0,
```

```
   0,0,0,0,0,0,0,0
39 2440 DATA 0,0,0,0,0,0,0,0,10
   ,130,160,26,134,160,22,134,7
   76
30 2450 DATA 128,6,134,128,6,13
   4,128,6,134,128,6,134,128,6,
   138,128,1472
12 2460 DATA 6,170,128,5,170,16
   0,1,166,160,1,69,64,0,0,0,0,
   1100
3C 2470 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
B8 2480 DATA 0,0,0,0,0,0,0,0,10
   ,0,160,26,1,160,22,1,380
2B 2490 DATA 128,6,2,128,6,134,
   128,6,134,128,5,134,0,1,170,
   0,1110
D6 2500 DATA 1,170,0,1,104,0,0,
   104,0,0,80,0,0,0,0,2,462
04 2510 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
52 2520 DATA 0,0,0,0,0,0,0,0,42
   ,40,168,106,105,168,90,105,8
   24
FD 2530 DATA 160,26,105,160,26,
   105,160,26,105,160,26,105,16
   0,26,170,160,1680
2C 2540 DATA 26,170,160,22,105,
   128,4,81,0,0,0,0,0,0,0,696

6C 2550 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
6F 2560 DATA 0,0,0,0,0,10,2,128
   ,26,6,128,26,6,128,26,138,62
   4
AC 2570 DATA 128,22,154,0,5,168
   ,0,1,168,0,2,170,0,6,154,0,9
   78
0A 2580 DATA 6,154,128,10,22,12
   8,26,6,128,21,5,64,0,0,0,223
   ,921
A5 2590 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,10,162,168,26,366
DC 2600 DATA 166,168,22,133,160
   ,6,129,160,6,129,160,6,130,1
   60,6,162,1703
19 2610 DATA 160,6,170,160,5,17
   0,160,1,105,160,0,85,160,2,1
   28,160,1632
59 2620 DATA 6,130,160,5,170,12
   8,1,106,0,0,84,0,0,0,0,146,9
   36
B3 2630 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
BF 2640 DATA 0,0,2,170,160,6,17
   0,160,6,166,160,6,149,160,6,
   133,1454
E9 2650 DATA 160,5,2,128,0,10,1
   28,0,42,0,0,168,0,2,160,160,
   965
5C 2660 DATA 6,130,160,6,170,16
   0,6,170,160,5,85,64,0,0,0,32
   ,1154
EB 2670 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
00 2680 DATA 0,0,0,10,0,0,42,12
   8,0,42,128,0,170,160,1,170,8
   51
2B 2690 DATA 160,1,170,160,1,17
   0,160,1,170,160,1,170,160,1,
   106,128,1719
37 2700 DATA 0,106,128,0,26,0,0
   ,21,0,0,0,0,0,0,0,101,382
33 2710 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
EF 2720 DATA 0,0,0,170,160,1,17
   0,160,1,170,160,1,170,160,1,
   170,1494
65 2730 DATA 160,1,170,160,1,17
   0,160,1,170,160,1,170,160,1,
   170,160,1815
BA 2740 DATA 1,170,160,1,170,16
   0,1,85,64,0,0,0,0,0,0,0,812
```

SAMPLER 64

Continued from last issue

```
PROGRAM: DATA 3

95 5 CK=0:L=9905
0B 10 POKE53280,0:POKE53281,0
5E 20 PRINT"[CLR]"
15 30 PRINT"DATA LOADER 3"
1A 40 PRINT"[HOME,DOWN2]POKE LO
   CATION:"L
61 50 FOR I=1 TO 8
9A 60 READ A
9A 65 IF A<0 THEN 120
F0 70 POKEL,A:CH=CH+A:L=L+1
D2 80 NEXT
4E 90 READ SUM
3D 100 IF SUM<>CHTHEN PRINT"CHE
   CKSUM ERROR IN LINE"PEEK(64)
   *256+PEEK(63):STOP
9A 110 CH=0:GOTO 40
F6 120 PRINT"READY TO SAVE PROG
   RAM"
E9 130 PRINT:PRINT"PRESS RETURN
   "
AE 140 GETA$:IFA$<>CHR$(13)THEN
   140
35 150 PRINT"[CLR]POKE 43,1:POK
   E44,8:POKE45,0:POKE46,54:SAV
   E"+CHR$(34);
92 160 PRINT"SAMPLER64"+CHR$(34
   )+",8"
4E 170 POKE631,19:POKE632,13:PO
   KE198,2
C6 500 DATA 0,0,0,0,0,0,0,0,0
A3 501 DATA 0,0,0,0,0,6,1,1,8
B4 502 DATA 6,0,0,0,0,0,0,0,6
0B 503 DATA 0,0,0,0,0,0,0,0,0
0A 504 DATA 0,0,0,0,0,0,0,0,0
01 505 DATA 1,1,1,1,1,1,1,1,8
D9 506 DATA 1,1,1,1,0,6,1,1,12
1E 507 DATA 6,0,0,0,0,0,14,14,3
   4
AA 508 DATA 14,14,14,14,14,14,1
   4,14,112
B0 509 DATA 14,14,14,14,0,0,1,1
   ,58
44 510 DATA 1,1,1,1,1,1,1,1,8
3E 511 DATA 1,1,1,1,0,6,1,1,12
B1 512 DATA 6,0,0,0,0,0,0,0,6
70 513 DATA 0,0,0,0,0,0,0,0,0
B5 514 DATA 0,0,0,0,0,0,1,1,2
BE 515 DATA 1,1,1,1,1,1,1,1,8
CC 516 DATA 1,1,1,1,0,6,1,1,12
53 517 DATA 6,0,0,0,0,0,14,14,3
   4
39 518 DATA 14,14,14,14,14,14,1
   4,14,112
5B 519 DATA 14,14,14,14,0,0,1,1
   ,58
71 520 DATA 1,1,1,1,1,1,1,1,8
C9 521 DATA 1,1,1,1,0,6,1,1,12
7F 522 DATA 6,0,0,0,0,0,0,0,6
BE 523 DATA 0,0,0,0,0,0,0,0,0
BF 524 DATA 0,0,0,0,0,0,1,1,2
B4 525 DATA 1,1,1,1,1,1,1,1,8
AE 526 DATA 1,1,1,1,0,6,1,1,12
F9 527 DATA 6,0,0,0,0,0,14,14,3
   4
C3 528 DATA 14,14,14,14,14,14,1
   4,14,112
B8 529 DATA 14,14,0,0,0,0,0,0,2
   8
23 530 DATA 0,1,1,1,1,0,0,0,4
B0 531 DATA 0,0,0,0,0,6,1,1,8
65 532 DATA 6,0,0,0,0,0,0,0,6
24 533 DATA 0,0,0,0,0,0,0,0,0
EB 534 DATA 0,0,0,0,0,0,0,0,0
EA 535 DATA 0,0,0,0,0,0,0,0,0
0F 536 DATA 0.0.0.0.0.6.1.1.8
A3 537 DATA 6,6,0,0,0,0,0,0,12
AF 538 DATA 0,0,0,0,0,0,0,0,0
AE 539 DATA 0,0,0,0,0,0,0,0,0
AD 540 DATA 0,0,0,0,0,0,0,0,0
9A 541 DATA 0,0,0,0,0,6,1,1,8
2F 542 DATA 6,6,6,6,6,6,6,6,48
2E 543 DATA 6,6,6,6,6,6,6,6,48
2D 544 DATA 6,6,6,6,6,6,6,6,48
2C 545 DATA 6,6,6,6,6,6,6,6,48
14 546 DATA 6,6,6,6,6,6,1,1,38
9E 547 DATA 1,1,1,1,1,1,1,1,8
9D 548 DATA 1,1,1,1,1,1,1,1,8
9C 549 DATA 1,1,1,1,1,1,1,1,8
D3 550 DATA 1,1,1,1,1,1,1,1,8
DC 551 DATA 1,1,1,1,1,1,1,0,7
D9 552 DATA 0,0,0,0,0,0,0,0,0
DB 553 DATA 0,0,0,0,0,0,0,0,0
9F 554 DATA 0,0,0,0,0,0,0,0,0
9E 555 DATA 0,0,0,0,0,0,0,0,0
9D 556 DATA 0,0,0,0,0,0,1,0,1
9C 557 DATA 0,0,0,0,0,0,0,0,0
C3 558 DATA 0,0,0,0,0,0,0,0,0
C2 559 DATA 0,0,0,0,0,0,0,0,0
C1 560 DATA 0,0,0,0,0,0,0,0,0
C0 561 DATA 0,0,0,0,0,0,0,0,0
07 562 DATA 0,0,0,0,0,0,0,0,0
06 563 DATA 0,0,0,0,0,0,0,0,0
05 564 DATA 0,0,0,0,0,0,0,0,0
04 565 DATA 0,0,0,0,0,0,0,0,0
4B 566 DATA 0,0,0,0,0,0,0,0,0
4A 567 DATA 0,0,0,0,0,0,0,0,0
49 568 DATA 0,0,0,0,0,0,0,0,0
34 569 DATA 0,0,0,0,0,0,0,169,1
   69
F8 570 DATA 5,133,1,120,169,11,
   141,17,597
7C 571 DATA 208,169,176,162,0,1
   41,6,220,1082
95 572 DATA 142,7,220,173,13,22
   0,169,25,969
F3 573 DATA 141,15,220,173,13,2
   20,41,16,839
3F 574 DATA 201,0,240,11,169,15
   ,141,24,801
A9 575 DATA 212,32,59,240,76,28
   ,240,169,1056
39 576 DATA 0,141,24,212,32,59,
   240,76,784
E5 577 DATA 28,240,160,0,145,25
   1,230,251,1305
79 578 DATA 208,8,230,252,165,2
   52,201,208,1524
C1 579 DATA 240,1,96,76,112,243
   ,0,169,937
25 580 DATA 0,133,251,169,12,13
   3,252,76,1026
64 581 DATA 0,240,0,0,0,0,0,120
   ,360
D6 582 DATA 169,11,141,17,208,1
   69,53,133,901
24 583 DATA 1,160,0,169,0,133,2
   51,169,883
F7 584 DATA 12,133,252,177,251,
   141,24,212,1202
B4 585 DATA 162,0,232,224,5,208
   ,251,200,1282
26 586 DATA 208,241,230,252,165
   ,252,201,208,1757
36 587 DATA 208,233,76,165,241,
   0,0,169,1092
75 588 DATA 1,133,65,76,80,240,
   165,65,825
05 589 DATA 201,1,208,3,76,96,2
   40,201,1026
1C 590 DATA 2,240,3,76,165,241,
   76,32,835
E8 591 DATA 241,0,0,0,0,0,0,169
   ,410
6B 592 DATA 0,133,251,169,12,13
   3,252,169,1119
B4 593 DATA 2,133,65,169,5,133,
   1,120,628
61 594 DATA 169,11,141,17,208,1
```

```
    69,176,162,1053
C7  595 DATA 0,141,6,220,142,7,2
    20,173,909
1F  596 DATA 13,220,169,25,141,1
    5,220,160,963
9B  597 DATA 0,162,8,169,0,133,2
    ,24,498
30  598 DATA 173,13,220,41,16,24
    0,30,169,902
A6  599 DATA 15,141,24,212,56,38
    ,2,202,690
A0  600 DATA 208,237,165,2,145,2
    51,230,251,1489
3E  601 DATA 208,8,230,252,165,2
    52,201,208,1524
3A  602 DATA 240,11,76,216,240,1
    69,0,141,1093
D1  603 DATA 24,212,76,238,240,7
    6,112,243,1221
ED  604 DATA 0,0,0,0,0,0,0,0,0,0
30  605 DATA 0,0,0,0,0,0,0,0,120,1
    20
7E  606 DATA 169,11,141,17,208,1
    69,53,133,901
E0  607 DATA 1,169,0,133,251,169
    ,12,133,868
0E  608 DATA 252,160,0,177,251,1
    33,2,160,1135
DB  609 DATA 8,165,2,10,133,2,17
    6,29,525
BA  610 DATA 169,0,141,24,212,23
    4,234,234,1248
1B  611 DATA 234,136,208,237,230
    ,251,208,8,1512
CE  612 DATA 230,252,165,252,201
    ,208,240,15,1563
73  613 DATA 76,50,241,234,234,2
    34,234,169,1472
3C  614 DATA 15,141,24,212,76,70
    ,241,76,855
8D  615 DATA 165,241,0,0,0,0,0,1
    20,526
20  616 DATA 169,11,141,17,208,1
    69,53,133,901
D0  617 DATA 1,160,255,169,0,133
    ,251,169,1138
4A  618 DATA 207,133,252,177,251
    ,141,24,212,1397
97  619 DATA 162,0,232,224,5,208
    ,251,136,1218
CB  620 DATA 192,255,208,239,198
    ,252,165,252,1761
9A  621 DATA 201,12,208,231,76,2
    11,10,0,949
F5  622 DATA 0,0,0,0,165,66,201,
    1,433
00  623 DATA 240,3,76,224,9,76,2
    11,10,849
E9  624 DATA 0,0,0,0,120,169,11,
    141,441
0C  625 DATA 17,208,169,53,133,1
    ,169,255,1005
5D  626 DATA 133,251,169,207,133
    ,252,160,0,1305
9A  627 DATA 177,251,133,2,160,8
    ,165,2,898
BE  628 DATA 74,133,2,176,31,169
    ,0,141,726
2D  629 DATA 24,212,234,234,234,
    136,208,238,1520
74  630 DATA 198,251,234,165,251
    ,201,255,208,1763
AE  631 DATA 8,198,252,165,252,2
    01,12,240,1328
26  632 DATA 14,76,199,241,234,2
    34,234,169,1401
1F  633 DATA 15,141,24,212,76,21
    9,241,76,1004
BB  634 DATA 211,10,234,96,160,0
    ,169,0,880
08  635 DATA 153,0,4,153,0,5,153
    ,0,468
50  636 DATA 6,153,0,7,153,0,216
    ,153,688
5E  637 DATA 0,217,153,0,218,153
    ,0,219,960
C2  638 DATA 200,208,229,160,0,1
    85,60,242,1284
2F  639 DATA 201,255,240,12,153,
    0,4,169,1034
55  640 DATA 1,153,0,216,200,76,
    38,242,926
70  641 DATA 76,119,242,32,32,16
    ,18,5,540
80  642 DATA 19,19,32,19,16,1,3,
    5,114
F1  643 DATA 32,20,15,32,19,20,1
    ,18,157
EC  644 DATA 20,32,19,1,13,16,12
    ,5,118
40  645 DATA 32,16,12,1,25,9,14,
    7,116
3D  646 DATA 32,255,0,165,65,201
    ,0,208,926
FD  647 DATA 3,76,211,10,201,1,2
    08,3,713
67  648 DATA 76,5,242,76,160,243
    ,32,240,1074
75  649 DATA 242,234,234,234,234
    ,120,169,11,1478
16  650 DATA 141,17,208,160,0,13
    2,251,169,1078
B0  651 DATA 12,133,252,177,251,
    141,24,212,1202
3E  652 DATA 173,1,220,201,251,2
    40,21,162,1269
DB  653 DATA 0,232,224,5,208,251
    ,200,208,1328
53  654 DATA 234,230,252,165,252
    ,201,208,208,1750
97  655 DATA 226,76,211,10,165,2
    51,141,119,1199
DA  656 DATA 2,165,252,141,120,2
    ,173,1,856
59  657 DATA 220,201,255,208,249
    ,177,251,141,1702
50  658 DATA 24,212,173,1,220,20
    1,239,240,1310
EA  659 DATA 18,162,0,232,224,5,
    208,251,1100
3A  660 DATA 200,208,234,230,252
    ,165,252,201,1742
5A  661 DATA 208,208,226,165,251
    ,141,121,2,1322
03  662 DATA 165,252,141,122,2,7
    6,0,243,1001
D4  663 DATA 0,0,0,0,0,0,0,0,173,1
    73
D2  664 DATA 1,220,201,239,208,2
    49,173,1,1292
4F  665 DATA 220,201,255,208,249
    ,96,0,173,1402
5F  666 DATA 120,2,141,113,240,1
    41,154,241,1152
F7  667 DATA 174,122,2,142,136,2
    40,202,142,1160
2B  668 DATA 129,241,76,211,10,0
    ,0,0,667
AE  669 DATA 169,12,141,113,240,
    141,47,241,1104
47  670 DATA 141,154,241,141,239
    ,241,162,208,1527
84  671 DATA 142,136,240,142,86,
    241,202,142,1331
B9  672 DATA 129,241,142,196,241
    ,169,255,141,1514
E5  673 DATA 192,241,169,0,141,4
    3,241,76,1103
5F  674 DATA 211,10,0,169,12,141
    ,113,240,896
06  675 DATA 141,47,241,141,154,
    241,141,239,1345
CB  676 DATA 241,162,208,142,136
    ,240,142,86,1357
BA  677 DATA 241,202,142,129,241
    ,142,196,241,1534
7A  678 DATA 169,255,141,192,241
    ,169,0,141,1308
23  679 DATA 43,241,76,95,11,0,0
    ,169,635
B7  680 DATA 12,141,113,240,141,
    47,241,141,1076
FC  681 DATA 154,241,141,239,241
    ,162,208,142,1528
6D  682 DATA 136,240,142,86,241,
    202,142,129,1318
39  683 DATA 241,142,196,241,169
    ,255,141,192,1577
D5  684 DATA 241,169,0,141,43,24
    1,76,224,1135
88  685 DATA 9,0,0,0,0,0,0,0,160,1
    69
C7  686 DATA 0,169,0,153,0,4,153
    ,0,479
37  687 DATA 5,153,0,6,153,0,7,1
    53,477
BA  688 DATA 0,216,153,0,217,153
    ,0,218,957
B6  689 DATA 153,0,219,200,208,2
    29,160,0,1163
5E  690 DATA 185,60,242,201,255,
    240,12,153,1348
F1  691 DATA 0,4,169,1,153,0,216
    ,200,743
5F  692 DATA 76,193,243,173,1,22
    0,201,239,1346
56  693 DATA 208,249,173,1,220,2
    01,255,208,1515
1A  694 DATA 249,120,169,11,141,
    17,208,169,1084
72  695 DATA 0,133,251,169,12,13
    3,252,160,1110
E8  696 DATA 0,177,251,133,2,173
    ,1,220,957
3D  697 DATA 201,251,240,45,160,
    8,165,2,1072
7F  698 DATA 10,133,2,176,25,169
    ,0,141,656
0E  699 DATA 24,212,234,234,136,
    208,239,230,1517
AB  700 DATA 251,208,8,230,252,1
    65,252,201,1567
F1  701 DATA 208,240,11,76,240,2
    43,169,15,1202
B1  702 DATA 141,24,212,76,11,24
    4,76,211,995
92  703 DATA 10,165,251,141,119,
    2,165,252,1105
FB  704 DATA 141,120,2,173,1,220
    ,201,255,1113
AB  705 DATA 208,249,160,0,177,2
    51,133,2,1180
3F  706 DATA 173,1,220,201,239,2
    40,40,160,1274
BC  707 DATA 8,165,2,10,133,2,17
    6,23,519
12  708 DATA 169,0,141,24,212,76
    ,128,244,994
61  709 DATA 230,251,208,8,230,2
    52,165,252,1596
74  710 DATA 201,208,240,11,76,5
    9,244,169,1208
06  711 DATA 15,141,24,212,76,86
    ,244,165,963
51  712 DATA 251,141,121,2,165,2
    52,141,122,1195
1D  713 DATA 2,76,136,244,76,122
    ,244,234,1134
EA  714 DATA 136,208,198,76,89,2
    44,0,173,1124
0E  715 DATA 119,2,141,43,241,17
    3,120,2,841
33  716 DATA 141,47,241,174,122,
    2,173,121,1021
F1  717 DATA 2,201,128,176,6,142
    ,86,241,982
17  718 DATA 76,168,244,202,142,
    86,241,173,1332
7B  719 DATA 121,2,141,192,241,1
    73,122,2,994
```

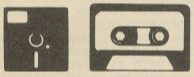
```
97  720 DATA 141,196,241,173,120
    ,2,141,239,1253
31  721 DATA 241,76,211,10,0,0,0
    ,165,703
1E  722 DATA 65,201,1,240,3,76,2
    11,10,807
78  723 DATA 173,113,240,141,255
    ,255,173,136,1486
29  724 DATA 240,141,255,255,0,0
    ,0,0,891
68  725 DATA 0,0,0,0,0,0,0,120,1
    20
A2  726 DATA 169,11,141,17,208,1
    60,0,168,875
76  727 DATA 0,133,251,173,113,2
    40,133,252,1295
29  728 DATA 177,251,141,24,212,
    162,0,232,1199
B7  729 DATA 224,5,208,251,234,2
    34,200,208,1564
D9  730 DATA 239,230,252,165,252
    ,205,136,240,1719
A9  731 DATA 208,230,76,11,245,0
    ,0,120,890
CC  732 DATA 169,11,141,17,208,1
    60,0,169,875
18  733 DATA 0,133,251,173,113,2
    40,133,252,1295
47  734 DATA 177,251,141,24,212,
    162,0,232,1199
D4  735 DATA 224,1,208,251,200,2
    08,241,230,1563
E5  736 DATA 252,165,252,205,136
    ,240,208,232,1690
BB  737 DATA 96,0,0,0,0,0,0,160,
    256
19  738 DATA 0,169,1,153,0,216,1
    85,88,812
45  739 DATA 245,201,255,240,7,1
    53,0,4,1105
EB  740 DATA 200,76,66,245,76,11
    6,11,32,822
E5  741 DATA 32,32,32,32,32,32,3
    2,32,256
DA  742 DATA 32,32,21,19,5,32,20
    ,8,169
59  743 DATA 5,19,5,32,11,5,25,1
    9,121
2B  744 DATA 46,46,46,32,32,32,3
    2,32,298
41  745 DATA 32,32,32,32,32,32,3
    2,32,256
44  746 DATA 32,32,32,32,32,32,3
    2,32,256
25  747 DATA 78,32,32,32,32,32,3
    2,32,302
C2  748 DATA 32,32,32,32,32,32,3
    2,32,256
8D  749 DATA 32,32,32,32,77,32,3
    2,32,301
60  750 DATA 32,32,32,32,32,32,3
    2,32,256
5B  751 DATA 32,32,32,32,32,32,3
    2,32,256
25  752 DATA 32,17,32,23,32,5,32
    ,18,191
C0  753 DATA 32,20,32,25,32,21,3
    2,9,203
25  754 DATA 32,15,32,16,32,32,3
    2,32,223
07  755 DATA 32,32,32,32,32,32,3
    2,32,256
2A  756 DATA 32,32,32,32,32,32,3
    2,32,256
F5  757 DATA 32,32,32,32,32,32,3
    2,32,256
2B  758 DATA 32,32,32,32,32,32,3
    2,32,256
23  759 DATA 32,32,32,32,32,32,3
    2,32,256
56  760 DATA 32,32,32,32,32,32,3
    2,32,256
D1  761 DATA 32,32,32,32,32,32,3
    2,32,256
9C  762 DATA 32,1,32,19,32,4,32,
    6,158
95  763 DATA 32,7,32,8,32,10,32,
    11,164
11  764 DATA 32,12,32,58,32,32,3
    2,32,262
3D  765 DATA 32,32,32,32,32,32,3
    2,32,256
F0  766 DATA 32,32,32,32,32,32,3
    2,32,256
FB  767 DATA 77,32,32,32,32,32,3
    2,32,301
39  768 DATA 32,32,32,32,32,32,3
    2,32,256
34  769 DATA 32,32,32,32,78,32,3
    2,32,302
D7  770 DATA 32,32,32,32,32,32,3
    2,32,256
3A  771 DATA 32,32,32,32,32,32,3
    2,32,256
C7  772 DATA 32,32,32,32,32,32,2
    55,0,447
5A  773 DATA 0,0,0,0,0,80,0,141,
    221
CD  774 DATA 94,246,160,0,185,14
    9,246,205,1285
21  775 DATA 94,246,240,8,200,19
    2,21,208,1209
F5  776 DATA 243,76,116,11,192,1
    0,176,12,836
3F  777 DATA 185,181,246,141,42,
    245,32,16,1088
DA  778 DATA 245,76,116,11,185,1
    81,246,141,1201
40  779 DATA 253,246,32,16,247,7
    6,116,11,997
FC  780 DATA 0,0,0,0,81,87,69,82
    ,315
CE  781 DATA 84,89,85,73,79,80,6
    5,83,638
1E  782 DATA 68,70,71,72,74,75,7
    6,58,564
61  783 DATA 0,0,0,0,0,0,0,0,0,0
AB  784 DATA 0,0,0,0,0,10,9,8,7,34
BE  785 DATA 6,5,4,3,2,1,10,9,40
D3  786 DATA 8,7,6,5,4,3,2,1,36
25  787 DATA 0,0,0,0,0,0,0,0,0,0
24  788 DATA 0,0,0,0,0,0,0,0,0,0
CF  789 DATA 0,0,0,0,0,0,0,120,1
    20
E5  790 DATA 169,11,141,17,208,1
    69,53,133,901
11  791 DATA 1,160,255,169,0,133
    ,251,169,1138
75  792 DATA 207,133,252,177,251
    ,141,24,212,1397
20  793 DATA 162,0,232,224,10,20
    8,251,136,1223
D3  794 DATA 192,255,208,239,198
    ,252,165,252,1761
DC  795 DATA 201,128,208,231,96,
    0,0,173,1037
C1  796 DATA 125,241,141,237,246
    ,173,129,241,1533
B2  797 DATA 141,241,246,173,154
    ,241,141,10,1347
0F  798 DATA 247,76,224,246,0,0,
    0,0,793
5D  799 DATA 0,0,0,0,0,0,0,160,1
    60
C8  800 DATA 0,185,72,247,201,25
    5,240,12,1212
06  801 DATA 153,0,4,169,1,153,0
    ,216,696
A9  802 DATA 200,76,50,247,76,16
    4,11,32,856
6E  803 DATA 1,18,5,32,25,15,21,
    32,149
EC  804 DATA 19,21,18,5,32,25,15
    ,21,156
75  805 DATA 32,23,9,19,8,32,20,
    15,158
51  806 DATA 32,5,18,1,19,5,32,1
    9,131
A6  807 DATA 1,13,16,12,5,32,32,
    32,143
81  808 DATA 32,32,32,32,32,32,3
    2,32,256
B4  809 DATA 32,32,32,32,32,32,3
    2,32,256
5F  810 DATA 32,32,32,32,32,32,3
    2,32,256
02  811 DATA 32,32,32,32,32,32,3
    2,32,256
6D  812 DATA 32,32,32,32,32,32,3
    2,32,256
A0  813 DATA 32,32,32,32,32,32,3
    2,32,256
95  814 DATA 32,32,32,32,32,32,3
    2,25,249
D3  815 DATA 47,14,255,0,0,0,0,1
    60,476
7A  816 DATA 0,169,0,133,251,169
    ,12,133,867
32  817 DATA 252,169,0,145,251,2
    00,208,251,1476
23  818 DATA 230,252,165,252,201
    ,208,208,241,1757
0D  819 DATA 169,0,133,65,76,211
    ,10,0,664
A5  820 DATA 0,0,0,0,160,0,169,0
    ,329
9F  821 DATA 153,0,4,153,0,5,153
    ,0,468
B3  822 DATA 6,153,0,7,153,0,216
    ,153,688
69  823 DATA 0,217,153,0,218,153
    ,0,219,960
7C  824 DATA 200,208,227,76,48,2
    47,0,0,1006
5B  825 DATA 0,0,0,0,0,0,0,0,169,1
    69
27  826 DATA 0,133,251,160,0,169
    ,1,153,867
BE  827 DATA 0,216,153,0,217,153
    ,0,218,957
B3  828 DATA 153,0,219,200,208,2
    41,165,251,1437
43  829 DATA 201,0,208,3,76,49,2
    48,201,986
35  830 DATA 1,208,3,76,91,248,2
    01,2,830
59  831 DATA 208,3,76,133,248,76
    ,175,248,1167
A9  832 DATA 169,52,133,1,160,0,
    185,0,700
5A  833 DATA 208,153,0,4,185,0,2
    09,153,912
D0  834 DATA 0,5,185,0,210,153,0
    ,6,559
56  835 DATA 185,0,211,153,0,7,2
    00,208,964
5F  836 DATA 229,169,53,133,1,23
    0,251,76,1142
26  837 DATA 202,11,169,52,133,1
    ,160,0,728
DB  838 DATA 185,0,212,153,0,4,1
    85,0,739
8D  839 DATA 213,153,0,5,185,0,2
    14,153,923
E7  840 DATA 0,6,185,0,215,153,0
    ,7,566
7F  841 DATA 200,208,229,169,53,
    133,1,230,1223
7E  842 DATA 251,76,202,11,169,5
    2,133,1,895
10  843 DATA 160,0,185,0,216,153
    ,0,4,718
B6  844 DATA 185,0,217,153,0,5,1
```

```
   85,0,745
FA  845 DATA 218,153,0,6,185,0,2
    19,153,934
02  846 DATA 0,7,200,208,229,169
    ,53,133,999
D5  847 DATA 1,230,251,76,202,11
    ,169,52,992
55  848 DATA 133,1,160,0,185,0,2
    20,153,852
C5  849 DATA 0,4,185,0,221,153,0
    ,5,568
7C  850 DATA 185,0,222,153,0,6,1
    85,0,751
C0  851 DATA 223,153,0,7,200,208
    ,229,169,1189
7B  852 DATA 53,133,1,230,251,76
    ,233,11,988
2B  853 DATA 0,0,0,0,0,0,0,0,0,0
2A  854 DATA 0,0,0,0,0,0,0,0,0,0
29  855 DATA 0,0,0,0,0,0,0,0,0,0
28  856 DATA 0,0,0,0,0,0,0,0,0,0
EF  857 DATA 0,0,0,0,0,0,0,0,0,0
EE  858 DATA 0,0,0,0,0,0,0,0,0,0
ED  859 DATA 0,0,0,0,0,0,0,0,0,0
EC  860 DATA 0,0,0,0,0,0,0,0,0,0
0B  861 DATA 0,0,0,0,0,0,0,0,28,28

61  862 DATA 8,10,0,158,50,57,48
    ,51,382
9D  863 DATA 32,169,72,69,78,32,
    84,72,608
C6  864 DATA 79,77,32,40,67,41,3
    9,56,431
32  865 DATA 56,0,0,0,0,0,0,169,14
    7,372
5A  866 DATA 32,176,8,169,11,141
    ,17,208,762
44  867 DATA 160,0,185,0,224,153
    ,0,4,726
0E  868 DATA 185,0,225,153,0,5,1
    85,0,753
52  869 DATA 226,153,0,6,185,0,2
    27,153,950
11  870 DATA 0,7,185,0,228,153,0
    ,216,789
D1  871 DATA 185,0,229,153,0,217
    ,185,0,969
C9  872 DATA 230,153,0,218,185,0
    ,231,153,1170
18  873 DATA 0,219,200,208,205,1
    69,0,32,1033
F5  874 DATA 60,9,234,234,234,16
    9,27,141,1108
76  875 DATA 17,208,32,228,255,2
    01,0,240,1181
2C  876 DATA 249,201,49,144,245,
    201,55,176,1320
1E  877 DATA 241,56,233,48,133,2
    51,201,6,1169
3F  878 DATA 208,3,76,102,254,16
    4,251,185,1243
97  879 DATA 159,8,133,252,185,1
    67,8,133,1045
22  880 DATA 253,108,252,0,141,3
    2,208,169,1163
28  881 DATA 55,133,1,88,96,0,19
    2,249,814
93  882 DATA 216,241,80,0,0,0,8,
    9,554
83  883 DATA 9,9,9,0,0,0,32,210,
    269
CA  884 DATA 255,120,169,53,133,
    1,96,169,896
33  885 DATA 55,133,1,88,96,0,16
    9,147,689
36  886 DATA 32,210,255,169,207,
    160,8,32,1073
FB  887 DATA 30,171,76,240,8,73,
    78,83,759
88  888 DATA 69,82,84,32,84,65,8
    0,69,565
81  889 DATA 32,38,32,80,82,69,8
    3,83,499
96  890 DATA 32.82.69.84.85.82.7
    8,0,512
64  891 DATA 0,0,0,0,0,0,32,228,
    260
40  892 DATA 255,201,13,240,7,16
    9,55,133,1073
B0  893 DATA 1,76,240,8,169,7,13
    3,1,635
C1  894 DATA 120,169,11,141,17,2
    08,173,13,852
EB  895 DATA 220,169,25,141,15,2
    20,173,13,976
F9  896 DATA 220,41,16,240,8,169
    ,15,141,850
1A  897 DATA 24,212,76,36,9,169,
    0,141,667
3C  898 DATA 24,212,173,1,220,20
    1,255,240,1326
44  899 DATA 229,169,63,133,0,16
    9,55,133,951
FD  900 DATA 1,169,27,141,17,208
    ,88,76,727
B4  901 DATA 32,8,141,32,208,141
    ,33,208,803
1E  902 DATA 169,55,133,1,88,96,
    0,0,542
81  903 DATA 0,0,0,0,0,0,169,147
    ,316
82  904 DATA 32,210,255,169,11,1
    41,17,208,1043
D8  905 DATA 120,169,53,133,1,16
    0,0,185,821
7F  906 DATA 0,232,153,0,4,185,0
    ,233,807
DD  907 DATA 153,0,5,185,0,234,1
    53,0,730
67  908 DATA 6,185,0,235,153,0,7
    ,185,771
A0  909 DATA 0,236,153,0,216,185
    ,0,237,1027
1C  910 DATA 153,0,217,185,0,238
    ,153,0,946
4D  911 DATA 218,185,0,239,153,0
    ,219,200,1214
A2  912 DATA 208,205,169,55,133,
    1,88,169,1028
F9  913 DATA 27,141,17,208,32,22
    8,255,201,1109
05  914 DATA 0,240,249,201,49,14
    4,245,201,1329
34  915 DATA 56,176,241,56,233,4
    8,133,251,1194
88  916 DATA 201,7,208,3,76,32,8
    ,164,699
DE  917 DATA 251,185,199,9,133,2
    52,185,207,1421
37  918 DATA 9,133,253,108,252,0
    ,118,8,881
3D  919 DATA 144,248,194,156,0,0
    ,10,10,762
60  920 DATA 11,10,11,11,0,0,120
    ,169,332
64  921 DATA 53,133,1,76,144,240
    ,169,63,879
7F  922 DATA 133,0,169,55,133,1,
    169,11,671
C1  923 DATA 141,17,208,88,76,32
    ,8,120,690
87  924 DATA 169,53,133,1,76,151
    ,240,120,943
BD  925 DATA 169,53,133,1,76,176
    ,240,169,1017
5D  926 DATA 0,133,65,76,32,8,16
    9,147,630
99  927 DATA 32,210,255,169,23,1
    60,10,32,891
54  928 DATA 30,171,76,43,10,67,
    85,82,564
D3  929 DATA 82,69,78,84,32,83,8
    0,69,577
ED  930 DATA 69,68,32,73,83,32,0
    ,0,357
15  931 DATA 0,120,169,53,133,1,
    174,125,775
8A  932 DATA 240,169,55,133,1,88
    ,169,0,855
F7  933 DATA 32,205,189,32,228,2
    55,201,0,1142
14  934 DATA 240,249,201,3,208,3
    ,76,80,1060
B2  935 DATA 9,201,43,240,7,201,
    45,240,986
BE  936 DATA 19,76,61,10,120,169
    ,53,133,641
6A  937 DATA 1,238,125,240,169,5
    5,133,1,962
E4  938 DATA 88,76,8,10,120,169,
    53,133,657
BC  939 DATA 1,206,125,240,169,5
    5,133,1,930
C7  940 DATA 88,76,8,10,169,147,
    32,210,740
BE  941 DATA 255,169,133,160,10,
    32,30,171,960
63  942 DATA 76,164,10,80,76,65,
    69,32,592
B1  943 DATA 83,65,77,80,76,69,3
    2,82,564
7D  944 DATA 69,86,69,82,83,69,3
    2,79,569
D6  945 DATA 82,32,70,79,82,87,6
    5,82,579
2B  946 DATA 68,0,32,228,255,201
    ,0,240,1024
56  947 DATA 249,201,82,240,7,20
    1,70,208,1258
5A  948 DATA 241,76,232,10,165,5
    5,201,0,990
5F  949 DATA 208,3,76,80,9,201,2
    ,240,819
77  950 DATA 8,120,169,53,133,1,
    76,239,799
36  951 DATA 10,120,169,53,133,1
    ,76,181,743
A4  952 DATA 241,169,63,133,0,16
    9,55,133,963
DC  953 DATA 1,169,11,141,17,208
    ,88,169,804
BE  954 DATA 0,133,66,76,80,9,16
    9,1,534
08  955 DATA 133,66,76,241,9,173
    ,125,240,1063
30  956 DATA 141,141,241,76,112,
    241,169,147,1268
FB  957 DATA 32,210,255,169,7,16
    0,11,32,876
01  958 DATA 30,171,76,49,11,83,
    69,76,565
82  959 DATA 69,67,84,13,13,49,3
    2,45,372
D9  960 DATA 32,82,69,83,84,79,8
    2,69,580
CA  961 DATA 32,84,79,32,68,69,7
    0,65,499
F9  962 DATA 85,76,84,13,13,50,3
    2,45,398
A4  963 DATA 32,67,82,79,80,0,0,
    32,372
52  964 DATA 228,255,201,0,240,2
    49,201,3,1377
58  965 DATA 208,3,76,80,9,201,4
    9,240,866
8F  966 DATA 12,201,50,208,234,1
    20,169,53,1047
3F  967 DATA 133,1,76,100,242,12
    0,169,53,894
1A  968 DATA 133,1,76,25,243,120
    ,169,53,820
45  969 DATA 133,1,76,68,243,169
    ,55,133,878
B6  970 DATA 1,88,76,1,10,169,14
    7,32,524
F1  971 DATA 210,255,120,169,53,
    133,1,76,1017
A4  972 DATA 64,245,169,55,133,1
    ,88,32,787
7B  973 DATA 228,255,201,0,240,2
    49,201,3,1377
5A  974 DATA 208,3,76,211,10,120
```

```
,162,53,843
FD  975 DATA 134,1,76,96,246,0,1
    65,65,783
4B  976 DATA 201,1,208,3,76,103,
    11,76,679
7B  977 DATA 211,10,120,169,53,1
    33,1,76,773
BE  978 DATA 213,247,169,55,133,
    1,88,32,938
AA  979 DATA 228,255,201,78,208,
    3,76,211,1260
10  980 DATA 10,201,89,240,3,76,
    169,11,799
09  981 DATA 120,169,53,133,1,76
    ,176,247,975
CC  982 DATA 120,169,53,133,1,76
    ,0,248,800
EA  983 DATA 169,55,133,1,88,32,
    228,255,961
7B  984 DATA 201,0,240,249,201,3
    ,208,3,1105
D5  985 DATA 76,211,10,201,32,20
    8,238,120,1096
EF  986 DATA 169,53,133,1,76,23,
    248,169,872
4B  987 DATA 55,133,1,88,32,228,
    255,201,993
8B  988 DATA 32,208,249,76,211,1
    0,0,0,786
15  989 DATA 0,0,0,0,0,0,0,199,1
    99
E0  990 DATA -1
```

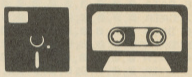
SET THE ALARM



PROGRAM: ALARM

```
3B   1 :
D6   2 REM          ALARM - BASIC LO
     ADER
9E   3 REM                N.P. GREGORY  0
     986
3E   4 :
F0   5 REM SYS 49152 : TURN OFF
24   6 REM SYS 49152,"A/PHHMM","A
     /PHHMM","STRING",1 - DISPLAY
     CLOCK
3D   7 :
86   10 RESTORE
BF   12 ADRS  = 49152
69   14 LINE  = 100
99   16 ELINE = 370
DB   18 C=0:T=0
2E   20 :
42   22 FOR LN = LINE TO ELINE ST
     EP 5
07   24 FOR A=0 TO 9
35   26 READ DT:IF DT=-1 THEN A=9
     :GOTO 30
F0   28 POKE ADRS+C,DT:T=T+DT:C=C
     +1:NEXT A
CE   30 READ CH:IF CH<>T THEN PRI
     NT"ERROR IN LINE";LN:END
0C   32 T=0:NEXT LN
B4  100 DATA 169,0,141,7,194,173
    ,13,220,9,4,930
A6  105 DATA 41,127,141,13,220,3
    2,121,0,208,13,916
C0  110 DATA 120,169,49,141,20,3
    ,169,234,141,21,1067
41  115 DATA 3,88,96,32,254,192,
    165,180,141,3,1154
F1  120 DATA 194,165,181,141,4,1
    94,32,254,192,165,1522
78  125 DATA 180,141,5,194,165,1
    81,141,6,194,32,1239
D9  130 DATA 253,174,32,158,173,
    32,163,182,201,27,1395
15  135 DATA 144,3,76,67,193,72,
    173,136,2,141,1007
25  140 DATA 98,192,141,128,192,
    141,141,192,56,32,1313
81  145 DATA 240,255,134,180,132
    ,181,173,0,4,133,1432
E1  150 DATA 182,104,168,169,0,1
    53,12,194,169,160,1311
F6  155 DATA 153,11,194,136,132,
    183,32,102,229,164,1336
8E  160 DATA 183,177,34,32,71,17
    1,173,0,4,9,854
30  165 DATA 128,153,11,194,136,
    16,233,165,182,141,1359
70  170 DATA 0,4,24,166,180,164,
    181,32,240,255,1246
96  175 DATA 32,121,0,240,14,32,
    253,174,32,158,1056
43  180 DATA 183,224,2,144,3,76,
    67,193,138,74,1104
B0  185 DATA 106,141,7,194,173,1
    4,220,9,128,141,1133
E5  190 DATA 14,220,173,15,220,9
    ,128,141,15,220,1155
4A  195 DATA 174,5,194,142,11,22
    0,174,6,194,142,1262
F5  200 DATA 10,220,160,0,140,9,
    220,140,8,220,1127
74  205 DATA 41,127,141,15,220,1
    73,3,194,141,11,1066
3D  210 DATA 220,173,4,194,141,1
    0,220,140,9,220,1331
6F  215 DATA 140,8,220,120,169,8
    7,141,20,3,169,1077
87  220 DATA 193,141,21,3,173,13
    ,220,9,132,141,1046
7B  225 DATA 13,220,88,96,32,253
    ,174,32,158,173,1239
12  230 DATA 32,163,182,201,5,24
    0,3,76,8,175,1085
2A  235 DATA 160,0,177,34,201,65
    ,240,4,201,80,1162
A7  240 DATA 208,241,132,180,201
    ,80,208,4,169,128,1551
20  245 DATA 133,180,169,19,133,
    182,32,43,193,200,1284
28  250 DATA 177,34,41,15,10,10,
    10,10,133,181,621
74  255 DATA 200,177,34,41,15,5,
    181,133,181,197,1164
1A  260 DATA 182,144,5,162,14,76
    ,55,164,166,182,1150
32  265 DATA 224,19,208,4,5,180,
    133,180,169,96,1218
33  270 DATA 133,182,96,173,7,19
    4,16,56,72,173,1102
C0  275 DATA 136,2,141,123,193,1
    41,223,193,141,250,1543
6F  280 DATA 193,160,28,162,1,17
    3,11,220,16,2,966
D1  285 DATA 162,16,133,2,138,9,
    128,153,0,4,745
24  290 DATA 165,2,41,127,170,32
    ,218,193,174,10,1132
8D  295 DATA 220,32,218,193,174,
    9,220,32,218,193,1509
3B  300 DATA 173,8,220,104,41,12
    7,208,9,173,13,1076
D0  305 DATA 220,16,58,41,4,240,
    54,160,0,174,967
D2  310 DATA 136,2,142,179,193,1
    85,10,194,240,15,1296
1D  315 DATA 77,9,194,153,0,4,17
    3,134,2,153,899
0B  320 DATA 0,216,200,208,236,1
    73,7,194,9,1,1244
02  325 DATA 141,7,194,206,8,194
    ,208,13,169,20,1160
16  330 DATA 141,8,194,173,9,194
    ,73,128,141,9,1070
0A  335 DATA 194,76,49,234,169,1
    74,200,153,0,4,1253
65  340 DATA 173,134,2,153,0,216
    ,138,41,240,74,1171
84  345 DATA 74,74,74,32,240,193
    ,41,15,24,105,872
2A  350 DATA 48,9,128,200,153,0,
    4,173,134,2,851
3D  355 DATA 153,0,216,138,96,0,
    0,0,0,0,603
8D  360 DATA 20,128,160,0,0,0,0,
    0,0,0,308
55  365 DATA 0,0,0,0,0,0,0,0,0,0
    ,0
4E  370 DATA 0,0,0,0,0,0,0,0,0,-
    1,0
```

JACK IN THE BOX



PROGRAM: BOXES LOADER

```
0B   5 PRINT"CREATING PROGRAM : [
     RVSON]BOX UTILS[RVSOFF,DOWN2
     ]"
AB   10 BL=47:LN=50:SA=52480
5B   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
03   30 READ A:PRINT".";:IF A<>CX
      THENPRINT"ERROR IN LINE";LN
     +(L*10):STOP
86   40 NEXT L
B9   50 DATA 32,155,183,142,32,20
     8,32,155,183,142,32,208,32,1
     55,183,142,2017
B3   60 DATA 134,2,32,155,183,142
     ,104,207,32,155,183,142,105,
     207,32,155,1970
C9   70 DATA 183,142,106,207,96,3
     2,155,183,142,95,207,32,155,
     183,142,96,2156
5E   80 DATA 207,32,155,183,142,9
     7,207,32,155,183,142,98,207,
     32,155,183,2210
C5   90 DATA 142,99,207,32,155,18
     3,142,100,207,32,155,183,142
     ,101,207,169,2256
00  100 DATA 146,32,210,255,32,1
     55,183,224,1,208,5,169,18,32
     ,210,255,2135
0E  110 DATA 234,174,134,2,142,1
     02,207,174,101,207,142,134,2
     ,169,32,174,2130
95  120 DATA 97,207,172,95,207,3
     2,51,206,200,204,96,207,208,
     247,232,236,2697
10  130 DATA 98,207,208,238,169,
     176,172,95,207,174,97,207,32
     ,51,206,169,2506
D8  140 DATA 189,172,96,207,174,
     98,207,32,51,206,169,173,172
     ,95,207,174,2422
37  150 DATA 98,207,32,51,206,16
     9,174,172,96,207,174,97,207,
     32,51,206,2179
62  160 DATA 172,95,207,200,169,
     195,174,97,207,32,51,206,174
     ,98,207,32,2316
58  170 DATA 51,206,174,99,207,2
     40,6,174,99,207,32,51,206,17
     4,100,207,2233
30  180 DATA 240,3,32,51,206,200
```

```
      ,204,96,207,208,219,172,95,2
      07,174,97,2411
B9    190 DATA 207,232,169,221,172
      ,95,207,32,51,206,172,96,207
      ,32,51,206,2356
99    200 DATA 232,236,98,207,208,
      238,173,99,207,240,19,169,17
      1,172,95,207,2771
F3    210 DATA 174,99,207,32,51,20
      6,169,179,172,96,207,32,51,2
      06,173,100,2154
26    220 DATA 207,240,19,169,171,
      172,95,207,174,100,207,32,51
      ,206,169,179,2398
C5    230 DATA 172,96,207,32,51,20
      6,234,169,19,32,210,255,174,
      102,207,142,2308
D4    240 DATA 134,2,96,72,24,32,2
      40,255,104,32,210,255,96,32,
      155,183,1922
71    250 DATA 142,95,207,32,155,1
      83,172,95,207,24,32,240,255,
      96,32,155,2122
E6    260 DATA 183,142,94,207,32,1
      55,183,173,94,207,232,142,89
      ,207,141,90,2371
65    270 DATA 207,174,134,2,142,1
      01,207,169,0,141,91,207,160,
      24,169,0,1928
7C    280 DATA 153,64,207,136,16,2
      48,32,34,207,32,228,255,240,
      251,141,92,2336
3C    290 DATA 207,201,20,208,41,1
      73,91,207,201,0,240,237,206,
      91,207,172,2502
9B    300 DATA 91,207,169,0,153,64
      ,207,32,58,207,169,32,32,210
      ,255,32,1918
AE    310 DATA 58,207,32,58,207,32
      ,34,207,32,58,207,76,19,207,
      173,91,1698
BD    320 DATA 207,24,105,1,205,89
      ,207,208,14,173,92,207,201,1
      3,240,7,1993
B0    330 DATA 201,20,240,3,76,121
      ,206,173,92,207,201,13,208,1
      5,32,58,1866
C1    340 DATA 207,169,32,32,210,2
      55,174,101,207,142,134,2,96,
      24,173,90,2048
09    350 DATA 207,201,1,240,17,17
      3,92,207,201,32,144,141,173,
      92,207,201,2329
8C    360 DATA 157,176,44,76,1,207
      ,173,92,207,201,48,144,34,20
      1,58,176,1995
4E    370 DATA 30,32,58,207,173,92
      ,207,32,210,255,172,91,207,1
      53,64,207,2190
82    380 DATA 238,91,207,173,91,2
      07,205,89,207,208,1,96,76,11
      8,206,76,2289
46    390 DATA 121,206,169,154,32,
      210,255,174,105,207,142,134,
      2,173,106,207,2397
22    400 DATA 32,210,255,174,104,
      207,142,134,2,96,169,157,32,
      210,255,96,2275
C8    410 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
36    420 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
3C    430 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
2A    440 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
10    450 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
1E    460 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
04    470 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
72    480 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0

F0    490 DATA 0,205,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0,205
66    500 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
6C    510 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
59    520 DATA 0,0,0,0,0,0,0,0,0,0
      ,0,0,0,0,0,0,0
05    530 PRINT "[DOWN2]PRESS ANY
      KEY TO SAVE MACHINE CODE"
D6    540 GETK$:IFK$=""THEN 540
5B    550 POKE43,0:POKE44,205:POKE
      45,0:POKE46,208:CLR:SAVE"BOX
      UTILS",8
24    560 REM ** CHANGE ,8 TO ,1 I
      F USING CASSETTE **
```

PROGRAM: BOX DEMO

```
D1    1000 :
FC    1010 F=F+1
50    1020 IFF=1THENLOAD"BOX UTILS
      ",8,1
48    1030 PRINT"[CLR]"
D2    1040 CO=52480 : REM CONFIG
05    1050 BO=52517 : REM BOX
12    1060 AT=52797 : REM PRINT AT

1C    1070 IN=52814 : REM INPUT RO
      UTINE
06    1080 :
56    1090 GOTO1150
6A    1100 :
AB    1110 SYSAT,9,24:PRINT"[RVSOF
      F,C7]PRESS A KEY TO CONTINUE
      ";
4D    1120 GETA$:IFA$=""THEN1120
E0    1130 RETURN
42    1140 :
10    1150 SYSCO,6,6,1,4,7,ASC("[C
      P]")
27    1160 SYSBO,5,35,4,8,0,0,1,0
A1    1170 SYSAT,12,6:PRINT"[C7]WE
      LCOME TO BOXES"
90    1180 GOSUB1110
E8    1190 PRINT"[CLR]"
16    1200 SYSBO,0,39,0,23,0,0,14,
      1
4B    1210 SYSAT,3,5
45    1220 PRINT"[C7]BOXES PROVIDE
      S THE BASIC PROGRAMMER"
A7    1230 PRINT"[RVSON,RIGHT3]WIT
      H SEVERAL FUNCTIONS:"
45    1240 PRINT
22    1250 PRINT"[RIGHT3,RVSON]CON
      FIG"
F7    1260 PRINT"[RIGHT3,RVSON]AT"

3F    1270 PRINT"[RIGHT3,RVSON]DRA
      W BOX"
CF    1280 PRINT"[RIGHT3,RVSON]INP
      UT"
83    1290 GOSUB1110
53    1300 PRINT"[CLR]"
00    1310 SYSBO,0,39,0,10,0,0,14,
      0
18    1320 SYSAT,1,1
14    1330 PRINT"[RIGHT,WHITE]AT.[
      C7] THIS ALLOWS THE CURSOR T
      O BE"
BF    1340 PRINT"[RIGHT6]PLACED ON
       THE SCREEN"
09    1350 PRINT"[RIGHT3,DOWN,RIGH
      T3]USING COORDINATES X,Y"
83    1360 PRINT"[RIGHT6]THIS IS U
      SEFUL IF YOU REQUIRE"
F4    1370 PRINT"[RIGHT6]EXTENSIVE
       CURSOR MOVEMENT"
65    1380 GOSUB1110
71    1390 PRINT"[CLR]"

89    1400 SYSBO,0,39,0,20,0,0,14,
      0
A3    1410 PRINT"[HOME,DOWN,RIGHT,
      WHITE]BOX DRAW[C7] THIS ALLO
      WS DISPLAY OF BOXES"
3D    1420 SYSAT,1,2:PRINT"ON THE
      COMMODORE SCREEN"
90    1430 SYSAT,1,4:PRINT"CARE SH
      OULD BE TAKEN NOT TO USE THE
      "
9D    1440 SYSAT,1,5:PRINT"BOTTOM
      RIGHT CHARACTER ON THE SCREE
      N"
9D    1450 SYSAT,1,7:PRINT"BOXES C
      AN BY DRAWN BE SPECIFYING"
B7    1460 SYSAT,1,9:PRINT"START X
      ,END X,START Y,END Y"
62    1470 SYSAT,1,10:PRINT"NEXT,
      2 VERTICAL BARS MAY BE PLACE
      D ON"
95    1480 SYSAT,1,11:PRINT"THESE
      ARE SHOWN IN B1 AND B2"
4E    1490 SYSAT,1,12:PRINT"THE NE
      XT PARAMETER, C1 IS THE COLO
      R"
DB    1500 PRINT"[RIGHT]FINALLY, T
      HE LAST FLAG IS SET"
8C    1510 PRINT"[RIGHT]1 INDICATE
      S A REVERSE BOX"
CC    1520 PRINT"[RIGHT]ANY OTHER
      INDICATES A NORMAL FRAME"
F3    1530 GOSUB1110
EE    1540 PRINT"[CLR]HERE ARE THE
       TWO TYPES OF BOXES"
7D    1550 SYSBO,5,35,5,10,0,0,14,
      0
6D    1560 SYSBO,5,35,11,16,0,0,14
      ,1
31    1570 SYSAT,6,6:PRINT"[RVSOFF
      ]NORMAL"
11    1580 SYSAT,6,12:PRINT"[RVSON
      ]REVERSE"
34    1590 GOSUB1110
B4    1600 PRINT"[CLR]"
4C    1610 SYSBO,1,19,0,3,0,0,1,0
DF    1620 SYSBO,20,38,0,3,0,0,2,0

02    1630 SYSBO,1,19,4,7,0,0,3,0
9D    1640 SYSBO,20,38,4,7,0,0,4,0

AD    1650 SYSBO,1,19,8,11,0,0,5,0

DE    1660 SYSBO,20,38,8,11,0,0,6,
      0
8A    1670 SYSBO,1,19,12,15,0,0,7,
      0
0B    1680 SYSBO,20,38,12,15,0,0,8
      ,0
90    1690 SYSBO,1,19,16,19,0,0,9,
      0
BE    1700 SYSBO,20,38,16,19,0,0,1
      0,0
69    1710 SYSBO,1,19,20,23,0,0,11
      ,0
6A    1720 SYSBO,20,38,20,23,0,0,1
      2,0
48    1730 GOSUB1110
20    1740 PRINT"[CLR]"
19    1750 SYSBO,1,19,0,3,0,0,1,1
02    1760 SYSBO,20,38,0,3,0,0,2,1

0F    1770 SYSBO,1,19,4,7,0,0,3,1
28    1780 SYSBO,20,38,4,7,0,0,4,1

00    1790 SYSBO,1,19,8,11,0,0,5,1

40    1800 SYSBO,20,38,8,11,0,0,6,
      1
90    1810 SYSBO,1,19,12,15,0,0,7,
      1
BB    1820 SYSBO,20,38,12,15,0,0,8
      ,1
9E    1830 SYSBO,1,19,16,19,0,0,9,
      1
```

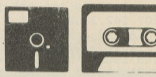
```
E0  1840 SYSBO,20,38,16,19,0,0,1
    0,1
A7  1850 SYSBO,1,19,20,23,0,0,11
    ,1
36  1860 SYSBO,20,38,20,23,0,0,1
    2,1
59  1870 GOSUB1110
9D  1880 PRINT"[CLR]"
A3  1890 SYSAT,15,0:PRINT"DATA I
    NPUT"
A0  1900 PRINT"[DOWN2,RIGHT]PLEA
    SE ENTER A WORD:"
0B  1910 SYSIN,0,10
58  1920 A$=""
F3  1930 FORL=0TO9
9D  1940 A$=A$+CHR$(PEEK(53056+L
    ))
73  1950 NEXTL
C0  1960 B$=A$
F6  1970 PRINT"[DOWN2]PLEASE ENT
    ER A NUMBER:"
90  1980 SYSIN,1,10
06  1990 A$=""
89  2000 FORL=0TO9:A$=A$+CHR$(PE
    EK(53056+L)):NEXTL
5D  2010 SYSAT,0,10
FE  2020 PRINT"[C7]WORD TYPED :
    [WHITE]";B$
DC  2030 PRINT"[C7]NUMBER TYPED
    : [WHITE]";VAL(A$)
F3  2040 GOSUB1110
48  2050 PRINT"[CLR]"
80  2060 OPT=1
FA  2070 SYSBO,8,34,1,5,0,0,1,1
EE  2080 SYSAT,16,2:PRINT"[WHITE
    ]BOX MENU"
BA  2090 SYSAT,10,3:PRINT"[RVSON
    ]USE CURSORS UP AND DOWN"
B7  2100 SYSAT,12,4:PRINT"[RVSON
    ]RETURN TO FINISH"
45  2110 SYSBO,10,30,10,12,0,0,1
    ,1
3D  2120 SYSBO,10,30,13,15,0,0,1
    4,1
8D  2130 SYSBO,10,30,16,18,0,0,1
    4,1
34  2140 SYSBO,10,30,19,21,0,0,1
    4,1
A5  2150 GETA$:IFA$=""THEN2150
85  2160 IFA$=CHR$(13)THENOOTO23
    00
E9  2170 IFA$="[DOWN]"ANDOPT=4TH
    ENOPT=1:GOTO2190
3F  2180 IFA$="[DOWN]"THENOPT=OP
    T+1
F6  2190 IFA$="[UP]"ANDOPT=1THEN
    OPT=4:GOTO2210
5A  2200 IFA$="[UP]"THENOPT=OPT-
    1
9D  2210 SYSBO,10,30,10,12,0,0,1
    4,1
11  2220 SYSBO,10,30,13,15,0,0,1
    4,1
89  2230 SYSBO,10,30,16,18,0,0,1
    4,1
B0  2240 SYSBO,10,30,19,21,0,0,1
    4,1
41  2250 IFOP=1THENSYSBO,10,30,1
    0,12,0,0,1,1
72  2260 IFOP=2THENSYSBO,10,30,1
    3,15,0,0,1,1
83  2270 IFOP=3THENSYSBO,10,30,1
    6,18,0,0,1,1
B5  2280 IFOP=4THENSYSBO,10,30,1
    9,21,0,0,1,1
F9  2290 GOTO2150
4E  2300 PRINT"[CLR]"
FA  2310 SYSBO,1,19,1,10,0,0,14,
    0
13  2320 SYSBO,1,19,11,20,13,18,
    14,0
8B  2330 SYSBO,20,38,1,10,0,0,14
    ,1
E6  2340 SYSBO,20,38,11,20,13,18
    ,14,1
3B  2350 GOSUB1110
8B  2360 PRINT"[CLR]"
B6  2370 SYSAT,6,2
EB  2380 PRINT"BOXES BY S.SCOTT
    - JUNE 1988"
DF  2390 END
```

FILE EXTENSION

PROGRAM: FILE EXTENSION

```
0 DIMB$(255),B(255):PRINT"(CLR)(
WHT)INSERT DISK & PRESS (RVS)RET
URN":POKE53280,0:POKE53281,0
1 GETA$:IFA$<>CHR$(13)THEN1:DATA
",8:","■","■","■",8,1","■","■",";","■
"
2 M=1:OPEN4,4,4:OPEN15,8,15,"I":IN
PUT#15,E:CLOSE15:IFE<>0THEN0
3 PRINT"(CLR)(RVS)";:OPEN15,8,15
:FORT=1TO3:READA$(T),C$(T):NEXT:
OPEN5,8,0,"$"
4 FORT=1TO7:GET#5,A$:NEXT
5 GET#5,A$:IFSTTHEN9
6 IFA$<>CHR$(34)THEN5
7 FORT=1TO21:GET#5,A$:B$(N)=B$(N
)+A$:IFA$=CHR$(34)THENB(N)=T
8 NEXT:PRINTCHR$(34)B$(N):N=N+1:
GETA$:IFA$<>" "THEN4
9 PRINT"(CLR)(YEL)FILE NAME:(WHT
)"CHR$(34)B$(M)"(DOWN)(DOWN)";FO
RT=1TO3:PRINT"(YEL)(DOWN)(LEFT)"
T"(WHT)"A$(T):NEXT
10 PRINT"(DOWN)(YEL)-(WHT) SCRAT
CH(DOWN)";PRINT"(YEL)@ (WHT)DISK
 COMMAND(DOWN)";PRINT"(YEL)S (WH
T)DISK STATUS":CLOSE5
11 P$="
 ":PRINT"(DOWN)(YEL)R (WHT)RENAM
E":PRINT"(DOWN)(YEL)P (WHT)HARD
COPY"
12 GETA$:PRINT"(HOME)"TAB(11)B$(
M):IFA$=""(DOWN)"ANDM<N-1THENM=M+
1:GOTO12
13 IFA$=""(UP)"ANDM>1THENM=M-1:GO
TO12
14 IFA$=""THEN12
15 IFA$="(CLR)"THENM=N-1
16 IFA$="(HOME)"THENM=1
17 IFA$="S"THENPRINT"(HOME)(DOWN
)(DOWN)"P$:INPUT#15,W,X$,Y,Z:PRI
NT"(UP)"W;X$Y;Z:GOTO12
18 IFA$="@"THENINPUT"(CLR)(YEL)C
OMMAND(WHT)":A$:PRINT#15,A$:GOTO
9
19 IFA$="P"THENPRINT#4,"(RVS)":F
ORT=0TON-1:PRINT#4,CHR$(34)B$(T
):NEXT
20 IFB$(M)=P$THEN12
21 IFA$="-"THENPRINT#15,"S:"+LEF
T$(B$(M),B(M)-1):B$(M)=P$
22 IFA$="R"THENC$=LEFT$(B$(M),B(
M)-1):D$=RIGHT$(B$(M),3):GOTO29
23 A=VAL(A$):IFA>0ANDA<4THENC$=L
EFT$(B$(M),B(M)-1):D$=RIGHT$(B$(
M),3):GOTO26
24 IFA$=" "THENRUN
25 GOTO12
26 IFLEN(C$)+LEN(C$(A))>15THEN12
27 PRINT#15,"R:"C$" "C$(A)"="C$:
E$=C$+CHR$(34)+A$(A)
28 B$(M)=LEFT$(E$+P$,18)+D$:GOTO
12
29 PRINT"(CLR)(YEL)OLD FILE NAME
 = (WHT)"C$:PRINTTAB(16)"(BLU)(D
OWN)(DOWN)(DOWN)----------------
(UP)(UP)"
30 INPUT"(YEL)NEW FILE NAME (WHT
)";Z$:IFZ$=""THEN9
31 B$(M)=LEFT$((Z$)+CHR$(34)+P$,
18)+D$
32 PRINT#15,"R:"Z$"="C$:B(M)=LEN
(Z$)+1:Z$="":GOTO9
```

HI-RES COLOUR PLOTTER



PROGRAM: PLOT64 LOADER

```
79  10 FORA=49152TO50175STEP16:D
    =0
25  20 FORB=0TO15:READC:POKEA+B,
    C:D=D+C:NEXT
74  30 READCH:IFD<>CHTHENPRINT"C
    HECKSUM ERROR IN LINE"PEEK(6
    3)+256*PEEK(64):END
21  40 NEXT:POKE50176,96:END
E8  500 DATA32,253,174,32,235,18
    3,165,21,141,2,196,240,10,20
    1,2,176,2063
20  501 DATA15,165,20,201,64,176
    ,9,165,20,141,1,196,224,200,
    144,3,1744
86  502 DATA76,72,178,142,3,196,
    32,165,194,32,63,193,72,174,
    8,196,1796
F5  503 DATA240,119,166,254,208,
    16,1,251,129,251,104,169,4,3
    2,148,193,2285
96  504 DATA173,7,196,129,251,96
    ,174,8,196,224,1,208,36,202,
    73,255,2229
B9  505 DATA33,251,129,251,104,7
    4,1,251,129,251,169,4,32,148
    ,193,173,2193
64  506 DATA7,196,10,10,10,10,13
    3,253,161,251,41,15,5,253,12
    9,251,1735
89  507 DATA96,224,2,208,29,162,
    0,1,251,129,251,104,74,73,25
    5,33,1892
E1  508 DATA251,129,251,169,4,32
    ,148,193,161,251,41,240,13,7
    ,196,129,2215
A4  509 DATA251,96,162,0,1,251,1
    29,251,104,74,1,251,129,251,
    169,216,2336
63  510 DATA32,148,193,173,7,196
    ,129,251,96,73,255,33,251,12
    9,251,104,2321
6A  511 DATA164,254,240,7,74,73,
    255,33,251,129,251,96,32,253
    ,174,32,2318
DB  512 DATA235,183,165,21,141,2
    ,196,240,10,201,2,176,15,165
    ,20,201,1973
EE  513 DATA64,176,9,165,20,141,
    1,196,224,200,144,3,76,72,17
    8,142,1811
4A  514 DATA3,196,32,63,193,166,
    254,208,16,33,251,141,16,196
    ,169,4,1941
A7  515 DATA32,148,193,161,251,1
    41,17,196,96,72,162,0,33,251
    ,208,28,1989
E5  516 DATA104,74,33,251,141,16
    ,196,208,4,141,17,196,96,169
    ,4,32,1682
```

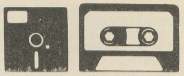
```
98  517 DATA148,193,161,251,74,7
    4,74,74,141,17,196,96,141,16
    ,196,104,1956
FC  518 DATA74,33,251,208,13,169
    ,4,32,148,193,161,251,41,15,
    141,17,1751
CE  519 DATA196,96,169,216,32,14
    8,193,161,251,41,15,141,17,1
    96,96,169,2137
F3  520 DATA0,133,251,169,32,133
    ,252,173,1,196,41,248,24,101
    ,251,133,2188
FA  521 DATA251,165,252,109,2,19
    6,133,252,173,3,196,41,248,1
    33,253,162,2569
DF  522 DATA5,32,200,193,162,3,3
    2,200,193,173,3,196,41,7,101
    ,251,1792
90  523 DATA133,251,144,2,230,25
    2,173,1,196,41,7,166,254,240
    ,2,41,2133
5B  524 DATA6,133,253,56,169,7,2
    29,253,170,169,1,224,0,240,4
    ,10,1924
32  525 DATA202,208,252,96,133,2
    52,169,0,133,251,173,1,196,7
    4,74,74,2288
EA  526 DATA174,2,196,240,2,9,32
    ,24,101,251,133,251,144,3,23
    0,252,2044
EA  527 DATA24,173,3,196,41,248,
    133,253,162,2,32,200,193,165
    ,253,101,2179
FA  528 DATA251,133,251,144,2,23
    0,252,96,169,0,141,15,196,16
    5,253,10,2308
EB  529 DATA46,15,196,202,208,24
    9,101,251,133,251,165,252,10
    9,15,196,133,2522
FB  530 DATA252,96,32,253,174,32
    ,235,183,165,20,141,1,196,16
    5,21,141,2107
37  531 DATA2,196,142,3,196,32,2
    53,174,32,235,183,165,20,141
    ,4,196,1974
F0  532 DATA165,21,141,5,196,142
    ,6,196,32,165,194,24,173,1,1
    96,141,1798
42  533 DATA12,196,109,4,196,141
    ,9,196,173,2,196,141,13,196,
    109,5,1698
B9  534 DATA196,141,10,196,240,1
    1,201,2,176,23,173,9,196,201
    ,64,176,2015
3F  535 DATA16,173,3,196,141,14,
    196,109,6,196,141,11,196,201
    ,200,144,1943
E6  536 DATA3,76,72,178,32,41,19
    2,173,1,196,205,9,196,208,8,
    173,1763
BF  537 DATA2,196,205,10,196,240
    ,10,238,1,196,208,3,238,2,19
    6,208,2149
CF  538 DATA227,32,41,192,173,3,
    196,205,11,196,240,5,238,3,1
    96,208,2166
6E  539 DATA240,32,41,192,173,1,
    196,205,12,196,208,8,173,2,1
    96,205,2080
6E  540 DATA13,196,240,15,206,1,
    196,173,1,196,201,255,208,22
    7,206,2,2336
B9  541 DATA196,240,222,32,41,19
    2,173,3,196,205,14,196,240,6
    ,206,3,2165
5D  542 DATA196,76,147,194,96,32
    ,241,183,165,254,240,4,224,1
    6,176,20,2264
7A  543 DATA142,7,196,32,241,183
    ,165,254,240,6,224,4,144,9,1
    76,4,2027
66  544 DATA224,2,144,3,76,72,17
    8,142,8,196,96,169,0,133,251
    ,168,1862
```

```
97  545 DATA169,32,133,252,152,1
    62,31,145,251,136,208,251,23
    0,252,202,208,2814
9E  546 DATA246,160,64,136,145,2
    51,208,251,96,173,24,208,9,8
    ,141,24,2144
E6  547 DATA208,173,17,208,9,32,
    141,17,208,165,254,240,8,173
    ,22,208,2083
3A  548 DATA9,16,141,22,208,96,1
    73,24,208,41,247,141,24,208,
    173,17,1748
B8  549 DATA208,41,223,141,17,20
    8,173,22,208,41,239,141,22,2
    08,96,32,2020
8E  550 DATA241,183,165,254,240,
    4,224,16,176,9,134,253,32,24
    1,183,244,2579
C8  551 DATA16,144,3,76,72,178,1
    42,32,208,165,253,166,254,24
    0,4,141,2094
04  552 DATA33,208,96,162,250,20
    2,157,0,4,157,250,4,157,244,
    5,157,2086
9A  553 DATA238,6,208,241,96,32,
    241,183,224,1,240,7,224,8,24
    0,3,2192
E9  554 DATA76,72,178,169,1,160,
    255,32,186,255,165,157,240,1
    ,96,169,2212
E9  555 DATA28,141,136,2,169,13,
    32,210,255,169,64,141,252,3,
    169,80,1864
64  556 DATA141,253,3,169,73,141
    ,254,3,169,67,141,255,3,169,
    4,162,2007
87  557 DATA252,160,3,32,189,255
    ,169,0,133,251,169,32,133,25
    2,169,251,2450
82  558 DATA162,64,160,63,32,216
    ,255,169,0,32,189,255,169,4,
    133,252,2155
7A  559 DATA169,251,162,232,160,
    7,32,216,255,165,254,240,13,
    169,216,133,2674
DF  560 DATA252,169,251,162,232,
    160,219,32,216,255,169,4,141
    ,136,2,96,2496
6D  561 DATA32,241,183,224,1,240
    ,7,224,8,240,3,76,72,178,169
    ,1,1899
5D  562 DATA168,32,186,255,165,1
    57,240,1,96,32,189,255,162,2
    ,165,254,2359
E1  563 DATA240,1,232,134,253,6,
    253,169,0,32,213,255,198,253
    ,208,247,2694
```

PROGRAM: PLOT64 DEMO

```
22   10 DEFFNA(X)=INT(RND(1)*X)
BD   20 POKE254,1:SYS49867:SYS498
     97:SYS49951,0,0:SYS49634,0,0
     ,319,199,1,1:PL=49152
69   30 FORZ=1TO100
B1   40 SYSPL,FNA(320),FNA(200),1
     ,1
62   50 NEXT:C=9
E1   60 FORP=0TO1:IFP=1THENC=14
DC   70 XC=180-60*P:YC=110-40*P:S
     =35-15*P
FD   80 FORK=-STOS
0A   90 X=SQR(S*S-K*K):X2=2*X
2A  100 SYSPL,XC-X-1,YC-K,C,1
80  110 FORL=-XTOXSTEP2.5:PO=1
9A  120 IFFNA(X2)-X>-LTHENPO=0
77  130 SYSPL,XC+L,YC-K,C,PO
3D  140 NEXTL,K,P
95  150 GOTO150
```

CONSTRUCT A COMPILER



PROGRAM: CODEGEN

```
FB   10 GOSUB 150
40   20 IF DE% THEN PRINT "{SD}IS
     K {SF}ILE ERROR! {SA}BORTING
     {SC}ODEGEN.":END
8C   30 GOSUB 780
7C   40 IF DE% THEN PRINT "{SD}IS
     K {SF}ILE ERROR! {SA}BORTING
     {SC}ODEGEN.":END
08   50 :
59   60 GOSUB 1090
E1   70 IF VT%>1 THEN GOSUB 1880
EA   80 IF TT%>1 THEN GOSUB 2150
FB   90 GOSUB 2330
5E  100 :
3B  110 PRINT#3,CHR$(0);CHR$(0);

9C  120 CLOSE 3:CLOSE 2:PRINT "{
    SS}TARTING ASSEMBLER..":CLR:
    LOAD"ASSEMBLE",8,1
B8  130 :
B6  140 :
CF  150 REM ********************
    **********
08  160 REM SETUP THE SYSTEM FOR
    CODEGEN
DB  170 REM ********************
    **********
8E  180 :
94  190 PRINT "{CLR,SF,SC,SL} {S
    C}OMPILER {SS}YSTEM {SV}ERSI
    ON 1.0"
4D  200 PRINT "{SC}ODEGEN {SV}1.
    0{SB}"
20  210 PRINT "{SC}OMMODORE 64 {
    SV}ERSION"
7E  220 PRINT "{SS}TEVE {SC}ARRI
    E 1988{DOWN2}"
DA  230 DIM SL$(200)
D0  240 GOSUB 320
39  250 GOSUB 420:IF DE% THEN RE
    TURN
58  260 GOSUB 590:IF DE% THEN RE
    TURN
35  270 :
23  280 :
AD  290 RETURN
17  300 :
0D  310 :
C4  320 REM ********************
    **********
FB  330 REM GET FILENAME
D0  340 REM ********************
    **********
65  350 :
21  360 F$=""
30  370 INPUT "{SF}ILENAME";F$
A5  380 IF F$="" THEN 370
09  390 RETURN
AB  400 :
A1  410 :
20  420 REM ********************
    **********
CE  430 REM READ IN SYM FILE
2C  440 REM ********************
    **********
F9  450 :
F8  460 OPEN 2,8,2,F$+".SYM,S,R"

BB  470 IF DS OR ST THEN DE%=-1:
    RETURN
6A  480 INPUT#2,VT%
51  490 IF VT%=1 THEN CLOSE 2:RE
    TURN
71  495 IF ST THEN CLOSE 2:DE%=-
    1:RETURN
```

```
62 500 DIM VN$(VT%+1),VT%(VT%+1
   ),VV%(VT%+1)
BE 510 PRINT "[DOWN,SR]EADING [
   SV]ARIABLES."
A1 520 FOR V=1 TO VT%-1
EF 530 :  INPUT#2,VN$(V),VT%(V)
   ,VV%(V)
9C 540 NEXT
9A 550 CLOSE 2
BC 560 RETURN
06 570 :
7C 580 :
FF 590 REM ********************
   **********
99 600 REM READ LITERALS
CB 610 REM ********************
   **********
54 620 :
70 630 OPEN 2,8,2,F$+".LTR,S,R"

FA 640 IF DS OR ST THEN DE%=-1:
   RETURN
63 650 INPUT#2,TT%
E6 660 IF TT%=1 THEN CLOSE 2:RE
   TURN
5C 665 IF ST THEN DE%=-1:RETURN

93 670 DIM LT$(TT%+1),L%(TT%+1)

6D 680 PRINT "[SR]EADING LITERA
   LS."
1B 690 FOR LT=1 TO TT%-1
92 700 :  INPUT#2,LE%:L%(LT)=LE
   %
3C 710 :  LT$=""
95 720 : IF LE%<>0 THEN FOR Y=
   1 TO LE%:GET#2,A$:LT$(LT)=LT
   $(LT)+A$:NEXT
5E 730 NEXT
54 740 CLOSE 2
7E 750 RETURN
C0 760 :
3F 770 :
36 780 REM ********************
   **********
BC 790 REM OPEN WORK FILES
62 800 REM ********************
   **********
17 810 :
3F 820 OPEN 2,8,2,F$+".SFC,S,R"

3D 830 IF DS OR ST THEN DE%=-1:
   RETURN
71 840 :
D2 850 OPEN 3,8,3,"@0:"+F$+".AS
   M,P,W"
3F 860 IF DS OR ST THEN DE%=-1:
   CLOSE2:RETURN
2F 870 PRINT#3,CHR$(1);CHR$(8);

FD 880 RETURN
47 890 :
BD 900 :
14 910 REM ********************
   **********
A0 920 REM OUTPUT ASM LINE
20 930 REM ********************
   **********
95 940 :
EB 950 PRINT#3,CHR$(255);CHR$(0
   );CHR$(0);CHR$(0);OL$;CHR$(0
   );
D3 960 TL=TL+1:PRINT TL;"[LEFT]
   LINES.[SPC6]";PRINT"[UP]";
43 970 RETURN
ED 980 :
DB 990 :
1A 1000 REM ********************
   **********
50 1010 REM OUTPUT LIBRARY CALL
   LINE
26 1020 REM ********************
   **********
30 1030 :
81 1040 GOSUB 910

4A 1050 OL$=" JSR SYSLIB"
19 1060 GOTO 910
08 1070 :
06 1080 :
7F 1090 REM ********************
   **********
5B 1100 REM GENERATE PROGRAM HE
   ADER
8B 1110 REM ********************
   **********
5E 1120 :
B2 1130 PRINT "[SG]ENERATING [S
   P]ROGRAM [SH]EADER."
3B 1140 OL$=";  [SC]ODEGEN [SV]1
   .0[SB]":GOSUB 910
BE 1150 OL$=";  [SC]64 [SV]ERSIO
   N";GOSUB 910
C7 1160 OL$=";":GOSUB 910
8D 1170 OL$=" ORG $0801":GOSUB
   910
24 1180 OL$=".BASIC":GOSUB 910
9E 1190 OL$=" BYT $0C,$08,$0A,$
   00,$9E,$20,$32":GOSUB 910
29 1200 OL$=" BYT $30,$36,$33,$
   00,$00,$00,$00":GOSUB 910
EA 1210 OL$=" JSR LOADLIB":GOSU
   B 910
BC 1220 OL$=" JMP MAINSTART":GO
   SUB 910
E1 1230 OL$=";":GOSUB 910
96 1240 OL$=";  ***** PROGRAM VA
   RIABLES *****":GOSUB 910
7C 1250 OL$=".AC1 EQZ $03":GOSU
   B 910
51 1260 OL$=".AC2 EQZ $05":GOSU
   B 910
C8 1270 OL$=".SD1 EQZ $26":GOSU
   B 910
FF 1280 OL$=".SD2 EQZ $3F":GOSU
   B 910
E1 1290 OL$=".UP1 EQZ $FB":GOSU
   B 910
C0 1300 OL$=".UP2 EQZ $FD":GOSU
   B 910
CB 1310 OL$=".APT EQZ $45":GOSU
   B 910
6B 1320 OL$=".TT1 EQZ $47":GOSU
   B 910
B3 1330 OL$=".SYSLIB EQZ $5E":G
   OSUB 910
9E 1340 OL$=";":GOSUB 910
18 1350 OL$=".LOADLIB":GOSUB 91
   0
33 1360 OL$=" LDA #2":GOSUB 910

50 1370 OL$=" LDY #1":GOSUB 910

92 1380 OL$=" LDX #8":GOSUB 910

E3 1390 OL$=" JSR $FFBA":GOSUB
   910
C7 1400 OL$=" LDA #6":GOSUB 910

EB 1410 OL$=" LDX #<SYSLIBNAME"
   :GOSUB 910
96 1420 OL$=" LDY #>SYSLIBNAME"
   :GOSUB 910
F6 1430 OL$=" JSR $FFBD":GOSUB
   910
8D 1440 OL$=" LDA #0":GOSUB 910
92 1450 OL$=" TAX":GOSUB 910
DC 1460 OL$=" LDY #$C0":GOSUB 9
   10
E5 1470 OL$=" JSR $FFD5":GOSUB
   910
5E 1480 OL$=" BCS LDERR":GOSUB
   910
99 1490 OL$=" JMP $C000":GOSUB
   910
32 1500 OL$=".LDERR":GOSUB 910
C9 1510 OL$=" LDA #<LDERRM":GOS
   UB 910
6E 1520 OL$=" STA TT1":GOSUB 91
   0
27 1530 OL$=" LDA #>LDERRM":GOS
   UB 910
AB 1540 OL$=" STA TT1+1":GOSUB
   910
A6 1550 OL$=" LDY #0":GOSUB 910

AD 1560 OL$=".LDERRLP":GOSUB 91
   0
C0 1570 OL$=" LDA (TT1),Y":GOSU
   B 910
ED 1580 OL$=" BEQ LDERREXIT":GO
   SUB 910
83 1590 OL$=" JSR $FFD2":GOSUB
   910
10 1600 OL$=" INY":GOSUB 910
F0 1610 OL$=" BNE LDERRLP":GOSU
   B 910
C3 1620 OL$=".LDERREXIT":GOSUB
   910
39 1630 OL$=" LDX #$80":GOSUB 9
   10
49 1640 OL$=" JMP ($0300)":GOSU
   B 910
BB 1650 OL$=";":GOSUB 910
67 1660 OL$=".SYSLIBNAME":GOSUB
   910
F7 1670 OL$=" BYT 'SYSLIB'":GOS
   UB 910
D0 1680 OL$=".LDERRM":GOSUB 910

23 1690 OL$=" BYT '[SL]IBRARY [
   SF]ILE [SN]OT [SF]OUND.',13"
   :GOSUB 910
51 1700 OL$=" BYT '[SR]UN {SA}B
   ORTED.',13,0":GOSUB 910
3A 1710 RETURN
84 1720 :
F2 1730 :
39 1740 REM ********************
   **********
E1 1750 REM READ LINE FROM SFC
   FILE
35 1760 REM ********************
   **********
CA 1770 :
CE 1780 OC$=""
BD 1790 INPUT#2,SL
BA 1800 FOR X=1 TO SL
89 1810 :  A$="":GET#2,A$:A$=A$
   +CHR$(0)
E3 1820 :  SF=ST
B2 1830 :  OC$=OC$+LEFT$(A$,1)
B5 1840 NEXT
CF 1850 RETURN
71 1860 :
6F 1870 :
AC 1880 REM ********************
   **********
53 1890 REM PROCESS VARIABLE TA
   BLE
98 1900 REM ********************
   **********
47 1910 :
15 1920 OL$="; ****** VARIABLES
   ******":GOSUB 910
D3 1930 PT%=1
CB 1940 PRINT "[SG]ENERATING [S
   V]ARIABLES."
5B 1950 IF VT%(PT%)=1 THEN OL$=
   "."+VN$(PT%)+" WOR 0":GOSUB
   910
F7 1960 IF VT%(PT%)=2 THEN OL$=
   "."+VN$(PT%)+" BYT 0,0,0":GO
   SUB 910
35 1970 IF VT%(PT%)=3 THEN GOSU
   B 2050
A6 1980 IF VT%(PT%)=4 THEN GOSU
   B 2100
88 1990 PT%=PT%+1
6F 2000 IF PT%<VT% THEN 1950
FE 2010 OL$=";":GOSUB 910
65 2020 RETURN
CF 2030 :
C5 2040 :
6C 2050 OL$="."+VN$(PT%)+" WOR"
   +STR$(VV%(PT%)):GOSUB 910
```

```
8C  2060 OL$=" RES"+STR$(2*VV%(P
    T%)):GOSUB 910
90  2070 RETURN
12  2080 :
08  2090 :
D6  2100 OL$="."+VN$(PT%)+" WOR"
    +STR$(VV%(PT%)):GOSUB 910
14  2110 OL$=" RES"+STR$(4*VV%(P
    T%)):GOSUB 910
DE  2120 RETURN
60  2130 :
5E  2140 :
BD  2150 REM ******************
    **********
20  2160 REM PROCESS LITERALS
E9  2170 REM ******************
    **********
B6  2180 :
C3  2190 LG=0
22  2200 PT%=1
41  2210 PRINT "[SG]ENERATING [S
    L]ITERALS."
29  2220 OL$="; ***** LITERALS *
    ****":GOSUB 910
07  2230 L$=STR$(LG):LB$="LIT"+R
    IGHT$(L$,LEN(L$)-1)
6D  2240 OL$="."+LB$+" BYT"+STR$
    (L%(PT%)):GOSUB 910
CB  2250 IF L%(PT%)>0 THEN OL$="
    BYT '"+LT$(PT%)+"'":GOSUB 9
    10
92  2260 LT$(PT%)=LB$
92  2270 PT%=PT%+1:LG=LG+1
8C  2280 IF PT%<TT% THEN 2230
39  2290 OL$=";":GOSUB 910
8A  2300 RETURN
35  2310 :
23  2320 :
48  2330 REM ******************
    **********
CB  2340 REM PROCESS SFC FILE
44  2350 REM ******************
    **********
7B  2360 :
59  2370 SB%=0:MR%=0:SP%=0:CS=0
07  2380 PRINT "[SG]ENERATING CO
    DE."
C5  2390 GOSUB 1780:REM READ LIN
    E FROM FILE
39  2400 GOSUB 2450:REM PROCESS
    LINE
6F  2410 IF SF=0 THEN GOTO 2390
F3  2420 RETURN
BD  2430 :
AB  2440 :
E0  2450 REM ******************
    **********
87  2460 REM PROCESS LINE FROM S
    FC FILE
FC  2470 REM ******************
    **********
83  2480 :
9C  2490 LP%=0
F8  2500 LP%=LP%+1
6F  2510 IF LP%>LEN(OC$) THEN RE
    TURN
E0  2520 CC%=ASC(MID$(OC$,LP%,1)
    )
88  2530 IF CC%>127 THEN 2630
CF  2540 :
90  2550 REM ***** CODES 1-33 **
    ***
30  2560 :
0E  2570 ON CC% GOSUB 2970,3100,
    3180,3260,3380,3500,3610,374
    0,3810
2F  2580 IF CC%>9 THEN ON CC%-9
    GOSUB 3890,4030,4170,2830,43
    50,4360,4390,4590,4600
D7  2590 IF CC%>18 THEN ON CC%-1
    8 GOSUB 4610,4620,4630,4640,
    4670,4670,4670,4670,4870
4C  2600 IF CC%>27 THEN ON CC%-2
    7 GOSUB 4670,4670,4980,4990,
    5000,5010
5C  2610 GOTO 2500
7C  2620 :
72  2630 REM ***** CODES 128 > *
    ****
60  2640 :
DB  2650 REM 128-138
F6  2660 ON CC%-127 GOSUB 5040,2
    830,2830,2830,2830,5170,5180
    ,5210,5320,5440,5550
C6  2670 REM 139-146
AC  2680 IF CC%>138 THEN ON CC%-
    138 GOSUB 5660,5790,5880,603
    0,6040,6070,6200,2830
D0  2690 REM 147-154
A9  2700 IF CC%>146 THEN ON CC%-
    146 GOSUB 6210,6220,2830,283
    0,6250,6430,6340,2830
8A  2710 REM 155-162
3C  2720 IF CC%>154 THEN ON CC%-
    154 GOSUB 2830,6550,6560,657
    0,6580,6590,6600,6610
18  2730 REM 163-170
84  2740 IF CC%>162 THEN ON CC%-
    162 GOSUB 6620,6630,6640,665
    0,6660,6670,6680,6690
37  2750 REM 171-178
28  2760 IF CC%>170 THEN ON CC%-
    170 GOSUB 6700,6710,6720,673
    0,6740,6750,6760,6770
A2  2770 REM 179-186
EC  2780 IF CC%>178 THEN ON CC%-
    178 GOSUB 6780,6790,6800,681
    0,6820,6830,6840,6850
39  2790 REM 187-191
31  2800 IF CC%>186 THEN ON CC%-
    186 GOSUB 6860,6870,6880,689
    0,6900
14  2810 GOTO 2500
35  2820 :
73  2830 PRINT CC%;"[SN]OT IMPLE
    MENTED"
AD  2840 RETURN
17  2850 :
0D  2860 :
EE  2870 REM ******************
    **********
58  2880 REM GET ADDRESS FROM LI
    NE
FA  2890 REM ******************
    **********
65  2900 :
81  2910 LP%=LP%+1:AD=ASC(MID$(O
    C$,LP%,1))
D9  2920 LP%=LP%+1:AD=AD+256*ASC
    (MID$(OC$,LP%,1))
F3  2930 RETURN
BD  2940 :
AB  2950 :
E0  2960 REM ******************
    **********
0A  2970 REM ******************
    **********
D3  2980 REM CODE 1. LOAD AC2 IM
    M.
06  2990 REM ******************
    **********
F9  3000 :
D8  3010 LP%=LP%+1:LO%=ASC(MID$(
    OC$,LP%,1)):LO$=STR$(LO%)
0C  3020 LP%=LP%+1:HI%=ASC(MID$(
    OC$,LP%,1)):HI$=STR$(HI%)
C9  3030 OL$=" LDA #"+RIGHT$(LO$
    ,LEN(LO$)-1):GOSUB 910
EA  3040 OL$=" LDX #"+RIGHT$(HI$
    ,LEN(HI$)-1):GOSUB 910
B1  3050 OL$=" STA AC2":GOSUB 91
    0
98  3060 OL$=" STX AC2+1":GOSUB
    910
87  3070 RETURN
2E  3080 :
24  3090 :
B7  3100 REM ******************
    **********
6E  3110 REM CODE 2. STACK AC2
83  3120 REM ******************
    **********
7C  3130 :
66  3140 OL$=" LDA #$01":GOSUB 1
    040
D4  3150 RETURN
5E  3160 :
54  3170 :
C7  3180 REM ******************
    **********
3F  3190 REM CODE 3. UNSTACK AC1
D3  3200 REM ******************
    **********
AC  3210 :
D7  3220 OL$=" LDA #$02":GOSUB 1
    040
24  3230 RETURN
8E  3240 :
84  3250 :
17  3260 REM ******************
    **********
01  3270 REM CODE 4. SAVE AC2 AT
     ADDR
63  3280 REM ******************
    **********
DC  3290 :
00  3300 GOSUB 2870
55  3310 OL$=" LDA AC2":GOSUB 91
    0
18  3320 OL$=" LDX AC2+1":GOSUB
    910
FD  3330 OL$=" STA "+VN$(AD):GOS
    UB 910
86  3340 OL$=" STX "+VN$(AD)+"+1
    ":GOSUB 910
AD  3350 RETURN
17  3360 :
0D  3370 :
EE  3380 REM ******************
    **********
0D  3390 REM CODE 5. LOAD AC2 FR
    OM ADDR
FA  3400 REM ******************
    **********
65  3410 :
89  3420 GOSUB 2870
2C  3430 OL$=" LDA "+VN$(AD):GOS
    UB 910
93  3440 OL$=" LDX "+VN$(AD)+"+1
    ":GOSUB 910
47  3450 OL$=" STA AC2":GOSUB 91
    0
16  3460 OL$=" STX AC2+1":GOSUB
    910
15  3470 RETURN
9F  3480 :
95  3490 :
06  3500 REM ******************
    **********
15  3510 REM CODE 6 INCREMENT IM
    MEDIATE
12  3520 REM ******************
    **********
ED  3530 :
F1  3540 GOSUB 2870
07  3550 OL$=" INC "+VN$(AD):GOS
    UB 910
53  3560 OL$=" BNE 3":GOSUB 910
11  3570 OL$=" INC "+VN$(AD)+"+1
    ":GOSUB 910
87  3580 RETURN
2E  3590 :
24  3600 :
B7  3610 REM ******************
    **********
E9  3620 REM CODE 7 DECREMENT IM
    MEDIATE
83  3630 REM ******************
    **********
7C  3640 :
60  3650 GOSUB 2870
CC  3660 OL$=" DEC "+VN$(AD):GOS
    UB 910
4D  3670 OL$=" LDA "+VN$(AD):GOS
```

```
    UB 910
D5  3680 OL$=" CMP #$FF":GOSUB 9
    10
EE  3690 OL$=" BNE 3":GOSUB 910
6E  3700 OL$=" DEC "+VN$(AD)+"+1
    ":GOSUB 910
02  3710 RETURN
AC  3720 :
9A  3730 :
F1  3740 REM ******************
    **********
02  3750 REM CODE 8  MOVE AC2 TO
    UP1
CD  3760 REM ******************
    **********
F2  3770 :
5E  3780 OL$=" LDA #$03":GOSUB 1
    040
52  3790 RETURN
DC  3800 :
5F  3810 REM ******************
    **********
5C  3820 REM CODE 9  MOVE AC2 TO
    UP2
AB  3830 REM ******************
    **********
35  3840 :
D4  3850 OL$=" LDA #$04":GOSUB 1
    040
AD  3860 RETURN
17  3870 :
0D  3880 :
EE  3890 REM ******************
    **********
FC  3900 REM CODE 10. LOAD SD2 I
    MM.
FA  3910 REM ******************
    **********
65  3920 :
89  3930 GOSUB 2870
C8  3940 OL$=" LDA "+LT$(AD):GOS
    UB 910
CE  3950 OL$=" LDX #<"+LT$(AD)+"
    +1":GOSUB 910
41  3960 OL$=" LDY #>"+LT$(AD)+"
    +1":GOSUB 910
D6  3970 OL$=" STA SD2":GOSUB 91
    0
DF  3980 OL$=" STX SD2+1":GOSUB
    910
B5  3990 OL$=" STY SD2+2":GOSUB
    910
21  4000 RETURN
83  4010 :
F9  4020 :
12  4030 REM ******************
    **********
5A  4040 REM CODE 11 SAVE SD2 AD
    DR
4E  4050 REM ******************
    **********
D1  4060 :
05  4070 GOSUB 2870
BB  4080 OL$=" LDA SD2":GOSUB 91
    0
74  4090 OL$=" LDX SD2+1":GOSUB
    910
43  4100 OL$=" LDY SD2+2":GOSUB
    910
0E  4110 OL$=" STA "+VN$(AD):GOS
    UB 910
19  4120 OL$=" STX "+VN$(AD)+"+1
    ":GOSUB 910
7F  4130 OL$=" STY "+VN$(AD)+"+2
    ":GOSUB 910
B2  4140 RETURN
7C  4150 :
6A  4160 :
A1  4170 REM ******************
    **********
5F  4180 REM CODE 12 LOAD SD2 AD
    DR
BD  4190 REM ******************
    **********
42  4200 :
92  4210 GOSUB 2870
05  4220 OL$=" LDA "+VN$(AD):GOS
    UB 910
2A  4230 OL$=" LDX "+VN$(AD)+"+1
    ":GOSUB 910
24  4240 OL$=" LDY "+VN$(AD)+"+2
    ":GOSUB 910
D1  4250 OL$=" STA SD2":GOSUB 91
    0
3E  4260 OL$=" STX SD2+1":GOSUB
    910
C8  4270 OL$=" STY SD2+2":GOSUB
    910
46  4280 RETURN
E8  4290 :
E6  4300 :
35  4310 REM ******************
    **********
50  4320 REM CODES 14 & 15 STACK
    /UNST SD
01  4330 REM ******************
    **********
3E  4340 :
0C  4350 OL$=" LDA #$05":GOTO 10
    40
D6  4360 OL$=" LDA #$06":GOTO 10
    40
19  4370 :
17  4380 :
44  4390 REM ******************
    **********
76  4400 REM CODE 16. STRING OP
    PREFIX
50  4410 REM ******************
    **********
6F  4420 :
26  4430 LP%=LP%+1:C%=ASC(MID$(O
    C$,LP%,1))
38  4440 IF C%=164 THEN OL$=" LD
    A #$07"
F6  4450 IF C%=165 THEN OL$=" LD
    A #$08"
9C  4460 IF C%=166 THEN OL$=" LD
    A #$09"
61  4470 IF C%=167 THEN OL$=" LD
    A #$0A"
99  4480 IF C%=168 THEN OL$=" LD
    A #$0B"
45  4490 IF C%=169 THEN OL$=" LD
    A #$0C"
F6  4500 IF C%=170 THEN OL$=" LD
    A #$0D"
C7  4510 GOSUB 1040
37  4520 RETURN
F9  4530 :
F7  4540 :
24  4550 REM ******************
    **********
5F  4560 REM CODES 17-22
30  4570 REM ******************
    **********
CF  4580 :
17  4590 OL$=" LDA #$0E":GOTO 10
    40
F6  4600 OL$=" LDA #$0F":GOTO 10
    40
70  4610 OL$=" LDA #$10":GOTO 10
    40
2B  4620 OL$=" LDA #$11":GOTO 10
    40
0A  4630 OL$=" LDA #$12":GOTO 10
    40
75  4640 OL$=" LDA #$13":GOTO 10
    40
06  4650 :
7C  4660 :
FF  4670 REM ******************
    **********
10  4680 REM CODES 23-26 / 28-29
CB  4690 REM ******************
    **********
54  4700 :
97  4710 GOSUB 2880
5A  4720 OL$=" LDA #<"+VN$(AD):G
    OSUB 910
B1  4730 OL$=" LDX #>"+VN$(AD):G
    OSUB 910
59  4740 OL$=" STA TT1":GOSUB 91
    0
46  4750 OL$=" STX TT1+1":GOSUB
    910
26  4760 OL$=" LDA #$14":GOSUB 1
    040
33  4770 IF CC%<=24 OR CC%>=28 T
    HEN OL$=" LDA #$15":GOSUB 10
    40
CB  4780 IF CC%=25 OR CC%=26 THE
    N OL$=" LDA #$16":GOSUB 1040
B5  4790 IF CC%=23 THEN OL$=" LD
    A #$17":GOTO 1040
8D  4800 IF CC%=24 THEN OL$=" LD
    A #$18":GOTO 1040
71  4810 IF CC%=25 THEN OL$=" LD
    A #$19":GOTO 1040
42  4820 IF CC%=26 THEN OL$=" LD
    A #$1A":GOTO 1040
09  4830 IF CC%=28 THEN OL$=" LD
    A #$1B":GOTO 1040
3D  4840 OL$=" LDA #$1C":GOTO 10
    40
3E  4850 :
34  4860 :
A6  4870 REM ******************
    **********
04  4880 REM CODE 27. UNSTACK AR
    RAY PTR
B2  4890 REM ******************
    **********
0D  4900 :
59  4910 OL$=" LDA #$1D":GOTO 10
    40
71  4920 :
6F  4930 :
AC  4940 REM ******************
    **********
E9  4950 REM CODES 30-32
98  4960 REM ******************
    **********
47  4970 :
A4  4980 OL$=" LDA #$1E":GOTO 10
    40
8F  4990 OL$=" LDA #$1F":GOTO 10
    40
F0  5000 OL$=" LDA #$20":GOTO 10
    40
88  5010 OL$=" LDA #$4D":GOTO 10
    40
95  5020 :
83  5030 :
28  5040 REM ******************
    **********
12  5050 REM ******************
    **********
97  5060 REM CODE 128. END
4E  5070 REM ******************
    **********
D1  5080 :
14  5090 IF SB% THEN SB%=0:OL$="
    RTS":GOTO 910
5B  5100 OL$=" LDA #$4E":GOTO 10
    40
33  5110 :
2E  5120 :
6D  5130 REM ******************
    **********
D1  5140 REM CODES 133-134 BSET/
    WSET
59  5150 REM ******************
06  5160 :
02  5170 OL$=" LDA #$21":GOTO 10
    40
F9  5180 OL$=" LDA #$22":GOTO 10
    40
60  5190 :
5E  5200 :
BD  5210 REM ******************
    **********
AF  5220 REM CODE 135. LOOP
E9  5230 REM ******************
```

```
           ***********
B6  5240 :
FF  5250 SP%=SP%+1
5B  5260 CN$=STR$(CS):CS=CS+1
E7  5270 SL$(SP%)="CTL"+RIGHT$(C
    N$,LEN(CN$)-1)
CC  5280 OL$="."+SL$(SP%):GOSUB
    910
30  5290 RETURN
F2  5300 :
E8  5310 :
63  5320 REM ******************
    ***********
33  5330 REM CODE 136. ENDLOOP
5F  5340 REM ******************
    ***********
C0  5350 :
CD  5360 CN$=SL$(SP%):SP%=SP%-1
D3  5370 NC%=ASC(MID$(OC$,LP%+1,
    1)+CHR$(0))
A1  5380 IF NC%<>0 THEN RETURN
F9  5390 OL$=" JMP "+CN$:GOSUB 9
    10
25  5400 OL$="."+CN$+"EX":GOSUB
    910
B9  5410 RETURN
7B  5420 :
71  5430 :
FA  5440 REM ******************
    ***********
9F  5450 REM CODE 137. WHILE
F6  5460 REM ******************
    ***********
49  5470 :
DB  5480 CN$=SL$(SP%)+"EX"
C7  5490 OL$=" LDA #$23":GOSUB 1
    040
C7  5500 OL$=" BNE 3":GOSUB 910
11  5510 OL$=" JMP "+CN$:GOSUB 9
    10
2B  5520 RETURN
95  5530 :
83  5540 :
28  5550 REM ******************
    ***********
03  5560 REM CODE 138. WHEN
24  5570 REM ******************
    ***********
DB  5580 :
E3  5590 OL$=" LDA #$23":GOSUB 1
    040
53  5600 OL$=" BNE 3":GOSUB 910
A5  5610 OL$=" JMP "+CN$:GOSUB 9
    10
19  5620 OL$="."+CN$+"EX":GOSUB
    910
9D  5630 RETURN
24  5640 :
12  5650 :
59  5660 REM ******************
    ***********
02  5670 REM CODE 139. IF
55  5680 REM ******************
    ***********
6A  5690 :
A3  5700 SP%=SP%+1
E5  5710 IN$=STR$(CS):CS=CS+1
AB  5720 SL$(SP%)="CTL"+RIGHT$(I
    N$,LEN(IN$)-1)
72  5730 OL$=" LDA #$23":GOSUB 1
    040
5C  5740 OL$=" BNE 3":GOSUB 910
B9  5750 OL$=" JMP "+SL$(SP%):GO
    SUB 910
18  5760 RETURN
9A  5770 :
90  5780 :
1B  5790 REM ******************
    ***********
8F  5800 REM CODE 140 . ENDIF
17  5810 REM ******************
    ***********
E8  5820 :
D4  5830 OL$=" "+SL$(SP%):GOSUB
    910
AE  5840 SP%=SP%-1
7E  5850 RETURN
C0  5860 :
3E  5870 :
1D  5880 REM ******************
    ***********
3C  5890 REM CODE 141. ELSE
48  5900 REM ******************
    ***********
17  5910 :
A8  5920 IN$=SL$(SP%)
5D  5930 SL$(SP%)=IN$+"EX"
EA  5940 OL$=" JMP "+SL$(SP%):GO
    SUB 910
EA  5950 OL$="."+IN$:GOSUB 910
D1  5960 RETURN
53  5970 :
49  5980 :
C2  5990 REM ******************
    ***********
29  6000 REM CODES 142-143 CHARO
    UT/FOPEN
3E  6010 REM ******************
    ***********
A1  6020 :
22  6030 OL$=" LDA #$24":GOTO 10
    40
51  6040 OL$=" LDA #$25":GOTO 10
    40
83  6050 :
F9  6060 :
12  6070 REM ******************
    ***********
9D  6080 REM CODE 144. BEGIN
4E  6090 REM ******************
    ***********
D1  6100 :
83  6110 IF SB% THEN RETURN
E4  6120 OL$=".MAINSTART":GOSUB
    910
87  6130 RETURN
29  6140 :
24  6150 :
B7  61660 REM ******************
    ***********
4A  6170 REM CODES 145/ 147-148
83  6180 REM ******************
    ***********
7C  6190 :
F5  6200 OL$=" LDA #$26":GOTO 10
    40
C8  6210 OL$=" LDA #$27":GOTO 10
    40
FF  6220 OL$=" LDA #$28":GOTO 10
    40
54  6230 :
42  6240 :
E9  6250 REM ******************
    ***********
D7  6260 REM CODE 151 SUBROUTINE
E5  6270 REM ******************
    ***********
9A  6280 :
0E  6290 GOSUB 2870:SB%=-1
FC  6300 OL$="."+VN$(AD):GOSUB 9
    10
30  6310 RETURN
F2  6320 :
E8  6330 :
63  6340 REM ******************
    ***********
C5  6350 REM CODE 153. CALL
5F  6360 REM ******************
    ***********
C0  6370 :
14  6380 GOSUB 2870
8B  6390 OL$=" JSR "+VN$(AD):GOS
    UB 910
97  6400 RETURN
19  6410 :
17  6420 :
44  6430 REM ******************
    ***********
73  6440 REM CODE 152. RETURN
50  6450 REM ******************
    ***********
6F  6460 :
8A  6470 OL$=" RTS":GOSUB 910
E7  6480 RETURN
49  6490 :
47  6500 :
94  6510 REM ******************
    ***********
56  6520 REM CODES 156-191
E0  6530 REM ******************
    ***********
9F  6540 :
6D  6550 OL$=" LDA #$29":GOTO 10
    40
CB  6560 OL$=" LDA #$2A":GOTO 10
    40
FE  6570 OL$=" LDA #$2B":GOTO 10
    40
45  6580 OL$=" LDA #$2C":GOTO 10
    40
98  6590 OL$=" LDA #$2D":GOTO 10
    40
3F  6600 OL$=" LDA #$2E":GOTO 10
    40
B2  6610 OL$=" LDA #$2F":GOTO 10
    40
97  6620 OL$=" LDA #$30":GOTO 10
    40
4A  6630 OL$=" LDA #$31":GOTO 10
    40
21  6640 OL$=" LDA #$32":GOTO 10
    40
14  6650 OL$=" LDA #$33":GOTO 10
    40
20  6660 OL$=" LDA #$34":GOTO 10
    40
07  6670 OL$=" LDA #$35":GOTO 10
    40
7A  6680 OL$=" LDA #$36":GOTO 10
    40
01  6690 OL$=" LDA #$37":GOTO 10
    40
14  6700 OL$=" LDA #$38":GOTO 10
    40
FB  6710 OL$=" LDA #$39":GOTO 10
    40
C1  6720 OL$=" LDA #$3A":GOTO 10
    40
CC  6730 OL$=" LDA #$3B":GOTO 10
    40
AB  6740 OL$=" LDA #$3C":GOTO 10
    40
06  6750 OL$=" LDA #$3D":GOTO 10
    40
35  6760 OL$=" LDA #$3E":GOTO 10
    40
80  6770 OL$=" LDA #$3F":GOTO 10
    40
37  6780 OL$=" LDA #$40":GOTO 10
    40
D6  6790 OL$=" LDA #$41":GOTO 10
    40
B9  6800 OL$=" LDA #$42":GOTO 10
    40
E8  6810 OL$=" LDA #$43":GOTO 10
    40
8B  6820 OL$=" LDA #$44":GOTO 10
    40
6A  6830 OL$=" LDA #$45":GOTO 10
    40
2D  6840 OL$=" LDA #$46":GOTO 10
    40
FC  6850 OL$=" LDA #$47":GOTO 10
    40
7F  6860 OL$=" LDA #$48":GOTO 10
    40
DE  6870 OL$=" LDA #$49":GOTO 10
    40
38  6880 OL$=" LDA #$4A":GOTO 10
    40
13  6890 OL$=" LDA #$4B":GOTO 10
    40
0A  6900 OL$=" LDA #$4C":GOTO 10
    40
```

Listings

PROGRAM: ASSEMBLE.LDR

```
D9  10 IF PEEK(44)=8 THEN PRINT
    "CHANGE START OF BASIC FIRST
    !!":END
AF  15 AD=2049
E3  20 FOR LN=100 TO 2430 STEP 1
    0
A3  25 :  RT=0
91  30 :  FOR OS=0 TO 15
C2  35 :     READ BY:POKE AD+OS,
    BY
4D  40 :     RT=RT+BY
99  45 :  NEXT
DC  50 :  READ TT:IF TT<>RT THEN
     PRINT "ERROR IN LINE";LN:EN
    D
2A  55 :  AD=AD+16
BE  60 NEXT
FE  65 PRINT "SAVING 'ASSEMBLE'"

33  70 HI=INT(AD/256):LO=AD-HI*2
    56
1E  75 POKE 43,1:POKE 44,8:POKE
    45,LO:POKE 46,HI:SAVE"ASSEMB
    LE",8
CC  80 CLR
6F  85 :
60  90 :
61  100 DATA 12,8,10,0,158,32,50
    ,48,54,51,0,0,0,0,76,33, 532

85  110 DATA 22,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0, 22
2B  120 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
F1  130 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
FF  140 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
05  150 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
53  160 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
59  170 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
67  180 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
6D  190 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
3B  200 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
41  210 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
4F  220 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
95  230 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
A3  240 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
A9  250 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
76  260 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
7C  270 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
8A  280 DATA 0,0,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0, 0
03  290 DATA 0,0,0,0,0,46,69,88,
    69,44,80,44,87,46,65,83, 721

A2  300 DATA 77,64,48,58,13,197,
    78,84,69,82,32,198,73,76,69,
    78, 1296
70  310 DATA 65,77,69,32,40,46,6
    5,83,77,41,58,0,13,206,79,32
    , 983
C7  320 DATA 70,73,76,69,78,65,7
    7,69,32,71,73,86,69,78,59,32
    , 1077
E0  330 DATA 193,66,79,82,84,73,
    78,71,13,0,13,198,73,76,69,7
    8, 1246
8F  340 DATA 65,77,69,32,84,79,7
    9,32,76,79,78,71,59,32,208,7
    6, 1196
FF  350 DATA 69,65,83,69,32,212,
    82,89,32,65,71,65,73,78,13,0
    , 1098
F9  360 DATA 14,147,13,198,195,2
    04,32,193,83,83,69,77,66,76,
    69,82, 1601
88  370 DATA 46,13,214,69,82,83,
    73,79,78,32,49,46,49,47,56,5
    6, 1072
9F  380 DATA 13,211,84,69,86,69,
    32,195,65,82,82,73,69,32,49,
    57, 1268
91  390 DATA 56,56,13,0,13,13,19
    3,83,83,69,77,66,76,69,82,32
    , 981
33  400 DATA 208,65,83,83,32,0,3
    2,66,69,71,73,78,83,46,13,0,
    1002
30  410 DATA 13,193,83,83,69,77,
    66,76,89,32,67,79,77,80,76,6
    9, 1229
34  420 DATA 84,69,46,13,204,79,
    65,68,32,65,68,68,82,69,83,8
    3, 1178
C7  430 DATA 32,61,36,0,13,197,7
    8,68,32,65,68,68,82,69,83,83
    , 1035
92  440 DATA 32,32,61,36,0,66,82
    ,75,0,67,76,67,24,67,76,68,
    829
B7  450 DATA 216,67,76,73,88,67,
    76,86,184,68,69,88,202,68,69
    ,89, 1586
BA  460 DATA 136,73,78,88,232,73
    ,78,89,200,78,79,80,234,80,7
    2,65, 1735
6D  470 DATA 72,80,72,80,8,80,76
    ,65,104,80,76,80,40,82,84,73
    , 1152
30  480 DATA 64,82,84,83,96,83,6
    9,67,56,83,69,68,248,83,69,7
    3, 1377
25  490 DATA 120,84,65,88,170,84
    ,65,89,168,84,83,88,186,84,8
    8,65, 1611
A1  500 DATA 138,84,88,83,154,84
    ,89,65,152,66,67,67,144,66,6
    7,83, 1497
CB  510 DATA 176,66,69,81,240,66
    ,77,73,48,66,78,69,208,66,80
    ,76, 1539
E3  520 DATA 16,66,86,67,80,66,8
    6,83,112,65,68,67,0,65,78,68
    , 1073
68  530 DATA 11,65,83,76,22,66,7
    3,84,33,67,77,80,44,67,80,88
    , 1016
BB  540 DATA 55,67,80,89,66,68,6
    9,67,77,69,79,82,88,73,78,67
    , 1174
8B  550 DATA 99,74,77,80,110,74,
    83,82,121,76,68,65,132,76,68
    ,88, 1373
FF  560 DATA 143,76,68,89,154,76
    ,83,82,165,79,82,65,176,82,7
    9,76, 1575
29  570 DATA 187,82,79,82,198,83
    ,66,67,209,83,84,65,220,83,8
    4,88, 1760
EE  580 DATA 231,83,84,89,242,66
    ,89,84,0,87,79,82,1,69,81,90
    , 1457
E5  590 DATA 2,69,81,65,3,79,82,
    71,4,82,69,83,5,255,105,101,
    1156
6B  600 DATA 117,255,109,125,121
    ,97,113,255,255,41,37,53,255
    ,45,61,57, 1996
87  610 DATA 33,49,255,10,255,6,
    22,255,14,30,255,255,255,255
    ,255,255, 2459
32  620 DATA 36,255,255,44,255,2
    55,255,255,255,255,201,197,2
    13,255,205,221, 3412
6F  630 DATA 217,193,209,255,255
    ,224,228,255,255,236,255,255
    ,255,255,255,255, 3857
22  640 DATA 192,196,255,255,204
    ,255,255,255,255,255,255,255
    ,198,214,255,206, 3760
EA  650 DATA 222,255,255,255,255
    ,255,73,69,85,255,77,93,89,6
    5,81,255, 2639
D0  660 DATA 255,255,230,246,255
    ,238,254,255,255,255,255,255
    ,255,255,255,255, 4028
F2  670 DATA 76,255,255,255,255,
    108,255,255,255,255,255,32,2
    55,255,255,255, 3531
07  680 DATA 255,255,169,165,181
    ,255,173,189,185,161,177,255
    ,255,162,166,255, 3258
B0  690 DATA 182,174,255,190,255
    ,255,255,255,160,164,180,255
    ,172,188,255,255, 3450
18  700 DATA 255,255,74,255,70,8
    6,255,78,94,255,255,255,255,
    255,9,5, 2711
FB  710 DATA 21,255,13,29,25,1,1
    7,255,42,255,38,54,255,46,62
    ,255, 1623
CB  720 DATA 255,255,255,106,255
    ,102,118,255,110,126,255,255
    ,255,255,255,233, 3345
11  730 DATA 229,245,255,237,253
    ,249,225,241,255,255,255,133
```

```
    ,149,255,141,157, 3534
47  740 DATA 153,129,145,255,255
    ,255,134,255,150,142,255,255
    ,255,255,255,255, 3403
AC  750 DATA 255,132,148,255,140
    ,255,255,255,255,255,255,255
    ,255,13,193,83, 3259
DE  760 DATA 83,69,77,66,76,89,3
    2,70,65,73,76,83,32,79,78,32
    , 1080
72  770 DATA 84,72,73,83,32,76,7
    3,78,69,0,213,78,68,69,70,73
    , 1211
BB  780 DATA 78,69,68,32,211,89,
    77,66,79,76,32,197,82,82,79,
    82, 1399
C0  790 DATA 0,210,69,68,69,70,7
    3,78,69,68,32,211,89,77,66,7
    9, 1328
CD  800 DATA 76,32,197,82,82,79,
    82,0,205,78,69,77,79,78,73,6
    7, 1356
9F  810 DATA 32,78,79,84,32,82,6
    9,67,79,71,78,73,83,69,68,0,
    1044
27  820 DATA 194,65,68,32,211,89
    ,77,66,79,76,32,69,82,82,79,
    82, 1383
7F  830 DATA 0,201,76,76,69,71,6
    5,76,32,207,80,69,82,65,78,6
    8, 1315
72  840 DATA 32,198,73,69,76,68,
    0,201,76,76,69,71,65,76,32,2
    05, 1387
F6  850 DATA 78,69,77,79,78,73,6
    7,32,198,73,69,76,68,0,205,7
    3, 1315
2C  860 DATA 83,83,73,78,71,32,2
    07,80,69,82,65,78,68,32,197,
    82, 1380
34  870 DATA 82,79,82,46,0,196,7
    3,83,75,32,198,73,76,69,32,1
    97, 1393
D6  880 DATA 82,82,79,82,46,0,21
    1,89,78,84,65,88,32,69,82,82
    , 1251
56  890 DATA 79,82,46,0,201,76,7
    6,69,71,65,76,32,209,85,65,7
    8, 1310
17  900 DATA 84,73,84,89,32,197,
    82,82,79,82,0,201,76,76,69,7
    1, 1377
EB  910 DATA 65,76,32,193,68,68,
    82,69,83,83,73,78,71,32,77,7
    9, 1229
D7  920 DATA 68,69,46,0,206,79,8
    4,32,216,32,79,82,32,217,32,
    73, 1347
6D  930 DATA 78,68,69,88,46,0,21
    1,89,77,66,79,76,32,84,65,66
    , 1194
24  940 DATA 76,69,32,70,85,76,7
    6,46,0,194,82,65,78,67,72,32
    , 1120
FD  950 DATA 210,65,78,71,69,32,
    69,82,82,79,82,46,0,30,12,59
    , 1066
8A  960 DATA 12,82,12,105,12,129
    ,12,146,12,168,12,191,12,214
    ,12,231, 1362
4E  970 DATA 12,245,12,12,13,37,
    13,55,13,74,13,169,38,162,10
    ,133, 1011
7F  980 DATA 20,134,21,162,0,160
    ,2,185,231,8,209,20,208,9,13
    6,16, 1521
56  990 DATA 246,160,3,177,20,24
    ,96,232,224,62,176,250,165,2
    0,105,4, 1964
96  1000 DATA 133,20,165,21,105,
    0,133,21,24,144,218,173,230,
    8,201,3, 1599
5A  1010 DATA 240,5,162,3,76,190
    ,13,32,124,13,176,246,96,138
    ,10,72, 1596
93  1020 DATA 173,23,8,201,1,208
    ,8,32,78,14,169,13,32,210,25
    5,104, 1529
D9  1030 DATA 170,142,19,8,189,9
    5,13,168,189,94,13,170,32,25
    5,13,173, 1743
01  1040 DATA 19,8,240,5,169,0,7
    6,209,13,169,2,32,195,255,16
    9,3, 1564
E7  1050 DATA 32,195,255,174,18,
    8,232,232,154,162,128,108,0,
    3,134,20, 1855
A4  1060 DATA 132,21,160,0,177,2
    0,240,6,32,210,255,200,208,2
    46,96,201, 2204
DF  1070 DATA 65,144,6,201,91,17
    6,2,56,96,24,96,201,48,144,2
    50,201, 1801
7E  1080 DATA 58,176,246,144,242
    ,32,16,14,176,237,76,28,14,3
    2,28,14, 1533
68  1090 DATA 176,229,201,65,144
    ,227,201,71,176,223,144,219,
    134,20,132,21, 2383
B2  1100 DATA 160,0,177,20,32,21
    0,255,200,201,13,208,246,96,
    162,88,160, 2178
A4  1110 DATA 8,76,61,14,201,10,
    176,3,9,48,96,105,54,96,72,7
    4, 1103
2E  1120 DATA 74,74,74,32,85,14,
    32,210,255,104,41,15,32,85,1
    4,76, 1217
3D  1130 DATA 210,255,165,72,32,
    95,14,165,71,76,95,14,32,115
    ,14,169, 1594
92  1140 DATA 32,32,210,255,76,7
    8,14,169,38,162,8,133,20,134
    ,21,162, 1544
B6  1150 DATA 2,32,198,255,32,22
    8,255,141,34,8,32,228,255,14
    1,35,8, 1884
5A  1160 DATA 208,10,173,34,8,20
    8,5,32,204,255,56,96,32,228,
    255,141, 1945
98  1170 DATA 36,8,32,228,255,14
    1,37,8,32,228,255,201,0,240,
    13,160, 1874
F9  1180 DATA 0,145,20,230,20,20
    8,241,230,21,76,185,14,169,1
    3,145,20, 1737
2D  1190 DATA 24,96,173,24,8,240
    ,1,96,162,9,76,190,13,169,0,
    133, 1414
F0  1200 DATA 71,133,72,165,45,1
    66,46,133,69,134,70,160,0,15
    2,145,69, 1630
AC  1210 DATA 162,161,160,9,32,2
    55,13,96,169,0,141,230,8,160
    ,0,32, 1628
6A  1220 DATA 207,255,201,13,240
    ,6,153,231,8,200,208,243,140
    ,230,8,96, 2439
27  1230 DATA 162,69,160,9,32,25
    5,13,32,249,14,173,230,8,208
    ,10,162, 1786
01  1240 DATA 93,160,9,32,255,13
    ,76,234,13,201,13,144,10,162
    ,123,160, 1698
6C  1250 DATA 9,32,255,13,76,17,
    15,160,0,185,66,9,153,198,8,
    200, 1396
F7  1260 DATA 192,3,208,245,162,
    0,189,231,8,157,166,8,153,19
    8,8,232, 2160
12  1270 DATA 200,236,230,8,208,
    240,162,0,189,54,9,153,198,8
    ,232,200, 2327
B1  1280 DATA 224,8,208,244,140,
    33,8,174,230,8,160,0,185,62,
    9,157, 1850
B5  1290 DATA 166,8,200,232,192,
    4,208,244,142,32,8,96,169,2,
    168,162, 2033
61  1300 DATA 8,32,186,255,173,3
    2,8,162,166,160,8,32,189,255
    ,32,192, 1890
C0  1310 DATA 255,176,83,162,2,3
    2,198,255,176,76,32,228,255,
    32,183,255, 2400
1B  1320 DATA 208,68,32,228,255,
    32,183,255,208,60,32,204,255
    ,96,169,3, 2288
43  1330 DATA 168,162,8,32,186,2
    55,173,33,8,162,198,160,8,32
    ,189,255, 2029
B0  1340 DATA 32,192,255,176,33,
    162,3,32,201,255,176,26,173,
    30,8,32, 1786
41  1350 DATA 210,255,32,183,255
    ,208,15,173,31,8,32,210,255,
    32,183,255, 2337
1B  1360 DATA 208,4,32,204,255,9
    6,32,204,255,169,16,76,209,1
    3,173,23, 1969
68  1370 DATA 8,9,48,141,230,9,1
    62,213,160,9,76,255,13,230,2
    51,208, 2022
CB  1380 DATA 2,230,252,140,19,8
    ,160,0,177,251,172,19,8,96,1
    98,251, 1983
C8  1390 DATA 165,251,201,255,20
    8,2,198,252,96,32,15,16,169,
    0,170,141, 2171
1C  1400 DATA 230,8,32,254,15,32
    ,38,14,176,4,142,230,8,96,15
    7,231, 1667
89  1410 DATA 8,232,208,238,32,2
    54,15,32,4,16,201,32,240,246
    ,96,165, 2019
95  1420 DATA 45,166,46,133,5,13
    4,6,160,0,177,5,208,2,24,96,
    205, 1412
54  1430 DATA 230,8,208,40,162,0
    ,200,200,200,200,177,5,221,2
    31,8,208, 2298
9D  1440 DATA 27,232,236,230,8,1
    44,242,160,1,177,5,141,22,8,
    200,177, 2010
4E  1450 DATA 5,141,20,8,200,177
    ,5,141,21,8,56,96,160,0,177,
    5, 1220
26  1460 DATA 24,105,4,101,5,133
    ,5,144,2,230,6,76,72,16,32,2
    54, 1209
D4  1470 DATA 15,32,26,16,173,23
    0,8,208,5,162,4,76,190,13,32
    ,64, 1254
AC  1480 DATA 16,144,12,162,2,17
    3,23,8,201,1,208,5,76,190,13
    ,162, 1396
5D  1490 DATA 0,169,1,141,24,8,2
    24,0,240,1,96,160,0,173,230,
    8, 1475
8C  1500 DATA 145,69,200,169,2,1
    45,69,200,165,71,145,69,200,
    165,72,145, 2031
30  1510 DATA 69,200,162,0,189,2
    31,8,145,69,232,200,236,230,
    8,208,244, 2431
D3  1520 DATA 152,24,101,69,133,
    69,165,70,105,0,133,70,201,1
    60,208,5, 1665
EB  1530 DATA 162,13,76,190,13,1
    60,0,152,145,69,96,169,0,133
    ,3,133, 1514
2B  1540 DATA 4,32,254,15,32,46,
    14,176,1,96,201,65,176,4,41,
    15, 1172
82  1550 DATA 144,2,233,55,24,6,
    3,38,4,176,25,6,3,38,4,176,
    937
F4  1560 DATA 19,6,3,38,4,176,13
    ,6,3,38,4,176,7,5,3,133, 634
C4  1570 DATA 3,76,2,17,162,10,7
    6,190,13,169,0,133,3,133,4,3
    2, 1023
D4  1580 DATA 15,16,32,254,15,32
    ,28,14,176,1,96,41,15,72,165
```

```
,4, 976
FB 1590 DATA 72,165,3,72,6,3,38
,4,176,218,6,3,38,4,176,212,
1196
6D 1600 DATA 24,104,101,3,133,3
,104,105,0,133,4,176,199,6,3
,38, 1136
21 1610 DATA 4,176,193,104,24,1
01,3,133,3,165,4,105,0,133,4
,176, 1328
A0 1620 DATA 179,144,191,32,254
,15,133,3,169,0,133,4,32,254
,15,201, 1759
66 1630 DATA 39,240,5,162,8,76,
190,13,76,254,15,76,179,17,1
73,25, 1548
A7 1640 DATA 8,240,36,201,60,24
0,4,165,4,133,3,169,0,133,4,
76, 1476
72 1650 DATA 200,17,32,4,16,201
,13,240,229,201,40,240,225,2
01,41,240, 2140
DE 1660 DATA 221,201,44,240,217
,208,15,169,1,141,27,8,165,4
,240,5, 1906
51 1670 DATA 169,2,141,27,8,96,
201,43,240,4,201,45,208,72,1
73,26, 1656
14 1680 DATA 8,240,5,162,9,76,1
90,13,238,26,8,165,4,72,165,
3, 1384
12 1690 DATA 72,32,4,16,72,32,2
54,15,32,156,17,104,201,43,2
40,24, 1314
B0 1700 DATA 166,3,164,4,104,13
3,3,104,133,4,56,138,229,3,1
33,3, 1380
E3 1710 DATA 152,229,4,133,4,76
,156,17,24,104,101,3,133,3,1
04,101, 1344
75 1720 DATA 4,133,4,76,156,17,
162,0,142,26,8,201,60,240,4,
201, 1434
0A 1730 DATA 62,208,6,141,25,8,
32,254,15,201,39,208,6,32,13
2,17, 1386
C9 1740 DATA 76,156,17,32,16,14
,144,54,32,26,16,32,64,16,17
6,25, 896
C6 1750 DATA 169,1,141,28,8,173
,23,8,201,2,208,5,162,1,76,1
90, 1396
BA 1760 DATA 13,169,2,141,27,8,
76,156,17,169,0,173,20,8,133
,3, 1115
4A 1770 DATA 173,21,8,133,4,173
,22,8,141,27,8,76,156,17,201
,36, 1204
55 1780 DATA 240,4,201,38,208,6
,32,252,16,76,156,17,32,28,1
4,144, 1464
EA 1790 DATA 6,32,58,17,76,156,
17,162,5,76,190,13,173,27,8,
24, 1040
A4 1800 DATA 105,1,24,101,71,13
3,71,169,0,101,72,133,72,173
,23,8, 1257
03 1810 DATA 201,2,240,1,96,162
,3,32,201,255,173,29,8,32,21
0,255, 1900
7B 1820 DATA 32,183,255,240,3,7
6,231,15,172,27,8,240,29,165
,3,32, 1711
F0 1830 DATA 210,255,32,183,255
,240,3,76,231,15,136,240,13,
165,4,32, 2090
24 1840 DATA 210,255,32,183,255
,240,3,76,231,15,76,204,255,
141,29,8, 2213
60 1850 DATA 169,0,141,27,8,76,
157,18,141,29,8,32,156,17,17
3,23, 1175
D6 1860 DATA 8,201,1,240,58,173
,27,8,201,1,240,51,165,71,24
,105, 1574
6B 1870 DATA 2,170,165,72,105,0
,168,165,3,134,3,166,4,132,4
,56, 1349
5F 1880 DATA 229,3,133,3,138,22
9,4,133,4,201,255,240,12,201
,0,208, 1993
4A 1890 DATA 22,165,3,201,127,1
76,16,144,6,165,3,201,128,14
4,8,169, 1678
DB 1900 DATA 1,141,27,8,76,157,
18,162,14,76,190,13,141,29,8
,24, 1085
FE 1910 DATA 105,30,133,253,169
,11,105,0,133,254,32,4,16,20
1,65,208, 1719
D7 1920 DATA 24,160,1,177,251,2
01,13,240,4,201,32,208,12,32
,254,15, 1825
A2 1930 DATA 169,0,141,27,8,168
,76,105,20,32,4,16,201,35,20
8,33, 1243
55 1940 DATA 32,254,15,32,156,1
7,173,28,8,240,5,169,1,141,2
7,8, 1306
3C 1950 DATA 173,27,8,201,1,240
,5,162,10,76,190,13,160,1,76
,105, 1448
23 1960 DATA 20,201,40,240,81,3
2,156,17,173,28,8,240,5,169,
2,141, 1553
09 1970 DATA 27,8,173,27,8,201,
1,208,2,160,2,201,2,208,2,16
0, 1390
A5 1980 DATA 5,173,29,8,201,110
,240,4,201,121,208,2,160,5,1
92,5, 1664
47 1990 DATA 208,5,169,2,141,27
,8,32,4,16,201,44,240,3,76,1
05, 1281
4F 2000 DATA 20,32,254,15,201,8
8,240,10,201,89,240,5,162,12
,76,190, 1835
FD 2010 DATA 13,200,200,76,105,
20,32,254,15,32,156,17,32,4,
16,201, 1373
8F 2020 DATA 41,240,53,173,28,8
,240,5,169,1,141,27,8,173,27
,8, 1342
1D 2030 DATA 201,1,240,5,162,10
,76,190,13,32,4,16,201,44,24
0,5, 1440
E4 2040 DATA 162,9,76,190,13,32
,254,15,201,88,208,244,32,25
4,15,201, 1994
DF 2050 DATA 41,208,237,160,8,7
6,105,20,32,254,15,201,44,24
0,10,169, 1820
78 2060 DATA 2,141,27,8,160,10,
76,105,20,173,28,8,240,5,169
,1, 1173
34 2070 DATA 141,27,8,173,27,8,
201,1,240,5,162,10,76,190,13
,32, 1314
96 2080 DATA 254,15,201,89,208,
186,160,9,177,253,201,255,24
0,6,141,29, 2424
93 2090 DATA 8,76,157,18,162,11
,76,190,13,224,56,144,3,76,2
46,20, 1480
FA 2100 DATA 224,33,144,3,76,77
,19,224,25,144,3,76,249,18,7
6,238, 1629
10 2110 DATA 18,169,0,133,71,13
3,72,32,239,15,32,136,14,8,1
69,38, 1279
74 2120 DATA 162,8,133,251,134,
252,32,15,16,40,144,1,96,173
,23,8, 1488
79 2130 DATA 201,2,208,3,32,125
,14,169,0,141,24,8,141,25,8,
141, 1242
80 2140 DATA 26,8,141,28,8,32,5
3,16,201,59,240,206,201,46,2
08,6, 1479
9A 2150 DATA 32,143,16,32,56,16
,201,13,240,192,32,16,14,176
,5,162, 1346
1D 2160 DATA 6,76,190,13,32,26,
16,32,172,13,72,32,56,16,104
,32, 888
16 2170 DATA 122,20,76,155,20,2
24,56,208,3,76,106,21,224,57
,208,3, 1579
0E 2180 DATA 76,181,21,224,58,2
08,3,76,220,21,224,59,208,3,
76,8, 1666
A9 2190 DATA 22,224,60,208,3,76
,82,21,32,56,16,32,156,17,16
5,3, 1173
63 2200 DATA 24,101,71,133,71,1
65,4,101,72,133,72,173,23,8,
201,2, 1354
C2 2210 DATA 240,1,96,162,3,32,
201,255,169,0,166,3,164,4,20
2,224, 1922
3E 2220 DATA 255,208,8,136,192,
255,208,3,76,204,255,32,210,
255,76,63, 2436
4B 2230 DATA 21,32,56,16,32,156
,17,165,3,166,4,133,71,134,7
2,141, 1219
D1 2240 DATA 30,8,142,31,8,96,3
2,53,16,32,56,16,201,39,240,
38, 1038
0F 2250 DATA 32,156,17,165,4,24
0,5,162,10,76,190,13,32,111,
22,230, 1465
E7 2260 DATA 71,208,2,230,72,32
,56,16,201,44,240,218,201,13
,208,1, 1813
5F 2270 DATA 96,162,9,76,190,13
,32,254,15,201,39,240,14,133
,3,32, 1509
8C 2280 DATA 111,22,230,71,208,
2,230,72,76,151,21,32,254,15
,76,134, 1705
40 2290 DATA 21,32,53,16,32,56,
16,32,156,17,32,119,22,165,7
1,24, 864
0F 2300 DATA 105,2,133,71,165,7
2,105,0,133,72,32,56,16,201,
44,240, 1447
D8 2310 DATA 224,201,13,208,1,9
6,162,9,76,190,13,32,211,14,
165,6, 1621
2C 2320 DATA 72,165,5,72,32,156
,17,104,133,5,104,133,6,165,
4,240, 1413
1B 2330 DATA 5,162,10,76,190,13
,160,1,169,1,145,5,200,165,3
,145, 1450
22 2340 DATA 5,200,165,4,145,5,
96,32,211,14,165,5,72,165,6,
72, 1362
61 2350 DATA 32,156,17,104,133,
6,104,133,5,160,1,169,2,76,2
51,21, 1370
60 2360 DATA 186,142,18,8,32,22
2,14,32,17,15,169,1,141,23,8
,32, 1060
05 2370 DATA 125,15,32,146,20,1
69,2,32,195,255,238,23,8,32,
125,15, 1432
B2 2380 DATA 32,175,15,32,146,2
0,32,77,22,76,234,13,162,241
,160,9, 1446
F8 2390 DATA 32,255,13,173,31,8
,32,95,14,173,30,8,32,95,14,
162, 1167
A1 2400 DATA 21,160,10,32,255,1
3,32,115,14,169,13,76,210,25
5,169,1, 1545
8A 2410 DATA 141,27,8,76,124,22
,169,2,141,27,8,173,23,8,201
,2, 1152
2B 2420 DATA 240,1,96,162,3,32,
201,255,172,27,8,165,3,32,21
0,255, 1862
AA 2430 DATA 136,240,5,165,4,32
,210,255,76,204,255,0,0,0,0,
0, 1582
```

MAY I INTERRUPT

```
PROGRAM: MAY I INTERRUPT

DB  10 BL=209  :LN=50  :SA=49152
C0  20 FOR L=0 TO BL:CX=0:FOR D=0 TO 15:READ A:CX=CX+A
82  25 POKE53280,A:POKE SA+L*16+D,A:NEXT D
A5  30 READ A:IF A><CX THENPRINT "ERROR IN LINE";LN+(L*10):STOP
1D  40 NEXT L:SYS52480
B4  50 DATA 0,0,0,0,0,21,21,21,21,21,21,21,23,23,23,237
D6  60 DATA 23,23,23,23,23,23,25,25,25,25,25,25,25,19,19,19,372
40  70 DATA 19,19,19,19,19,21,21,21,21,21,21,21,23,23,23,332
9A  80 DATA 23,23,23,23,23,25,25,25,25,25,25,25,19,19,19,372
DD  90 DATA 19,19,19,19,100,100,84,84,100,100,100,100,94,94,94,1145
CB  100 DATA 94,79,79,79,79,84,84,84,84,75,75,75,75,75,75,1271
E3  110 DATA 75,71,71,71,71,71,71,71,71,67,67,67,67,67,67,1112
07  120 DATA 67,63,63,84,84,67,67,84,84,63,63,63,63,63,63,1104
5F  130 DATA 63,63,63,63,63,50,50,0,42,42,50,50,50,50,47,47,840
99  140 DATA 47,67,67,67,67,63,63,63,63,100,100,100,100,100,100,1267
E9  150 DATA 100,94,94,94,94,94,94,94,94,84,84,84,84,84,84,1440
77  160 DATA 84,79,79,94,94,84,84,94,94,79,79,79,79,79,79,1339
8A  170 DATA 79,79,79,79,79,100,100,84,84,100,100,100,100,94,94,94,1445
5B  180 DATA 94,79,79,79,79,84,84,84,84,75,75,75,75,75,75,1271
33  190 DATA 75,71,71,71,71,71,71,71,71,67,67,67,67,67,67,1112
D7  200 DATA 67,63,63,84,84,67,67,84,84,63,63,63,63,63,63,1104
7B  210 DATA 63,63,63,63,63,42,42,35,35,42,42,42,42,39,39,39,754
3E  220 DATA 39,39,39,39,39,37,37,31,31,37,37,37,37,35,35,35,584
5E  230 DATA 35,35,35,35,35,33,33,28,28,33,33,33,33,31,31,31,522
F1  240 DATA 31,31,31,31,31,31,31,9,47,63,84,84,84,84,84,84,84,923
3B  250 DATA 84,84,84,84,84,84,0,0,0,0,0,0,0,0,0,0,0,420
03  260 DATA 0,0,0,0,0,0,31,31,31,31,31,31,31,181,181,181,791
J9  270 DATA 181,181,181,181,181,30,30,30,30,30,30,30,30,239,239,239,1862
32  280 DATA 239,239,239,239,239,31,31,31,31,31,31,31,31,181,181,181,1986
9S  290 DATA 181,181,181,181,181,30,30,30,30,30,30,30,30,239,239,239,1862
59  300 DATA 239,239,239,239,239,121,121,125,125,121,121,121,121,215,215,215,2816
D3  310 DATA 215,191,191,191,191,125,125,125,125,69,69,69,69,69,69,69,1962
BA  320 DATA 69,12,12,12,12,12,12,12,12,15,15,15,15,15,15,15,270
33  330 DATA 15,75,75,125,125,15,15,125,125,75,75,75,75,75,75,75,1220
DE  340 DATA 75,75,75,75,75,60,60,62,62,60,60,60,60,107,107,107,1180
FD  350 DATA 107,15,15,15,15,75,75,75,75,121,121,121,121,121,121,121,1314
60  360 DATA 121,215,215,215,215,215,215,215,125,125,125,125,125,125,2716
61  370 DATA 125,191,191,215,215,125,125,215,215,191,191,191,191,191,191,2954
91  380 DATA 191,191,191,191,191,121,121,125,125,121,121,121,121,215,215,215,2576
83  390 DATA 215,191,191,191,191,125,125,125,125,69,69,69,69,69,69,69,1962
4A  400 DATA 69,12,12,12,12,12,12,12,12,15,15,15,15,15,15,15,270
43  410 DATA 15,75,75,125,125,15,15,125,125,75,75,75,75,75,75,75,1220
62  420 DATA 75,75,75,75,75,62,62,134,134,62,62,62,62,223,223,223,1684
0B  430 DATA 223,223,223,223,223,162,162,165,165,162,162,162,162,134,134,134,2819
0A  440 DATA 134,134,134,134,134,134,135,135,49,49,135,135,135,135,135,165,165,165,2073
52  450 DATA 165,165,165,165,165,165,165,223,107,75,125,125,125,125,125,125,125,125,2270
49  460 DATA 125,125,125,125,125,125,0,0,0,0,0,0,0,0,0,0,0,625
63  470 DATA 0,0,0,0,0,0,17,17,17,16,0,0,0,0,17,17,17,118
BB  480 DATA 16,0,0,0,0,0,17,17,17,16,0,0,0,0,17,17,17,134
16  490 DATA 16,0,0,0,0,0,17,17,17,16,0,0,0,0,17,17,17,134
B4  500 DATA 16,0,0,0,0,0,17,17,17,16,0,0,0,0,17,17,17,134
16  510 DATA 16,0,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,200
C9  520 DATA 16,17,17,17,16,17,17,17,16,17,16,17,16,17,16,17,17,17,267
7B  530 DATA 16,17,16,17,16,17,17,17,16,17,16,17,16,17,16,17,17,17,266
73  540 DATA 16,17,16,17,16,17,16,17,16,17,17,17,16,0,0,0,215
A9  550 DATA 0,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,184
B1  560 DATA 16,17,17,17,16,17,17,17,16,17,16,17,16,17,17,17,267
B3  570 DATA 16,17,16,17,16,17,17,17,16,17,16,17,16,17,17,17,266
D8  580 DATA 16,17,16,17,16,17,16,17,16,17,17,17,16,0,0,0,215
21  590 DATA 0,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,184
S9  600 DATA 16,17,17,17,16,17,17,17,16,17,16,17,16,17,17,17,267
0B  610 DATA 16,17,16,17,16,17,17,17,16,17,16,17,16,17,16,17,17,17,266
43  620 DATA 16,17,16,17,16,17,16,17,16,17,17,17,16,0,0,0,215
D9  630 DATA 0,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,184
97  640 DATA 16,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,200
C9  650 DATA 16,0,0,0,0,17,16,17,16,17,17,17,16,17,17,17,200
SB  660 DATA 16,0,0,0,0,17,17,17,17,17,17,17,17,17,17,17,203
9F  670 DATA 16,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,15
39  680 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
S9  690 DATA 84,10,10,10,10,12,12,12,12,10,10,10,10,14,14,14,254
D7  700 DATA 14,10,10,10,10,14,14,14,14,10,10,10,10,14,14,14,192
06  710 DATA 14,10,10,10,10,12,12,12,12,10,10,10,10,14,14,14,184
CB  720 DATA 14,10,10,10,10,14,14,14,14,10,10,10,10,14,14,14,192
31  730 DATA 14,10,10,10,10,15,15,15,15,10,10,10,10,16,16,16,202
S2  740 DATA 16,10,10,10,10,17,17,17,17,10,10,10,10,18,18,18,218
S1  750 DATA 18,10,10,10,10,21,21,21,21,10,10,10,10,23,23,23,251
1F  760 DATA 23,21,21,21,21,21,21,21,21,21,21,21,21,10,9,8,302
0S  770 DATA 7,7,7,7,7,16,16,16,16,7,7,7,7,16,16,16,175
83  780 DATA 16,6,6,6,6,15,15,15,15,5,5,5,5,14,14,14,162
S3  790 DATA 14,11,11,11,11,15,15,15,15,11,11,11,11,17,17,17,213
B4  800 DATA 17,7,7,7,7,8,8,8,8,7,7,7,7,7,6,125
91  810 DATA 5,5,5,5,5,15,15,15,15,10,10,10,10,16,16,16,173
9D  820 DATA 16,10,10,10,10,17,17,17,17,10,10,10,10,18,18,18,218
S4  830 DATA 18,10,10,10,10,21,21,21,21,10,10,10,10,23,23,23,251
67  840 DATA 23,21,21,21,21,21,21,21,21,21,21,21,21,25,23,21,344
6B  850 DATA 18,17,17,17,17,11,11,11,11,11,11,11,11,23,21,19,237
AC  860 DATA 17,15,15,15,15,10,10,10,10,10,10,10,10,21,18,17,213
5E  870 DATA 15,14,14,14,14,9,9,9,9,9,9,9,9,18,16,15,192
J6  880 DATA 14,12,12,12,12,11,11,11,11,21,21,21,21,21,21,21,253
E3  890 DATA 21,21,21,21,21,0,0,0,0,0,0,0,0,0,0,105
JE  900 DATA 125,143,143,143,143,143,143,143,143,143,143,143,143
```

```
,143,24,24,24,1913
0E 910 DATA 24,143,143,143,143,
239,239,239,239,143,143,143,
143,24,24,24,2196
9A 920 DATA 24,143,143,143,143,
143,143,143,143,143,143,143,
143,24,24,24,1812
A2 930 DATA 24,143,143,143,143,
239,239,239,239,143,143,143,
143,24,24,24,2196
3A 940 DATA 24,143,143,143,143,
210,210,210,210,143,143,143,
143,195,195,195,2593
45 950 DATA 195,143,143,143,143
,195,195,195,195,143,143,143
,143,209,209,209,2746
13 960 DATA 209,143,143,143,143
,31,31,31,31,143,143,143,143
,181,181,181,2020
C1 970 DATA 181,31,31,31,31,31,
31,31,31,31,31,31,31,143,104
,97,897
52 980 DATA 233,119,119,119,119
,195,195,195,195,12,12,12,12
,195,195,195,2122
BE 990 DATA 195,71,71,71,71,210
,210,210,210,237,237,237,237
,239,239,239,2984
76 1000 DATA 239,218,218,218,21
8,210,210,210,210,218,218,21
8,218,195,195,195,3408
F2 1010 DATA 195,233,233,233,23
3,97,97,97,97,233,233,233,23
3,233,12,71,2763
8F 1020 DATA 237,71,71,71,71,21
0,210,210,210,143,143,143,14
3,195,195,195,2518
02 1030 DATA 195,143,143,143,14
3,195,195,195,195,143,143,14
3,143,209,209,209,2746
AC 1040 DATA 209,143,143,143,14
3,31,31,31,31,143,143,143,14
3,181,181,181,2020
9B 1050 DATA 181,31,31,31,31,31
,31,31,31,31,31,31,30,181
,31,795
40 1060 DATA 209,195,195,195,19
5,218,218,218,218,218,218,21
8,218,181,31,239,3184
EB 1070 DATA 195,210,210,210,21
0,143,143,143,143,143,143,14
3,143,31,209,195,2614
B6 1080 DATA 210,24,24,24,24,10
4,104,104,104,104,104,104,10
4,209,195,210,1752
E3 1090 DATA 24,143,143,143,143
,218,218,218,218,31,31,31,31
,31,31,1685
FC 1100 DATA 31,31,31,31,31,0,0
,0,0,0,0,0,0,0,0,155
B7 1110 DATA 0,17,17,17,16,17,1
7,17,16,17,17,17,16,17,17,17
,252
5F 1120 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
09 1130 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
43 1140 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
9D 1150 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
17 1160 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
C1 1170 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
31 1180 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,65,65,6
5,412
37 1190 DATA 65,65,65,65,64,17,
17,17,16,17,17,17,16,17,17,1
7,509
EF 1200 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
59 1210 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
79 1220 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,65,65,6
5,412
0F 1230 DATA 65,65,65,65,64,17,
17,17,16,17,17,17,16,17,17,1
7,509
67 1240 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
91 1250 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,17,17,1
7,268
01 1260 DATA 16,17,17,17,16,17,
17,17,16,17,17,17,16,65,65,6
5,412
56 1270 DATA 65,65,65,65,64,17,
17,17,17,17,17,17,16,65,65,6
5,654
37 1280 DATA 65,65,65,65,64,17,
17,17,17,17,17,17,16,65,65,6
5,654
F9 1290 DATA 65,65,65,65,64,17,
17,17,17,17,17,17,16,65,65,6
5,654
35 1300 DATA 65,65,65,65,64,17,
17,17,16,17,17,17,17,17,17,1
7,510
1E 1310 DATA 16,0,0,0,0,0,0,0,0
,0,0,0,0,0,0,16
BE 1320 DATA 0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0
C2 1330 DATA 21,21,21,21,21,15,
15,15,15,15,15,15,16,16,16,1
6,273
F2 1340 DATA 16,16,16,16,16,17,
17,17,17,17,17,17,16,16,16,1
6,264
7E 1350 DATA 18,16,16,16,16,15,
15,15,15,15,15,15,16,16,16,1
6,248
4E 1360 DATA 16,16,16,16,16,17,
17,17,17,17,17,17,16,16,16,1
6,264
C1 1370 DATA 16,16,16,16,16,12,
12,12,12,12,12,12,14,14,14,1
4,218
0C 1380 DATA 14,14,14,14,14,14,
14,14,14,14,14,14,15,15,15,1
5,227
C3 1390 DATA 15,15,15,15,15,17,
17,17,17,17,17,17,39,39,39,3
9,328
BF 1400 DATA 39,25,25,25,25,28,
28,28,28,25,25,25,25,25,25,2
5,426
75 1410 DATA 25,25,25,25,25,10,
10,10,10,10,10,10,10,9,9,9,2
32
1B 1420 DATA 9,47,47,47,47,42,4
2,42,59,59,59,59,59,59,59,59
,778
F6 1430 DATA 59,53,53,53,53,53,
53,53,53,47,47,47,47,47,47,4
7,812
CF 1440 DATA 47,15,15,15,15,14,
14,14,14,11,11,11,11,11,11,1
1,240
DC 1450 DATA 11,11,11,11,11,12,
12,12,12,12,12,12,12,14,14,1
4,193
9C 1460 DATA 14,14,14,14,14,14,
14,14,14,14,14,14,14,15,15,1
5,227
D3 1470 DATA 15,15,15,15,15,17,
17,17,17,17,17,17,39,39,39,3
9,328
0F 1480 DATA 39,25,25,25,25,28,
28,28,28,25,25,25,25,25,25,2
5,426
66 1490 DATA 25,25,25,25,25,29,
29,23,23,29,29,29,29,28,28,2
8,429
F3 1500 DATA 28,28,28,28,28,26,
26,21,21,26,26,26,26,25,25,2
5,413
0C 1510 DATA 25,25,25,25,25,23,
23,18,18,23,23,23,23,25,25,2
5,374
01 1520 DATA 25,25,25,25,25,14,
14,14,14,5,5,5,5,5,5,5,216
D0 1530 DATA 5,5,5,5,5,0,0,0,0,
0,0,0,0,0,0,25
4E 1540 DATA 31,31,31,31,31,210
,210,210,210,210,210,210,210
,195,195,195,2420
67 1550 DATA 195,195,195,195,19
5,195,195,195,195,195,195,19
5,195,195,195,3120
D4 1560 DATA 195,195,195,195,19
5,210,210,210,210,210,210,21
0,210,195,195,195,3240
7B 1570 DATA 195,195,195,195,19
5,195,195,195,195,195,195,19
5,195,195,195,3120
A7 1580 DATA 195,195,195,195,19
5,143,143,143,143,143,143,14
3,143,24,24,24,2191
C6 1590 DATA 24,24,24,24,24,239
,239,239,239,239,239,239,239
,210,210,210,2662
02 1600 DATA 210,210,210,210,21
0,195,195,195,195,195,195,19
5,195,223,223,223,3279
29 1610 DATA 223,30,30,30,30,49
,49,49,49,30,30,30,30,30,30,
30,749
E3 1620 DATA 30,30,30,30,30,143
,143,143,143,143,143,143,143
,247,247,247,2035
EB 1630 DATA 247,107,107,107,10
7,62,62,62,62,190,190,190,19
0,190,190,190,2253
31 1640 DATA 190,57,57,57,57,57
,57,57,57,107,107,107,107,10
7,107,107,1395
A0 1650 DATA 107,210,210,210,21
0,239,239,239,239,218,218,21
8,218,218,218,218,3429
39 1660 DATA 218,218,218,218,21
8,143,143,143,143,143,143,14
3,143,24,24,24,2306
56 1670 DATA 24,24,24,24,24,239
,239,239,239,239,239,239,239
,210,210,210,2662
52 1680 DATA 210,210,210,210,21
0,195,195,195,195,195,195,19
5,195,223,223,223,3279
39 1690 DATA 223,30,30,30,30,49
,49,49,49,30,30,30,30,30,30,
30,749
59 1700 DATA 30,30,30,30,30,223
,223,181,181,223,223,223,223
,49,49,49,1997
17 1710 DATA 49,49,49,49,49,156
,156,31,31,156,156,156,156,3
0,30,30,1333
31 1720 DATA 30,30,30,30,30,181
,181,209,209,181,181,181,181
,30,30,30,1744
7B 1730 DATA 30,30,30,30,30,24,
24,24,24,71,71,71,71,71,71,7
1,743
EC 1740 DATA 71,71,71,71,71,0,0
,0,0,0,0,0,0,0,0,0,355
3B 1750 DATA 0,0,0,0,0,0,17,17,17
,16,0,0,0,0,0,17,17,17,118
E5 1760 DATA 16,0,0,0,0,0,17,17,1
7,16,0,0,0,0,0,17,17,17,134
EF 1770 DATA 16,0,0,0,0,0,17,17,1
7,16,0,0,0,0,0,17,17,17,134
65 1780 DATA 16,0,0,0,0,0,17,17,1
7,16,0,0,0,0,0,17,17,17,134
```

```
BB  1790 DATA 16,0,0,0,0,17,17,1
    7,16,0,0,0,0,17,17,17,134
32  1800 DATA 16,0,0,0,0,17,17,1
    7,16,0,0,0,0,17,17,17,134
60  1810 DATA 16,0,0,0,0,17,17,1
    7,16,0,0,0,0,17,17,17,134
26  1820 DATA 16,17,17,17,16,17,
    17,17,16,17,17,16,0,0,0,2
    17
49  1830 DATA 0,0,0,0,0,17,17,17
    ,16,0,0,0,0,17,17,17,118
12  1840 DATA 16,17,17,17,16,17,
    17,17,16,17,16,17,16,17,17,1
    7,267
66  1850 DATA 16,17,16,17,16,17,
    17,17,16,17,16,17,16,17,17,1
    7,266
2E  1860 DATA 16,17,17,17,16,17,
    17,17,16,17,17,17,16,0,0,0,2
    17
71  1870 DATA 0,0,0,0,0,17,17,17
    ,16,0,0,0,0,17,17,17,118
42  1880 DATA 16,0,0,0,0,17,17,1
    7,16,0,0,0,0,17,17,17,134
30  1890 DATA 16,0,0,0,0,17,17,1
    7,16,0,0,0,0,17,17,17,134
76  1900 DATA 16,17,17,17,16,17,
    17,17,16,17,17,17,16,0,0,0,2
    17
BC  1910 DATA 0,0,0,0,0,17,16,17
    ,16,17,17,17,16,17,17,17,184

7E  1920 DATA 16,0,0,0,0,17,16,1
    7,16,17,17,17,16,17,17,17,2C
    0
18  1930 DATA 16,0,0,0,0,17,16,1
    7,16,17,17,17,16,17,17,17,20
    0
96  1940 DATA 16,0,0,0,0,17,17,1
    7,16,17,17,17,17,17,17,17,20
    2
98  1950 DATA 16,0,0,0,0,0,0,0,0
    ,0,0,0,0,0,0,0,16
3C  1960 DATA 0,0,0,0,0,0,0,0,0,
    0,0,0,0,0,0,0,0
7C  1970 DATA 173,255,204,240,6,
    206,255,204,76,188,204,169,4
    ,141,255,204,2784
EC  1980 DATA 169,15,141,24,212,
    169,9,141,5,212,169,57,141,6
    ,212,169,1851
AE  1990 DATA 10,141,12,212,169,
    56,141,13,212,169,9,141,19,2
    12,169,9,1694
43  2000 DATA 141,20,212,169,7,1
    41,10,212,169,128,141,9,212,
    173,80,193,2017
F4  2010 DATA 141,0,212,173,0,19
    2,141,1,212,173,160,194,141,
    4,212,173,2129
56  2020 DATA 80,197,141,7,212,1
    73,0,196,141,8,212,173,160,1
    98,141,11,2050
97  2030 DATA 212,173,80,201,141
    ,14,212,173,0,200,141,15,212
    ,173,160,202,2309
4A  2040 DATA 141,18,212,173,63,
    204,201,194,208,21,173,62,20
    4,201,152,208,2435
8E  2050 DATA 14,162,49,189,205,
    204,157,62,204,202,16,247,76
    ,182,204,162,2335
61  2060 DATA 0,32,196,204,162,6
    ,32,196,204,162,12,32,196,20
    4,162,18,1818
96  2070 DATA 32,196,204,162,24,
    32,196,204,162,30,32,196,204
    ,162,36,32,1904
AC  2080 DATA 196,204,162,42,32,
    196,204,162,48,32,196,204,16
    9,1,141,25,2014
96  2090 DATA 208,76,49,234,254,
    62,204,208,3,254,63,204,96,8
    0,193,141,2329
CF  2100 DATA 0,212,173,0,192,14
    1,1,212,173,160,194,141,4,21
    2,173,80,2068
4B  2110 DATA 197,141,7,212,173,
    0,196,141,8,212,173,160,198,
    141,11,212,2182
F5  2120 DATA 173,80,201,141,14,
    212,173,0,200,141,15,212,173
    ,160,202,0,2097
CA  2130 DATA 120,169,31,141,13,
    220,141,13,221,173,13,220,17
    3,13,221,169,2051
CF  2140 DATA 0,141,20,3,169,204
    ,141,21,3,169,1,141,26,208,8
    8,96,1431
```

JOYSTICK CURSOR

PROGRAM: JOYCURS.SRC

THIS PROGRAM ONLY TO BE ENTERED
IF YOU ARE USING AN ASSEMBLER.

```
10 OPEN1,8,1,"JOYCURS.OBJ":SYS32768
20 .OPT P,O1:.SYM 2
30 ;
100 ;"┌──────────────────────┐
110 ;"|                      |
120 ;"|JOYSTICK CURSOR V2.3|
130 ;"|                      |
140 ;"|    J. KEW, JAN 88    |
150 ;"|                      |
160 ;"|  SOURCE CODE FOR     |
170 ;"|ASSEMBLER/MONITOR 64|
180 ;"└──────────────────────┘
190 ;
200 *=$033C
210 INT = $0314
220 JV = $DC00
230 XMAX = $0289
240 BUFFL = $C6
250 KBUF = $0277
260 ;PLUS TBITZ, END OF PROG
290 ;
300 INIT  SEI             ;TOGGLE
310 :     LDA #<TBITZ     ;ROUTINE
320 :     EOR INT         ;ON/OFF
330 :     STA INT
340 :     LDA #>TBITZ
350 :     EOR INT+1
360 :     STA INT+1
370 :     CLI
380 :     RTS
390 ;
400 START LDA JV
410 :     AND #$1F    ;ISOLATE J/S BITS
420 :     TAY
430 :     LDA TAB.Y   ;LOAD CHARACTER
440 :     BEQ OUT1    ;FINISH IF NULL
450 :     CMP LASTC   ;COMPARE WITH LAST
460 :     BNE RESDL   ;IF DIFF, BRANCH
461 :     LDX RFLG    ;REPEAT FLAG
462 :     BNE DECDL   ;REPEAT ON
463 :     BEQ OUT
470 RESDL LDX #10     ;RESET DELAY
480 :     STX REPDL
490 :     BNE CHARP   ;JUMP
500 DECDL LDX REPDL
510 :     BEQ DECCT   ;IF DELAY=0
520 :     DEX         ;DECREMENT
530 :     STX REPDL
540 :     BEQ RESCT   ;IF DELAY NOW=0
550 :     BNE OUT     ;IF NOT, FINISH
560 DECCT DEC REPCT   ;DEC COUNTER
570 :     BNE OUT     ;IF NOT=0, FINISH
580 RESCT LDX #4      ;IF =0, RESET
590 :     STX REPCT
600 CHARP LDX BUFFL   ;PROCESS CHAR
610 :     CPX XMAX
620 :     BEQ OUT     ;IF FULL, FINISH
630 :     STA KBUF,X  ;STORE CHAR
640 :     INX         ;INC LENGTH
```

```
650 :       STX BUFFL
660 OUT1    STA LASTC
670 OUT     JMP $EA31   ;EXIT
690 ;
700 LASTC .BYT $00
710 REPCT .BYT $04
720 REPDL .BYT $0A
730 RFLG  .BYT $01
790 ;
800 ;           -   -   -   -   FSE
810 TAB .BYT $00,$00,$00,$00,$00,$00
820 ;
830 ;         FNE FE    -  FSW FNW FW
840 :   .BYT $00,$94,$00,$00,$00,$14
850 ;
860 ;           -   FS  FN  F   -   -
870 :   .BYT $00,$20,$0D,$00,$00,$00
880 ;
890 ;           -   -   -   SE  NE  E
900 :   .BYT $00,$00,$00,$1D,$1D,$1D
910 ;
920 ;           -   SW  NW  W   -   S
930 :   .BYT $00,$9D,$9D,$9D,$00,$11
940 ;
950 ;           N   -
960 :   .BYT $91,$00
970 ;
1000 TBITZ = START ↑ $EA31
```

PROGRAM: JOYCURS

```
6D  10 A=A+1:IFA=1THENLOAD"JOYCU
    RS.OBJ",8,1
28  20 SYS828
EB  30 POKE53280,0:POKE53281,0:P
    RINT"{CLR,DOWN,WHITE}";CHR$(
    14);TAB(13);"{SJ}OYSTICK{SC}
    URSOR"
B1  40 PRINTTAB(13)"{CT14}"
53  50 PRINT"{DOWN}";TAB(12);"{C
    8,SJ}. {SK}EW{SPC3,SJ}AN '88
    "
0D  60 PRINT"{DOWN3,RIGHT9,SU}SE
    A JOYSTICK IN PORT 2."
13  70 PRINT"{DOWN,RIGHT2,SS,SY,
    SS} 828{SPC4}: TOGGLES ROUTI
    NE ON/OFF."
DD  80 PRINT"{RIGHT2,SP,SO,SK,SE
    } 922,1 : REPEAT JOYKEYS"
63  90 PRINT"{RIGHT2,SP,SO,SK,SE
    } 922,0 : REPEAT OFF"
0E  100 PRINT"{DOWN,RIGHT2,SU}SE
    PROGRAM {SJ,SO,SY,SM,SO,SD}
    TO MODIFY ROUTINE."
E9  110 PRINT"{DOWN2,RIGHT5,SJ}O
    YSTICK CURSORING IS NOW {SO,
    SN}."
C5  120 PRINT"{DOWN3,C5,SPC10,SP
    }RESS A KEY TO EXIT.{WHITE}"

1F  130 GETA$:IFA$=""THEN130
C6  140 PRINT"{CLR}"
```

PROGRAM: JOYMOD

```
6D  10 A=A+1:IFA=1THENLOAD"JOYCU
    RS.OBJ",8,1
5C  20 POKE53281,0:POKE53280,0:P
    RINTCHR$(142)"{WHITE}":GOSUB
    400:PRINT"{DOWN4}MODIFY (Y/N
    ) ?"
B2  30 GETA$:IFA$=""THEN30
B8  40 IFA$="N"THEN160
FD  50 IFA$<>"Y"THEN30
2A  60 FORN=1TO17:READDR$,DD$,P:
    GOSUB400
E3  70 PRINT"{HOME,DOWN4}";TAB(3
    0):"N{RIGHT,DOWN2}E{DOWN2,LE
    FT3}S{LEFT3,UP2}W{RIGHT}";DD
    $
15  80 PRINT"{HOME,DOWN10}PRESS
    KEY FOR DIRECTION OR ← FOR N
    ULL":PRINT"{DOWN}";DR$
BC  90 GETA$:IFA$=""THEN90
7D  100 POKE923+P,ASC(A$):NEXTN
24  110 GOSUB400:PRINT"{DOWN4}RE
    PEAT FLAG ON (Y/N) ?"
14  120 GETA$:IFA$=""THEN120
4B  130 RF=0:IFA$="Y"THENRF=1:GO
    TO160
DA  140 IFA$<>"N"THEN120
2E  150 POKE922,RF
81  160 GOSUB400
22  170 PRINT"{DOWN4}SAVE (Y/N)
    ?"
E2  180 GETA$:IFA$=""THEN180
32  190 IFA$="N"THEN230
61  200 IFA$<>"Y"THEN180
72  210 PRINT:INPUT"FILENAME ";F
    $
94  220 SYS57812F$,8,1:POKE193,6
    0:POKE194,3:POKE174,188:POKE
    175,3:SYS62957
EE  230 PRINT"{CLR}":END
8B  300 DATA"NORTH","{SW,UP,LEFT
    ,S-}",30,"NORTHEAST","{SW,UP
    ,SN}",22,"EAST","{SW,S*}",23

C1  310 DATA"SOUTHEAST","{SW,DOW
    N,SM}",21,"SOUTH","{SW,DOWN,
    LEFT,S-}",29,"SOUTHWEST","{S
    W,DOWN,LEFT2,SN}",25
15  320 DATA"WEST","{SW,LEFT2,S*
    }",27,"NORTHWEST","{SW,UP,LE
    FT2,SM}",26,"FIRE","{SQ}",15

A0  330 DATA"FIRE+NORTH","{SQ,UP
    ,LEFT,S-}",14,"FIRE+NORTHEAS
    T","{SQ,UP,SN}",6,"FIRE+EAST
    ","{SQ,S*}",7
6B  340 DATA"FIRE+SOUTHEAST","{S
    Q,DOWN,SM}",5,"FIRE+SOUTH","
    {SQ,DOWN,LEFT,S-}",13
C1  350 DATA"FIRE+SOUTHWEST","{S
    Q,DOWN,LEFT2,SN}",9,"FIRE+WE
    ST","{SQ,LEFT2,S*}",11
15  360 DATA"FIRE+NORTHWEST","{S
    Q,UP,LEFT2,SM}",10
CB  400 PRINT"{CLR,DOWN}";TAB(9)
    ;"MODIFY JOYSTICK CURSOR"
9B  410 PRINTTAB(9)"{CY22}"
2B  420 RETURN
```

PROGRAM: JOYCURS.LOADER

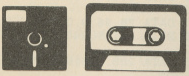
```
86  10 BL=7:LN=50:SA=828
5B  20 FOR L=0 TO BL:CX=0:FOR D=
    0 TO 15:READ A:CX=CX+A:POKE
    SA+L*16+D,A:NEXT D
A5  30 READ A:IF A<>CX THENPRINT
    "ERROR IN LINE";LN+(L*10):ST
    OP
86  40 NEXT L
62  50 DATA 120,169,126,77,20,3.
    141,20,3,169,233,77,21,3,141
    ,21,1344
E8  60 DATA 3,88,96,173,0,220,41
    ,31,168,185,155,3,240,55,205
    ,151,1814
A3  70 DATA 3,208,7,174,154,3,20
    8,9,240,46,162,10,142,153,3,
    208,1730
DE  80 DATA 23,174,153,3,240,8,2
    02,142,153,3,240,7,208,26,20
    6,152,1940
A0  90 DATA 3,208,21,162,4,142,1
    52,3,166,198,236,137,2,240,9
    ,157,1840
B9  100 DATA 119,2,232,134,198,1
    41,151,3,76,49,234,0,4,10,1,
    0,1354
3D  110 DATA 0,0,0,0,0,0,148,0,0
    ,0,20,0,32,13,0,0,213
4E  120 DATA 0,0,0,0,29,29,29,0,
    ,157,157,157,0,17,145,0,0,720

88  130 PRINT "{CLR}THE DATA FOR
    JOYCURSOR IS NOW IN THE"
91  140 PRINT "CASSETTE BUFFER."

46  150 PRINT "IF YOU ARE A DISK
    USER THEN YOU CAN SAVE";
C0  160 PRINT "THE PROGRAM AS MA
    CHINE CODE BY TYPING"
34  170 PRINT" POKE 43,60:POKE44
    ,3:POKE45,188:POKE46,3"
3D  180 PRINT" CLR:SAVE"+CHR$(34
    )+"JOYCURS.OBJ"+CHR$(34)+",8
    "

29  190 PRINT"IF YOU ARE USING C
    ASSETTE THEN YOU WILL"
FE  200 PRINT"HAVE TO ADD THIS P
    ROGRAM TO ANY"
00  210 PRINT"PROGRAM THAT YOU W
    ISH TO USE JOYCURSOR"
55  220 PRINT"WITH. {RVSON}NOTE{
    RVSOFF} ANY CASSETTE LOAD OR
     SAVE"
BA  230 PRINT"WILL ERASE THE JOY
    CURSOR PROGRAM."
B1  240 PRINT " IF YOU KNOW HOW
    TO USE AN ASSEMBLER"
E4  250 PRINT "YOU COULD RELOCAT
    E THE MACHINE CODE TO "
B7  260 PRINT "ANOTHER ADDRESS B
    Y ENTERING THE"
5F  270 PRINT"ASSEMBLER RATHER T
    HAN THE BASIC LOADER."
20  280 PRINT" IF YOU DO NOT SAV
    E JOYCURS.OBJ THEN YOU";
58  290 PRINT"MUST DELETE THE LO
    AD INSTRUCTIONS FROM"
B2  300 PRINT"THE OTHER PROGRAMS
     FOR THIS ARTICLE AND"
D2  310 PRINT"MAKE SURE THAT YOU
     HAVE RUN THIS PROG."
E0  320 PRINT"BEFORE RUNNING THE
    M."
```

HI-RES FILL



PROGRAM: HI-RES FILL

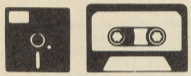
```
47  10 P=49152
69  20 READX:IFX=-1THENEND
4D  30 POKEP,X
BF  40 FORC=1TO7:READY:POKEP+C,Y
    :X=X+Y:NEXTC
77  50 READH:IFH<>XTHENPRINT"ERR
    OR IN LINE"PEEK(63)+PEEK(64)
    *256:END
95  60 P=P+8:GOTO20
D7  1000 DATA 169,57,141,24,208,
    173,2,221,995
8F  1010 DATA 9,3,141,2,221,169,
    148,141,834
FD  1020 DATA 0,221,169,204,141,
    136,2,173,1046
FF  1030 DATA 17,208,9,32,141,17
    ,208,96,728
85  1040 DATA 169,21,141,24,208,
    173,2,221,959
A7  1050 DATA 9,3,141,2,221,169,
    151,141,837
61  1060 DATA 0,221,169,4,141,13
    6,2,173,846
9D  1070 DATA 17,208,41,223,141,
    17,208,96,951
31  1080 DATA 169,0,162,224,133,
    251,134,252,1325
AF  1090 DATA 160,0,145,251,200,
    208,251,230,1445
70  1100 DATA 252,208,247,96,165
    ,20,24,41,1053
82  1110 DATA 248,121,112,192,13
    3,78,165,21,1070
1B  1120 DATA 121,137,192,133,79
    ,165,156,41,1024
77  1130 DATA 7,168,165,20,41,7,
    170,96,674
68  1140 DATA 0,64,128,192,0,64,
    128,192,768
76  1150 DATA 0,64,128,192,0,64,
    128,192,768
54  1160 DATA 0,64,128,192,0,64,
    128,192,768
2C  1170 DATA 0,224,225,226,227,
    229,230,231,1592
97  1180 DATA 232,234,235,236,23
    7,239,240,241,1894
CE  1190 DATA 242,244,245,246,24
    7,249,250,251,1974
A6  1200 DATA 252,254,128,64,32,
    16,8,4,758
98  1210 DATA 2,1,32,84,192,32,1
    9,193,555
E3  1220 DATA 189,162,192,17,78,
    145,78,32,893
C2  1230 DATA 36,193,96,32,84,19
    2,32,19,684
07  1240 DATA 193,189,162,192,73
    ,255,49,78,1191
BE  1250 DATA 145,78,32,36,193,9
    6,32,84,696
C0  1260 DATA 192,32,19,193,189,
    162,192,81,1060
F3  1270 DATA 78,145,78,32,36,19
    3,96,32,690
BB  1280 DATA 84,192,32,19,193,1
    89,162,192,1063
8A  1290 DATA 49,78,32,36,193,20
    1,0,96,685
7B  1300 DATA 56,169,199,229,155
    ,144,21,133,1106
1A  1310 DATA 156,74,74,74,168,1
    65,21,74,806
DF  1320 DATA 208,10,165,20,144,
    5,44,18,614
5B  1330 DATA 193,208,1,96,32,32
    ,192,76,830
2E  1340 DATA 72,178,192,72,173,
    14,220,41,962
D8  1350 DATA 254,141,14,220,165
    ,1,41,253,1089
B9  1360 DATA 133,1,104,96,72,16
    5,1,9,581
67  1370 DATA 2,133,1,173,14,220
    ,9,1,553
06  1380 DATA 141,14,220,104,96,
    32,253,174,1034
47  1390 DATA 32,235,183,134,155
    ,96,32,53,920
DF  1400 DATA 193,32,240,192,32,
    170,192,96,1147
D6  1410 DATA 32,53,193,32,240,1
    92,32,187,961
2E  1420 DATA 192,96,32,53,193,3
    2,240,192,1030
7D  1430 DATA 32,206,192,96,0,0,
    0,0,526
ED  1440 DATA 103,0,195,165,20,1
    66,21,141,811
3F  1450 DATA 96,193,142,97,193,
    165,155,141,1182
E2  1460 DATA 98,193,96,173,96,1
    93,174,97,1120
B8  1470 DATA 193,133,20,134,21,
    173,98,193,965
D3  1480 DATA 133,155,96,230,20,
    208,2,230,1074
F8  1490 DATA 21,96,165,20,208,2
    ,198,21,731
1C  1500 DATA 198,20,96,230,155,
    208,2,230,1139
61  1510 DATA 156,96,165,155,208
    ,2,198,156,1136
9D  1520 DATA 198,155,96,32,215,
    193,160,0,1049
50  1530 DATA 177,251,133,20,200
    ,177,251,133,1342
9E  1540 DATA 21,200,177,251,133
    ,155,200,145,1282
C7  1550 DATA 251,173,92,193,96,
    32,215,193,1245
74  1560 DATA 160,0,165,20,145,2
    51,200,165,1106
85  1570 DATA 21,145,251,200,165
    ,155,145,251,1333
BB  1580 DATA 200,173,92,193,145
    ,251,96,169,1319
6C  1590 DATA 0,162,200,133,251,
    134,252,174,1306
7F  1600 DATA 93,193,202,240,16,
    24,165,251,1184
A8  1610 DATA 105,4,133,251,165,
    252,105,0,1015
26  1620 DATA 133,252,76,226,193
    ,96,173,94,1243
A9  1630 DATA 193,16,43,32,99,19
    3,173,92,841
AC  1640 DATA 193,48,6,32,147,19
    3,76,12,707
4C  1650 DATA 194,32,154,193,165
    ,155,201,255,1349
A1  1660 DATA 240,66,201,200,240
    ,62,32,240,1281
40  1670 DATA 192,32,223,192,240
    ,54,169,0,1102
5E  1680 DATA 141,94,193,76,84,1
    94,32,99,913
A0  1690 DATA 193,173,92,193,48,
    6,32,147,884
E8  1700 DATA 193,76,55,194,32,1
    54,193,165,1062
AF  1710 DATA 155,201,255,240,23
    ,201,200,240,1515
33  1720 DATA 19,32,240,192,32,2
    23,192,208,1138
03  1730 DATA 11,169,128,141,94,
    193,238,93,1067
32  1740 DATA 193,32,189,193,32,
    115,193,173,1120
81  1750 DATA 95,193,16,43,32,99
    ,193,173,844
32  1760 DATA 92,193,16,6,32,147
    ,193,76,755
E9  1770 DATA 109,194,32,154,193
    ,165,155,201,1203
AE  1780 DATA 255,240,82,201,200
    ,240,78,32,1328
A1  1790 DATA 240,192,32,223,192
    ,240,70,169,1358
B9  1800 DATA 0,141,95,193,76,19
    7,194,32,928
74  1810 DATA 99,193,173,92,193,
    16,6,32,804
41  1820 DATA 147,193,76,152,194
    ,32,154,193,1141
49  1830 DATA 165,155,201,255,24
    0,39,201,200,1456
CD  1840 DATA 240,35,32,240,192,
    32,223,192,1186
D0  1850 DATA 208,27,169,128,141
    ,95,193,238,1199
8C  1860 DATA 93,193,173,92,193,
    73,128,141,1086
61  1870 DATA 92,193,32,189,193,
    173,92,193,1157
32  1880 DATA 73,128,141,92,193,
    32,115,193,967
BE  1890 DATA 96,32,53,193,32,20
    8,194,96,904
8E  1900 DATA 169,0,141,93,193,1
    41,92,193,1022
FC  1910 DATA 169,0,141,94,193,1
    41,95,193,1026
B0  1920 DATA 32,240,192,32,223,
    192,208,13,1132
E7  1930 DATA 32,138,193,165,20,
    37,21,201,807
1B  1940 DATA 255,240,2,208,235,
    32,131,193,1296
A2  1950 DATA 32,240,192,32,223,
    192,208,19,1138
47  1960 DATA 32,173,192,32,246,
    193,32,131,1031
32  1970 DATA 193,165,20,201,64,
    208,233,165,1249
DB  1980 DATA 21,240,229,173,93,
    193,240,19,1208
61  1990 DATA 32,163,193,206,93,
    193,32,240,1152
97  2000 DATA 192,32,223,192,240
    ,6,173,93,1151
83  2010 DATA 193,208,237,96,76,
    216,194,162,1382
CB  2020 DATA 0,160,204,134,78,1
    32,79,160,947
98  2030 DATA 0,145,78,200,208,2
    51,230,79,1191
5C  2040 DATA 166,79,224,208,208
    ,243,96,32,1256
C3  2050 DATA 253,174,32,158,183
    ,138,32,47,1017
AD  2060 DATA 195,96,32,53,193,3
    2,223,192,1016
75  2070 DATA 96,0,0,0,0,0,0,0,9
    6
E9  2080 DATA-1
```

PROGRAM: HI-RES DEMO

```
46  1 POKE53280,6+8
7B  2 DEFFNR1(X)=INT(RND(1)*264)+5
CE  3 DEFFNR2(X)=INT(RND(1)*144)+5
83  10 SYS49152:REM HIRES
49  11 PRINT"[CLR]"
BA  30 SYS49991,5:REM SET COLOUR
54  50 SYS49216:REM CLEAR GRAPHIC
41  60 FORD=0TO19
2C  70 O1=FNR1(0):O2=FNR2(0):GOSUB
       1000 SYS49184:REM LORES
16  80 NEXTD
```

```
C4  100 SYS49865,5,199-5:REM FILL
C0  110 POKE53280,5
0D  120 POKE198,0:WAIT198
,1:POKE198,0:
6A  999 END
10  1000 FORC=0TO50
41  1010 SYS49470,O1,O2+C:REM
PLOT
63  1020 SYS49470,O1+C,O2:REM
PLOT
21  1030 SYS49470,O1+C,O2+50:REM
PLOT
51  1040 SYS49470,O1+50,O2+C:REM
PLOT
DF  1050 NEXTC
A6  1060 RETURN
```

CODE RELOCATION



PROGRAM: CRELOC/BL

```
 10 GOTO50000
 20089 DATA 10,8,10,0,158,50,48,5
 4
 20097 DATA 49,0,0,0,32,68,229,16
 2
 20105 DATA 0,142,133,9,32,173,8,
 174
 20113 DATA 133,9,189,195,8,240,6
 ,32
 20121 DATA 210,255,232,208,245,2
 32,189,195
 20129 DATA 8,208,230,32,207,255,
 201,13
 20137 DATA 208,249,160,0,185,2,5
 ,201
 20145 DATA 48,176,8,201,7,176,39
 ,105
 20153 DATA 9,208,7,56,233,48,201
 ,10
 20161 DATA 176,28,192,1,240,10,1
 0,10
 20169 DATA 10,10,141,133,9,200,2
 08,220
 20177 DATA 13,133,9,141,129,9,16
 9,0
 20185 DATA 141,128,9,76,109,8,23
 8,32
 20193 DATA 208,76,13,8,234,169,1
 36,133
 20201 DATA 73,169,9,133,74,173,1
 30,9
 20209 DATA 133,75,173,131,9,133,
 76,160
 20217 DATA 0,162,0,177,73,205,13
 2,9
 20225 DATA 208,14,161,75,24,109,
 129,9
 20233 DATA 145,73,230,75,208,2,2
 30,76
 20241 DATA 200,208,2,230,74,204,
 130,9
 20249 DATA 208,225,165,74,205,13
 1,9,208
 20257 DATA 218,76,248,8,162,0,18
 9,187
 20265 DATA 8,240,6,32,210,255,23
 2,208
 20273 DATA 245,96,13,13,29,29,29
 ,29
 20281 DATA 29,0,42,80,82,79,71,8
 2
 20289 DATA 65,77,32,82,69,76,79,
 67
 20297 DATA 65,84,79,82,42,0,76,6
 9
 20305 DATA 78,71,84,72,61,32,36,
 48
 20313 DATA 53,56,51,0,82,69,76,7
 9
 20321 DATA 67,65,84,69,32,84,79,
 58
 20329 DATA 36,67,48,48,48,0,0,16
 9
 20337 DATA 0,133,73,173,129,9,13
 3,74
 20345 DATA 169,136,133,75,169,9,
 133,76
 20353 DATA 160,0,177,75,145,73,2
 30,73
 20361 DATA 208,2,230,74,230,75,2
 08,2
 20369 DATA 230,76,165,75,205,130
 ,9,208
 20377 DATA 233,165,76,205,131,9,
 208,226
 20385 DATA 32,173,8,162,0,189,95
 ,9
 20393 DATA 240,6,32,210,255,232,
 208,245
 20401 DATA 32,228,255,240,251,20
 1,89,240
 20409 DATA 26,32,173,8,162,0,189
 ,111
 20417 DATA 9,240,6,32,210,255,23
 2,208
 20425 DATA 245,174,128,9,173,129
 ,9,32
 20433 DATA 205,189,96,108,128,9,
 82,85
 20441 DATA 78,32,78,79,87,63,32,
 40
 20449 DATA 89,47,78,41,32,0,83,8
 9
 20457 DATA 83,32,65,68,68,82,69,
 83
 20465 DATA 83,32,73,83,58,32,0,0
 20473 DATA 0,11,15,19,0,0,0,76
 20481 DATA 74,19,169,0,141,65,19
 ,173
 20489 DATA 57,19,133,73,173,58,1
 9,133
 20497 DATA 74,160,0,177,73,205,6
 5,19
 20505 DATA 240,23,230,73,208,2,2
 30,74
 20513 DATA 165,73,205,59,19,208,
 236,165
 20521 DATA 74,205,60,19,208,229,
 76,56
 20529 DATA 19,238,65,19,208,209,
 24,96
 20537 DATA 0,192,16,192,16,192,0
 ,96
 20545 DATA 0,173,57,19,133,73,13
 3,75
 20553 DATA 173,58,19,133,74,173,
 64,19
 20561 DATA 133,76,160,0,177,73,2
 09,75
 20569 DATA 240,3,32,129,19,200,2
 08,4
 20577 DATA 230,74,230,76,165,74,
 205,60
 20585 DATA 19,208,233,204,59,19,
 208,228
 20593 DATA 173,180,19,24,109,59,
 19,141
 20601 DATA 61,19,165,78,141,62,1
 9,96
 20609 DATA 173,179,19,208,13,238
 ,179,19
 20617 DATA 173,59,19,133,77,173,
 60,19
 20625 DATA 133,78,177,73,72,173,
 65,19
 20633 DATA 145,73,140,181,19,104
 ,56,237
 20641 DATA 58,19,172,180,19,145,
 77,172
 20649 DATA 181,19,238,180,19,208
 ,2,230
 20657 DATA 78,96,0,0,0,162,0,189
 20665 DATA 41,19,240,6,32,210,25
 5,232
 20673 DATA 208,245,96,169,147,32
 ,210,255
 20681 DATA 162,0,142,181,19,32,1
 82,19
 20689 DATA 174,181,19,189,49,19,
 240,6
 20697 DATA 32,210,255,232,208,24
 5,232,189
 20705 DATA 49,19,208,230,96,169,
 0,141
 20713 DATA 39,19,162,6,142,40,19
 ,160
 20721 DATA 25,24,32,240,255,32,2
 07,255
 20729 DATA 240,251,174,39,19,238
 ,39,19
 20737 DATA 157,237,19,201,13,208
 ,238,174
 20745 DATA 40,19,232,232,224,12,
 144,220
 20753 DATA 96,32,196,19,32,230,1
 9,162
 20761 DATA 88,32,203,19,32,228,2
 55,240
 20769 DATA 251,201,78,240,236,96
 ,0,0
 20777 DATA 13,13,29,29,29,29,29,
 0
 20785 DATA 29,29,29,29,29,29,18,
 65
 20793 DATA 76,76,32,73,78,80,85,
 84
 20801 DATA 32,73,78,32,72,69,88,
 146
 20809 DATA 17,17,0,83,84,65,82,8
 4
 20817 DATA 32,79,70,32,65,83,83,
 69
 20825 DATA 77,66,76,89,49,58,0,8
 3
 20833 DATA 84,65,82,84,32,79,70,
 32
 20841 DATA 65,83,83,69,77,66,76,
 89
 20849 DATA 50,58,0,69,78,68,43,4
 9
 20857 DATA 32,79,70,32,65,83,83,
 69
 20865 DATA 77,66,76,89,49,58,0,0
 20873 DATA 65,82,69,32,89,79,85,
 32
 20881 DATA 83,85,82,69,32,89,47,
 78
 20889 DATA 0,0,76,79,79,75,73,78
 20897 DATA 71,32,70,79,82,32,77,
 65
 20905 DATA 82,75,69,82,0,0,77,65
 20913 DATA 82,75,69,82,32,70,79,
 85
 20921 DATA 78,68,32,45,32,80,82,
 69
 20929 DATA 80,65,82,73,78,71,32,
 80
 20937 DATA 82,79,71,82,65,77,0,0
 20945 DATA 77,65,82,75,69,82,32,
 78
 20953 DATA 79,84,32,70,79,85,78,
 68
 20961 DATA 32,45,32,69,88,73,84,
 73
 20969 DATA 78,71,0,0,65,66,67,68
 20977 DATA 13,69,70,65,66,13,49,
 50
 20985 DATA 51,52,13,160,0,189,23
 7,19
 20993 DATA 232,201,13,240,246,20
 1,64,176
 21001 DATA 6,56,233,48,76,18,19,
 233
```

```
21009 DATA 55,192,1,240,6,141,66
,19
21017 DATA 200,208,226,14,66,19,
14,66
21025 DATA 19,14,66,19,14,66,19,
13
21033 DATA 66,19,96,162,0,160,0,
140
21041 DATA 67,19,32,252,19,172,6
7,19
21049 DATA 153,68,19,200,192,6,2
08,239
21057 DATA 96,0,0,0,0,0,0,0
21065 DATA 0,216,32,18,19,32,44,
19
21073 DATA 32,121,19,32,68,229,1
62,106
21081 DATA 32,203,19,32,3,19,176
,6
21089 DATA 162,160,32,203,19,96,
162,126
21097 DATA 32,203,19,32,66,19,32
,220
21105 DATA 19,32,158,19,32,59,19
,96
21113 DATA 173,69,19,141,57,19,1
73,68
21121 DATA 19,141,58,19,173,71,1
9,141
21129 DATA 63,19,173,70,19,141,6
4,19
21137 DATA 173,73,19,141,59,19,1
73,72
21145 DATA 19,141,60,19,96,173,5
7,19
21153 DATA 160,0,56,233,135,133,
73,141
21161 DATA 248,19,173,58,19,233,
1,133
21169 DATA 74,141,249,19,169,250
,133,75
21177 DATA 169,19,133,76,177,75,
145,73
21185 DATA 230,73,208,2,230,74,2
30,75
21193 DATA 208,2,230,76,165,74,2
05,58
21201 DATA 19,208,233,165,73,205
,57,19
21209 DATA 208,226,96,173,59,19,
56,237
21217 DATA 57,19,141,57,19,173,6
0,19
21225 DATA 237,58,19,141,58,19,1
69,136
21233 DATA 24,109,57,19,141,123,
19,169
21241 DATA 9,109,58,19,141,124,1
9,162
21249 DATA 0,173,58,19,41,240,74
,74
21257 DATA 74,74,24,105,48,201,5
8,144
21265 DATA 3,24,105,7,157,217,19
,232
21273 DATA 224,4,240,21,224,1,20
8,8
21281 DATA 173,58,19,41,15,76,11
,19
21289 DATA 173,57,19,224,2,240,2
13,208
21297 DATA 242,173,65,19,141,125
,19,96
21305 DATA 0,0,162,0,189,199,19,
240
21313 DATA 6,32,210,255,232,208,
245,162
21321 DATA 0,32,207,255,240,251,
201,13
21329 DATA 240,8,157,183,19,232,
224,13
21337 DATA 208,239,224,0,240,220
,142,197
21345 DATA 19,162,0,189,221,19,2
40,6
21353 DATA 32,210,255,232,208,24
5,32,207
21361 DATA 255,240,251,201,13,24
0,5,141
21369 DATA 198,19,208,242,173,19
8,19,56
21377 DATA 233,48,201,1,240,4,20
1,8
21385 DATA 208,176,170,169,1,160
,0,32
21393 DATA 186,255,173,197,19,16
2,183,160
21401 DATA 19,32,189,255,173,248
,19,133
21409 DATA 73,173,249,19,133,74,
169,73
21417 DATA 174,61,19,172,62,19,2
32,208
21425 DATA 1,200,32,216,255,96,3
2,32
21433 DATA 32,32,32,32,32,32,32,
32
21441 DATA 32,32,32,32,0,0,13,17
21449 DATA 17,17,17,29,29,80,82,
79
21457 DATA 71,82,65,77,32,78,65,
77
21465 DATA 69,58,32,0,13,17,17,2
9
21473 DATA 29,79,85,84,80,85,84,
32
21481 DATA 68,69,86,73,67,69,32,
40
21489 DATA 49,47,56,41,58,32,0,0
21497 DATA 0,10,8,10,0,158,50,48
21505 DATA 54,49,0,0,0,32,68,229
21513 DATA 162,0,142,133,9,32,17
3,8
21521 DATA 174,133,9,189,195,8,2
40,6
21529 DATA 32,210,255,232,208,24
5,232,189
21537 DATA 195,8,208,230,32,207,
255,201
21545 DATA 13,208,249,160,0,185,
2,5
21553 DATA 201,48,176,8,201,7,17
6,39
21561 DATA 105,9,208,7,56,233,48
,201
21569 DATA 10,176,28,192,1,240,1
0,10
21577 DATA 10,10,10,141,133,9,20
0,208
21585 DATA 220,13,133,9,141,129,
9,169
21593 DATA 0,141,128,9,76,109,8,
238
21601 DATA 32,208,76,13,8,234,16
9,136
21609 DATA 133,73,169,9,133,74,1
73,130
21617 DATA 9,133,75,173,131,9,13
3,76
21625 DATA 160,0,162,0,177,73,20
5,132
21633 DATA 9,208,14,161,75,24,10
9,129
21641 DATA 9,145,73,230,75,208,2
,230
21649 DATA 76,200,208,2,230,74,2
04,130
21657 DATA 9,208,225,165,74,205,
131,9
21665 DATA 208,218,76,248,8,162,
0,189
21673 DATA 187,8,240,6,32,210,25
5,232
21681 DATA 208,245,96,13,13,29,2
9,29
21689 DATA 29,29,0,42,80,82,79,7
1
21697 DATA 82,65,77,32,82,69,76,
79
21705 DATA 67,65,84,79,82,42,0,7
6
21713 DATA 69,78,71,84,72,61,32,
36
21721 DATA 48,52,48,48,0,82,69,7
6
21729 DATA 79,67,65,84,69,32,84,
79
21737 DATA 58,36,67,48,48,48,0,0
21745 DATA 169,0,133,73,173,129,
9,133
21753 DATA 74,169,136,133,75,169
,9,133
21761 DATA 76,160,0,177,75,145,7
3,230
21769 DATA 73,208,2,230,74,230,7
5,208
21777 DATA 2,230,76,165,75,205,1
30,9
21785 DATA 208,233,165,76,205,13
1,9,208
21793 DATA 226,32,173,8,162,0,18
9,95
21801 DATA 9,240,6,32,210,255,23
2,208
21809 DATA 245,32,228,255,240,25
1,201,89
21817 DATA 240,26,32,173,8,162,0
,189
21825 DATA 111,9,240,6,32,210,25
5,232
21833 DATA 208,245,174,128,9,173
,129,9
21841 DATA 32,205,189,96,108,128
,9,82
21849 DATA 85,78,32,78,79,87,63,
32
21857 DATA 40,89,47,78,41,32,0,8
3
21865 DATA 89,83,32,65,68,68,82,
69
21873 DATA 83,83,32,73,83,58,32,
0
21881 DATA 0,0,0,0,0,0,0,0
21889 DATA 247,247,2,0,0,0,0,0
21897 DATA 0,0,0,0,0,0,0,0
21905 DATA 0,0,0,0,0,0,0,0
21913 DATA 0,0,0,0,0,0,0,1
21921 DATA 0,0,0,1,1,1,1,1
21929 DATA 1,1,1,0,0,0,1,2
21937 DATA 2,2,2,2,2,2,2,1
21945 DATA 2,2,1,2,2,0,0,0
21953 DATA 0,0,2,2,3,2,0,2
21961 DATA 0,2,0,2,0,2,0,2
21969 DATA 0,0,3,0,3,0,3,0,0
21977 DATA 0,0,3,0,0,3,3,5
21985 DATA 3,5,3,4,3,3,3,0
21993 DATA 5,3,3,3,3,3,3,3
22001 DATA 3,3,3,0,0,0,256
50000 M=2049:PRINT"(CLR)(DOWN)(D
OWN)(RGHT)(RGHT)(RGHT)(RVS)LOCAT
ION:(OFF)"
50010 FORL=0TO1:L=0
50020 READV:IFV=256THENL=1:GOTO5
0050
50030 POKEM,V:PRINT"(HOME)(DOWN)
(DOWN)(RGHT)(RGHT)(RGHT)(RGHT)(R
GHT)(RGHT)(RGHT)(RGHT)(RGHT)(RGH
T)(RGHT)(RGHT)";M
50040 M=M+1
50050 NEXT
50060 INPUT"(CLR)(DOWN)(DOWN)(DO
WN)(RGHT)(RGHT)FILENAME";F$
50070 INPUT"(DOWN)(DOWN)(RGHT)(R
GHT)TAPE(T)/DISC(D)";O$
50080 IFF$=""ORO$<>"T"ANDO$<>"D"
THEN50060
50085 O=1*ABS(O$="T")+8*ABS(O$="
D")
50090 PRINT"(CLR)(DOWN)(DOWN)SAV
E"CHR$(34);F$;CHR$(34);",";O
50094 H=INT(M/256):L=M-H*256:POK
E252,L:POKE253,H
50095 POKE46,PEEK(253):POKE45,PE
EK(252)
50100 POKE631,13:POKE198,1:PRINT
""
```

YOUR COMMODORE

Lineage: 58p per word. (including VAT)
Semi display: £10.95 plus VAT per single column centimetre 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

Send your requirements to:
ALAN COLE
CLASSIFIED DEPARTMENT
ASP LTD, 1 GOLDEN SQUARE, LONDON W1R 3AB.

SOFTWARE

YOUR COMMODORE SPECIALS

TECH DRAW 64 - A comprehensive technical illustration aid for C64 owners for both disk and tape. Commands available include LINE DRAW, RAYS, BOX, CIRCLE, ARC, ELLIPSE, FREEHAND, FILL, HATCH & TEXT. Wipe copy, move and rotate, save and load or print your drawing all for £8.95 tape or disk. Order Codes TD64T (tape) TD64D (disk)

Full details in Your Commodore July 1987.

SPEEDY ASSEMBLER

Your Commodore's very own Assembler, a 100% memory resident program for loading from tape or disk, featured in the Your Commodore Machine Code Series and now the Y.C. standard assembler only £9.95 Tape or Disk. Order Codes YSPASSD (disk) YSPASSR (tape)

Order from Your Commodore Readers Services at 9, Hall Road, Maylands Wood Estate, Hemel, Hempstead Herts HP2 7BH. Please make cheques payable to A.S.P. Ltd., or telephone your Access/Visa order on 0442 41221

COMMODORE 64/128 CASSETTE ONLY

X RATED ADULTS ONLY GAME

FANTASY

ONLY £6.50

Loosen your collar, get out your JOYSTICK and get stuck in. By the time you finish you'll be exhausted.

WARNING If you are easily offended do NOT order this game.

R'n'H MICROTEC
32 Hazell Way
Stoke Pages
BUCKS SL2 44D

ONLY AVAILABLE BY MAIL ORDER

MARKET YOUR EXPERTISE

IN YOUR COMMODORE CALL ALAN COLE ON 01-437 0699 TODAY!

MIDI PRODUCTS

SONUS

INNOVATIVE 'MIDI' SOFTWARE PRODUCTS
See April '88 Review, Page 65
Take advantage of our low prices, - send SAE for free leaflets to:

SONUS INTL LTD, PO Box 18, Wokingham RG11 4BP Berks
Tel: (0734) 792699

Advertisers Plan your Autumn advertising in YOUR COMMODORE

Call Alan Cole on 01-437 0699 For Details of Series Discounts

or write to the Classified Department Argus Specialist Publications 1 Golden Square London W1R 3AB

BUSINESS

HOW TO PROFIT from your computer skills. Free details now from RS Fairfield Books MI 14 Robert Rayner Close Peterborough PE2 0AY.

LANGUAGES

PLUS4 FORTH DISK. £24.95

MetacomPiler, FIG/79. 32 Kbytes. Auto Tape/disk and Silent. HIRES: DRAW & DUMP. DEFINABLE CHARS: Complete with 50+ commented screens.

TENSAL TECHNOLOGY
15, Penrice Close,W-S-M. Avon. BS22 9AH

SERVICES

COMMODORE SUPPLIES

C64 Power Pack	19.95
64 Data Rec (Binatone)	17.95
C2N (C.16) Data Rec	17.95
64 Music Expansion Syst	69.95
Neous Mouse and Cheese	19.95

Prices include VAT & P&P. Chq to:

OMNIDALE LTD
23 Curzon Street, Derby.
Tel: 0332 291219

• Services • Software • Midi Producers • For Sale • Languages • Wanted

Your Commodore offers its advertisers a variety of choice for marketing their Products and Services.

TERMS & CONDITIONS

CLASSIFIED ADVERTISING TERMS & CONDITIONS

Our terms for new advertisers (semi-display and lineage) are strictly pro-forma payments until satisfactory reference can be taken up (excluding recognised advertising agencies). Cheques and P.O.'s should be crossed and made payable to ARGUS SPECIALIST PUBLICATIONS LTD and sent together with the advertisements to:

The Classified Dept.,
No. 1 Golden Square,
London W1R 3AB.

There are no reimbursements for cancellations. Advertisements arriving too late for a particular issue will be inserted in the following issue unless accompanied by instructions to the contrary. It is the responsibility of the advertiser to ensure that the first insertion of every series is published correctly, and corrections must be notified in time for the second insertion, otherwise the publishers will not accept liability or offer any reduction in charges.

All advertising sales are subject to Government Regulations concerning VAT. Advertisers are responsible for complying with the various legal requirements in force eg. The Trade Description Act, sex discrimination act & the business advertisements (disclosure) order 1977.

Full Terms & Conditions of Advertising available on request.

FOOTBALL & CRICKET

SPORTS SIMULATIONS FROM E&J SOFTWARE (Established 3 Years)

4 CLASSIC Strategy Games packed with GENUINE & REALISTIC Features

PREMIER II: CAN YOU HANDLE ALL OF THIS? Play all teams Home & Away. Unique & Comprehensive Transfer Market Feature Full Team & Substitute Selection • In-Match Substitutions • Match Injuries • Team Morale • Transfer Demands • 7 Skill Levels • Manager's Salary • Continuing Seasons • Job Offers • Sackings • Save Game • MUCH MORE!

EUROPEAN II: THE MOST COMPLETE EUROPEAN SIMULATION YOU CAN BUY! Home & Away Legs • Penalty Shoot Out 2 Substitutes allAllowed • Away Goals Count Double • Full Team & Subs Selection • Extra Time • 7 Skill Levels • Disciplinary Table • Save Game • TEXT MATCH SIMULATION • Match Timer, Named & Recorder Goal Scorers, Corners, Free Kicks, Goal Times, Disallowed Goals, Sending Off, Injury Time, Penalties, Bookings • MUCH MORE!

WORLD CHAMPIONS: A COMPLETE WORLD CUP SIMULATION Select Frendlies • Squad of 25 Players • Qualifying Rounds 2 In-Match Substitutes • Disciplinary Table • Select Tour Opponents • Save Game • 7 Skill Levels • Extra Time • Penalty Shoot-Out • TEXT MATCH SUMMULATION including: Bookings, Goal Times, Named & Recorder Goal Scorers, Injury Time, Corners, Free Kicks, Match Clock, Penalties • MUCH MORE!

CRICKET MASTER: A SUPERB SIMULATION OF ONE DAY CRICKET. Weather Wicket & Outfield Conditions • Batting & Bowling Tatics Team Selection • Fast, Soin & Medium Pace Bowlers • 4 Types of Batsman • Select Field Layout • 3 Skill Levels • Wides Byes • No Ball • Dropped Catches • Scoreboard • Batting & Bowling Analysis • Run Rate • Run Single Option • 3 Game Speeds • MUCH MORE! Price includes a FREE pad of CRICKET MASTER Scoresheets.

Software availability	Spectrum Any 48 +128 Tape	Spectrum Any 48 +128 Disc +3	Commodore 64 +128 Tape	Commodore 64 +128 5¼" Disc	Amstrad CPC Tape	Amstrad CPC 3" Disc
PREMIER II	£8.95	£10.95	£7.95	£10.45	£7.95	£11.95
EUROPEAN II	£8.95	£10.95	£7.95	£10.45	D/A	N/A
WORLD CHAMPIONS	£8.95	£10.95	£7.95	£10.45	£7.95	£11.95
CRICKET MASTER	£7.95	£11.95	£8.95	£11.45	£8.95	£12.95

Send to: E & J SOFTWARE, Room C1, 37 Westmoor Road, ENFIELD, Middlesex EN3 7LE

Repairs Guide

CALL

ALAN COLE

ON

01—437 0699

PROBLEMS WITH YOUR COMMODORE ?

FOR FAST, RELIABLE AND PROFESSIONAL REPAIRS AT COMPETITIVE PRICES

P M ENGINEERING

UNIT 8, NEW ROAD, ST. IVES, CAMBRIDGESHIRE. PE17 - 4BG

VISA

ST. IVES (0480) 61394

We can also supply Hardware, Software, Blank Disks, Accessories and Spare parts.

COMPUTER REPAIRS

SPECTRUM, COMMODORE, AMSTRAD, ACORN, BBC etc.

Fixed charge repairs on all makes

Please ring for details:

MCE SERVICES

33 Albert Street, Mansfield, Notts NG18 1EA

Tel: 0623 653512

SPECIALIST COMMODORE

G-TEK

Commodore 64	£21.00	Commodore Modem	£16.00
Commodore 16	£19.00	Commodore 128	£30.00
Commodore +4	£20.00	Commodore 801/802	P.O.A.
Commodore 1541	£25.00	Commodore 1520/11526	P.O.A.

(ALL ABOVE PRICES INC. VA.T.)

COMPUTER REPAIRS

Repairs carried out by ex-commodore technicians. A full test and service including a 4 month warranty with every repair (Commodore spares available on request)

Make cheque/Postal Order payable to: **G-TEK.**

(Please include £3.00 post)

UNIT G, LAMMAS COURTYARD, WELDON INDUSTRIAL ESTATE CORBY NORTHANTS NN17 1EZ Tel: (0536) 69454.

COMREPAIR

FOR ALL YOUR HOME COMPUTER REPAIRS. COMPETITIVE RATES, CONTACT

COMREPAIR

YORK 784 347 (24 hrs)

We also sell new & used computers Prices on request. Collection & delivery service By arrangement.

VTS COMPUTER REPAIRS

01 - 407 9829

Simply send your unit to the address below securely packed with fault description and max fee.

COMMODORE, AMSTRAD, BBC, SINCLAIR + MORE.....**£28.00**

VTS COMPUTER REPAIRS

12 Lyly House, Gt. Dover Street, London, SE1 4EQ.

FAST, RELIABLE TURNAROUND

SPARES REPAIRS SALES

all makes of computers & peripherals

Fast Reliable Guaranteed Service

Contact Dave Barber H.Eng., AMIERE

db ELECTRONIC SERVICES

205 Meadgate Avenue, Gt. Baddow, Chelmsford, Essex. CM2 7NJ

Tel: 0245 - 260874

CROYDON COMPUTER CENTRE

25 Brigstock Road, Thornton Heath, Surrey, CR4 7JJ Tel: 01 683 2646

COMPUTER SERVICING

(Est'd since 1979)

We repair — on the premises — quick turnround

- ★ Commodore & Spectrum
- ★ BBC & Electron (Approved Service Centre)
- ★ Amstrad & Torch (Approved Service Centre)
- ★ Disc Drives, Printers, Monitors

Mail Orders by phone Access & Visa accepted

COMMODORE SPARES & REPAIRS

906114-01	£9.30
6510	£9.95
6569	£22.50
6526 CIA	£9.50
6581 SID	£11.25
901227-03	£8.90
901226-01	£12.65
901225-01	£8.30
8501	£8.95
8360	£21.50
251641-02	£8.50
8701	£9.85
C64 PSU	£23.00
C64 MOD	£27.00
C64 DATA SET	£28.00
C128 PSU	£69.00

INCL. VAT & P&P

OASIS

Dept. 4C, 14 RIDGEWAY ROAD, SALISBURY, WILTSHIRE, SP1 3BU. TEL: (0722) 335061

Commodore warranty repairers offer spares and repairs on the full range of commodore CBM products, including all Amigas.

Phone or write for free estimates to:-

D.P.C.E. Volume Repair Centre

Wilkinson House, Telspace II, Stafford Park, Telford,

Tel: 0952 620 488

Ask for Pauline

Why not include your business details in our Specialists Repairs Guide.

Ring Alan Cole on 01-437 0699 or fill in the details of your business (opposite) and we will contact you.

Our address is on the classified pages.

Your Commodore — Specialist Repairs Guide — Please contact me from the details below:-

Name .....

Company .....

Address .....

Tel. No. .....

BABAK

Bug Finder

We'd like to remind our readers that we run a Bug Finder service.

If you have typed in one of our programs and despite much checking, you still can't get it 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 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, please check it several times first.

We do get a large number of queries and so it may take a while for us to deal with yours personally.

Note: we can only deal with problems relating to programs published in *Your Commodore*.

At the *Your Commodore* office we receive hundreds of letters from readers every month. We do try and answer each individually but sometimes this is impossible due to pressure of work. If you have written to us and not received a personal reply, we apologise for this but we cannot promise to reply to every item of mail we receive. If you feel that your question or letter really needs an answer, then inclusion of an s.a.e. will guarantee a reply, although this may still take time to arrive.

Commodore Where Are You?

At the *Your Commodore* office we are repeatedly asked for the address and telephone number of Commodore U.K. Many people, after referring to their computer manuals, believe them to be based in Corby.

The Commodore plant at Corby was closed down some time ago. Reproduced here you will find the correct address for Commodore U.K.

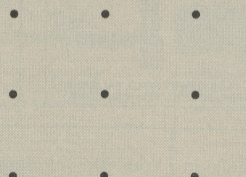
We suggest that you write this correct address in the front of your computers manual for future reference.

Commodore Business Machine, (UK),
Commodore House,
The Switchback,
Gardner Road,
Maidenhead,
Berks SL6 7XA.

PuzzleCorner

PUZZLE CORNER

Another simple one this month. Imagine that there are nine dots arranged in a 3 x 3 grid (see diagram).



All you have to do is join all the dots using just four straight lines. The only snag is that each new line must start where the old one finishes.

Send entries to, *Grid Puzzle*, Your Commodore, A.S.P. Ltd, 1 Golden Square, London W1R 3AB.

Competition Winners

At last the eagerly awaited result of the **Micronet** competition which we ran in the May issue. And the winner of the highly acclaimed ProPak which comprises the Telemap modem and software is Bruce Belton of Henfield, Sussex. Congratulations Bruce!

We have a Scottish winner for the June **Board Game** competition. Brian Graham of Ayr wins The Colossus Series which comprises Chess, Bridge and Maj Jong. The ten runners up will each receive a Maj Jong set – read on and see if it's you;

David Fairweather, Blackburn; A. Betesta, Derby; M.R. Eyres, Co. Galway; P. Moisejeus, Swindon; K. Patel, Crawley; Allan Parker, Huntingdon; G. Patel, Surrey; Dixie Dean, Littlehampton; J. Hicks, Redditch; Dave Parish, West Wickham.

The three lucky winners of the **Graphics** competition which we ran in the July issue are Michael Suchoruczka, Nottingham; M. Moore, Ipswich; J. Davey, Torquay. They will all receive a graphics package comprising Photo Finish, BillBoard Maker, Icon Factory, Screen F/X and Clipart from Financial Systems Software. The seven runners up will each receive a copy of the popular F/X package. They are: R.H. Underwood, Surbiton; Eugene Morgan, C. Down; A. Haddon, Nottingham; G.G. Brown, Tyne & Wear; M.J. New, Canterbury; Sean Whelan, Plumstead; G. Snowling, Sudbury.

Evesham Micros

All prices include VAT/delivery

star LC-10
Best-selling CBM ready printer

Enormously successful addition to the Star range of printers, the LC-10 incorporates many useful features at an ultra low price. Includes many facilities not normally available in the sub £200 price range, such as 4 NLQ fonts and paper parking (use single sheets without removing tractor paper). 7-colour version also available, which will accept standard LC10 black ribbons. LC10 available either in '64/128 ready form or as parallel version for Amiga users. Please state your computer type when ordering.

Only £199.00

Colour version also available,

Only £234.00

Prices include two extra black ribbons free of charge

OCEANIC OC-118

Previously sold as 'Excelerator Plus'

A superb package representing extremely good value for money, combining the Oceanic OC-118 disk drive (previously sold as 'Excelerator+') and the sophisticated GEOS system. Said by COMPUTE's Gazette to have "dramatic improvements over the 1541 in quality and reliability", the drive is a stylish and attractive compact unit featuring a direct drive motor and its own external power supply. GEOS brings the power of a graphic interface and integrated disk turbo to your '64 and includes geoPAINT, a graphic workshop, geoWRITE, a WYSIWIG word processor and many Desk Accessories. Many more extensions available - see below.

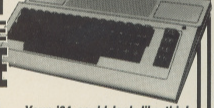
Oceanic OC-118 & GEOS £129.95

Oceanic OC-118 & GEOS plus *Freeze Machine* £149.95

GEOS Applications

GEOS 64	£24.95	GEOPUBLISH	£32.95
GEOFILE	£24.95	GEOPROGRAMMER	£32.95
GEOCALC	£24.95	GEOS 128	£32.95
DESKPACK+ 64/128	£21.95	GEOWRITE WORKSHOP	£24.95
GEOWRITE WORKSHOP 128	£32.95	FONTPACK+ 64/128	£16.95
GEOCALC 128	£32.95	GEOSPELL	£16.95
GEOFILE 128	£32.95		

GET THE SLIMLINE '64



Your '64 could look like this!

Why put up with an old fashioned looking computer? Fit this smart and modern looking new case to your '64 - it will look and feel like you are using a brand new computer. This high quality injection moulded case is simple to fit and gives a lower keyboard height. Reject the old image and order one *now*.

Only £19.95

FREEZE MACHINE for speed, power and ease of use

- Unstoppable Freeze
- Fast save routines
- Ultra-efficient file compactor
- Lazer and Turbo fastloads
- Integral reset button
- Tape turbo facilities
- 12 second disk format
- Selective file copier
- Selectaload
- many more useful features!

Only £28.95

For speed, power and ease of use it has to be Freeze Machine, probably the most effective backup cartridge on the market! Incorporating two types of fast load routines you can SAVE and reLOAD your favourite games in as little as 10 seconds and no more than 18. Numerous invaluable facilities available, including a built-in reset button. Utility Disc V3.0 also available to complement usage of the cartridge. It allows complete transfer to disk of many tape-based programs that load extra parts, eg. Gunship, Last Ninja, World Games. Supercycle. A very useful add-on.

Utility disc only £7.95

Selected Products

LOAD IT!! ..... The best thing to happen to a Commodore data recorder. Includes built-in azimuth adjustment knob and LED tape signal level meter **£39.95**

DOUBLER '64 ..... Makes perfect tape backups every time. Consists of hardware and software. Requires access to two data recorders. Very easy to use, only **£12.95**

ICONTROLLER ..... Natty little keyboard mounted cursor controller, ideal for icon-driven applications like GEOS **£11.95**

DOLPHIN DOS ..... Parallel operating system for use with 64/128 and 1541 disk drive. Fantastic speed increase on LOAD and SAVE whilst maintaining CBM disk format. Many extra DOS & BASIC commands, includes built-in monitor and Centronics printer driver **£69.95**

DISC DISECTOR V5.0 ..... Disk backup/utility package featuring wide range of powerful programs. Compatible with 64/128/128D and 1541/1570 disk drives **£19.95**

1541 PHYSICAL EXAM ..... Consists of digital alignment disk and drive fault diagnosis software to check and correct 1541 head alignment. Includes quiet drive stops **£39.95**

1541 QUIET DRIVE STOPS ..... Silences 'knocking' noise with 1541 drives (not suitable for 'turn lever' type drives) **£4.95**

DATA RECORDER ..... CBM compatible, same as C2N/1531 but cheaper and includes pause control button **£24.95**

AZIMATE 3000 KIT ..... Tape loading problems? Use this kit to check and adjust data recorder head alignment **£6.95**

AMIGA 500 ..... **£389.00**
standard 512K model, including Mouse, Silent Service and 5 disks of Public Domain software.

Phillips CM8833 (Colour monitor suitable for Amiga 500) **£279.00**

Phillips CM8852 monitor as above, but higher resolution **£299.00**

Disks & Boxes

25 bulk packed 5.25" DS/DD disks with sleeves, write protect tabs and labels. Good quality and fully guaranteed, only **£13.95**

25 disks + box. Disks as above plus 50 capacity lockable storage box, only **£22.95**

25 disks + 100 box. As previous offer but with 100 capacity locking box **£24.95**

50 capacity box. Lockable storage unit for 5.25" disks with smoked perspex top **£10.95**

100 capacity box. Larger version **£13.95**

How to order from Evesham Micros

VISA

Phone us with your ACCESS or VISA card details on :

☎ 0386-765500

All prices include VAT and delivery. Next day delivery £5.00 extra.

Send cheque, Postal Order or ACCESS/VISA card details

Govt., educ. & PLC orders welcome
Same day despatch whenever possible
All goods subject to availability, E.&O.E.
Open to callers 6 days, 9.30-5.30

Evesham Micros Ltd
63 BRIDGE STREET
EVESHAM
WORCS WR11 4SF
✆ 0386-765500
fax 0386-765354
telex 333294

Also at: 1762 Pershore Rd., Cotteridge, Birmingham B30 3BH Tel: 021 458 4564

You won't find these programs in the top ten!

These programs have sold thousands of copies, and yet you won't have seen them in the charts — why?

We produce programs that you can really get your teeth into. Programs like **BUSICALC** and **BUSICALC 3** which can be used at home or in the office to do all sorts of calculations, forecasts and budgets.

Programs like **MIKRO ASSEMBLER** and the **ZOOM** monitor which make it easy to write machine code programs. Programs like **MUSIC MASTER** which turn your computer into a musical instrument. And programs like the **BLITZ** compiler which makes ordinary BASIC programs run much, much faster.

We have been writing programs for Commodore computers since 1978 and now have hundreds of programs for the PET, VIC 20, CBM 64, CBM 128, even the C16 and Plus/4. So why aren't our programs in the charts?

Because our programs aren't one minute wonders, here today and gone tomorrow. Programs we released for the 64 in 1983 are still selling — and even more important, the people who bought them then are still using them.

Software should be an investment, not money down the drain. We believe that the more you put into a program, the more you should get out of it, and that's the way it works with software from **SUPERSOFT.**

The programs listed on the right represent a small selection from our range, but you can get a full list if you phone or write to the address below. We offer an excellent mail order service, and you can pay by cheque, Access, or Visa.

SUPERSOFT, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ
Telephone: 01-861 1166

SUPERSOFT

For Commodore 64	
Busicalc	17.95t 19.95d
Mikro Assembler	57.70c
Turbo Disk	14.95d
Pass Your Driving Test	8.95t
Music Master	17.95t 19.95d
Interdictor Pilot	17.95t 19.95d
Blitz Compiler	14.95t 19.95d
Word Perfect	17.95t 19.95d
Instant Recall	17.95t 19.95d
For Commodore 128	
Blitz Compiler	29.95d
128 Plus upgrade rom	19.95r
Help 64/128 cartridge	39.95c
For C16 and Plus/4	
Turbo 16	6.95t
Graphics Designer	6.95t 8.95d
Mikro Assembler	12.95t 14.95d
Music Master	12.95t 14.95d
Word Perfect	12.95t 14.95d
For Commodore Pet	
Word Perfect	51.75r
Flex-File 2.1	97.75d
Busicalc	44.85t 47.15d
Busicalc 3	97.95d
For Commodore Amiga	
MIDI for Amiga	49.75

YOUR
COMMODO

OCTOBER 1988

UNBEATABLE PROGRA

JOYSTICK CURSOR ☐ FILE EXTENSION ☐ HI-RES FILL